A1 Birtley to Coal House

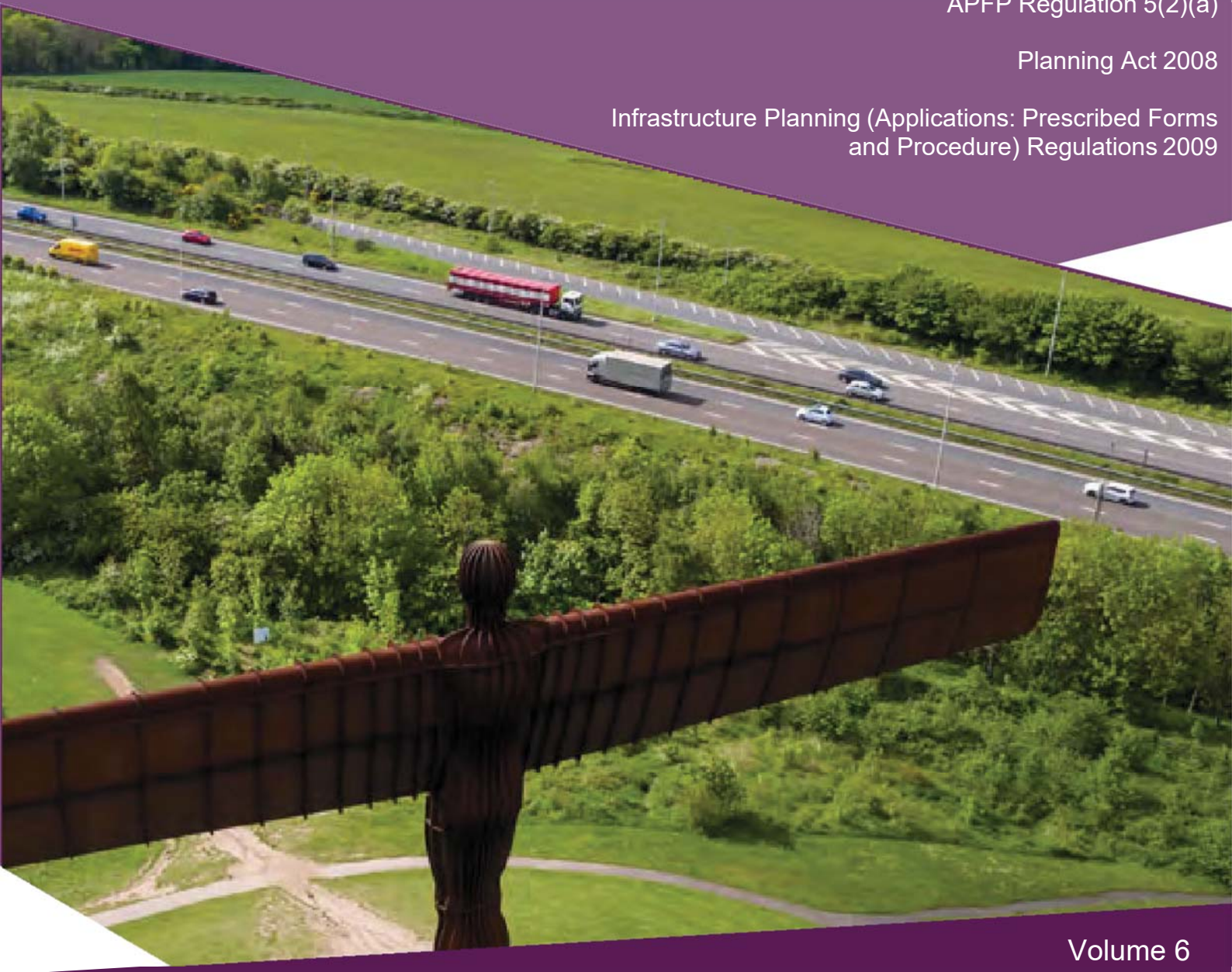
Scheme Number: TR010031

6.3 Environmental Statement – Appendix 4.3 Major Accidents and Disasters Assessment Report

APFP Regulation 5(2)(a)

Planning Act 2008

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



Volume 6

August 2019

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009

A1 Birtley to Coal House

Development Consent Order 20[xx]

Environmental Statement - Appendix

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010031
Application Document Reference	TR010031/APP/6.3
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Version	Date	Status of Version
Rev 0	14 August 2019	Application Issue

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1 INTRODUCTION

1.1 REQUIREMENT FOR ASSESSMENT

1.1.1. This Report addresses the potential vulnerability of the A1 Birtley to Coal House Scheme (hereafter referred to as "the Scheme") to major accident(s) and/or disaster(s) as required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (**Ref.1**).

1.1.2. The EIA Regulations 2017 require that: '*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 which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council(c) or Council Directive 2009/71/Euratom(d) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies*.'

1.2 SCHEME LOCATION AND DESCRIPTION

1.2.1. The Scheme location and description is included in the **Chapter 2 The Scheme.**

1.3 PURPOSE OF THE REPORT

1.3.1. This Major Accidents and Disasters (hereafter referred to as "Major Events") Assessment Report has been produced in accordance with the EIA Regulations 2017 (**Ref.1**) and the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 2, Part 5) (**Ref.2**).

1.3.2. This report describes the assessment methodology, any primary and tertiary mitigation adopted for the purposes of the assessment and a summary of the expected significant effects resulting from the vulnerability of the Scheme to the risk of Major Events taking into account relevant legislation and guidance applicable in England. Where appropriate, this description includes the further mitigation measures required to prevent, reduce or offset any significant negative effects, the preparedness for and proposed response to emergencies, and the expected residual effects after these measures have been employed.

1.3.3. This report addresses responses from the Planning Inspectorate in relation to Major Events within the Scoping Opinion Section 4.3 (**Ref. 3**) received by the Applicant in December 2017, including formal responses from statutory consultees. Based on the feedback in the Scoping Opinion, the scoping exercise was revisited (see **Section 6**) to inform the Major Events assessment.

1.3.4. This report (and its associated figures and appendices) is intended to be read as part of the wider Environmental Statement (ES), with particular reference to **Chapter 5 (Air Quality), Chapter 6 (Cultural Heritage), Chapter 7 (Landscape and Visual Amenity), Chapter 8**

(Biodiversity), Chapter 9 (Geology and Soils), Chapter 10 (Material Resources), Chapter 11 (Noise and Vibration), Chapter 12 (Population and Human Health), Chapter 13 (Road Drainage and the Water Environment) and Chapter 14 (Climate) (Application Document Reference: TR010031/APP/6.1).

1.4 COMPETENT EXPERT EVIDENCE

1.4.1. This report has been prepared by professionals who have sufficient expertise to ensure the completeness and quality of this major events assessment. **Appendix A** provides a list of qualifications, professional memberships and experience for the author and reviewer of this assessment.

1.5 LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATION

International

1.5.1. Paragraph 15 of Directive 2014/52/EU (**Ref. 4**) states:

"In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment."

National

1.5.2. The above EU Directive has been transposed into UK law through the EIA Regulations 2017 (**Ref.1**). Schedule 4 Paragraph 8 of the EIA Regulations 2017 require that the ES include:

"(8). 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 which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies."

1.5.3. It is worth noting that the UK approach has removed the word 'natural' with respect to "disasters". An article written by a registrant of the EIA Quality Mark Registrant Scheme of the Institute of Environmental Management and Assessment (IEMA) suggests that given the

intention underlying this aspect of the EU Directive, both manmade and natural disasters should be considered (**Ref. 5, 6, 7**).

1.5.4. The applicable legislative framework covering the design, construction, operation and maintenance of the Scheme is summarised as follows, further details are presented in **Appendix B**:

- Health and Safety at Work etc. Act 1974 (HSWA) (**Ref. 8**)
- Construction (Design and Management) Regulations 2015 (CDM) (**Ref. 9**)

POLICY

1.5.5. There are no policy documents applicable to this report at the time of writing.

2 ASSESSMENT METHODOLOGY

2.1 SCOPE

2.1.1. The Major Event assessment has considered the construction, operation and maintenance phases of the Scheme. It is considered highly unlikely that the Scheme would be demolished after its design life as the road is likely to have become an integral part of the infrastructure in the area. In the unlikely event of Scheme demolition, this would be part of the relevant statutory process at that time. The demolition phase of the Scheme has therefore not been assessed.

2.1.2. The assessment of significant adverse effects on receptors has considered all factors defined in the EIA regulations, specifically population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and the landscape.

2.1.3. Certain receptors have been excluded from the assessment, for the reasons described in **Table 2-1** below.

Table 2-1 – Excluded receptors

Excluded Receptors	Reason for Exclusion
Employees of Highways England and/or its suppliers, whether during construction, operation or maintenance of the Scheme.	Highways England's commitment and obligations to manage risks to employees are described in other documents (for example Highways England's H&S management system, Raising the bar initiative).
Members of the public who are wilfully trespassing, for example areas designated as a construction site.	Outside the occupier's legal requirements under the Occupier's Liability Act 1984 (**Ref. 10**).

2.2 SCOPING METHODOLOGY

2.2.1. In response to the Planning Inspectorate Scoping Opinion a supplementary scoping exercise was undertaken in order to provide evidence for those Major Events that should be taken forward into the assessment. The methodology detailed was followed:

2.2.2. **Stage 1:** A Long List of possible Major Events was developed. This list drew upon a variety of sources, including the UK Government's Risk Register of Civil Emergencies (**Ref. 11**). Low likelihood and low consequence events were scoped out as these events are unlikely to result in significant adverse effects as they do not fall into the definition of a Major Event. Highly likely and low consequence events were also scoped out as they will not lead to significant adverse effects. Furthermore, high likelihood and high consequence events were

also scoped out, as it is assumed that existing legislation and regulatory controls would not permit the Scheme to be progressed under these circumstances.

2.2.3. **Stage 2:** The Long List was reviewed for any potential accidents and disasters that were considered highly unlikely to occur due to the location of the Scheme based on information provided by the environmental topic teams and the use of information sources related to Major Events (**Ref. 12, 13, 14, 15, 16**). If an event type cannot occur due to the location of the Scheme, then a 'N' was indicated under the location risk column. If it was then a 'Y' was given (e.g. a Major Event type of urban accidents/fires would not be relevant for a Scheme located in a rural area).

2.2.4. **Stage 3:** Remaining items in the Long List were considered based on the sources identified in the **Section 2.6** of this document and taking into account the proposed use of the development and phase (i.e. construction, operation, maintenance). If the Major Event was not associated with the proposed use of the development, either at the construction or operation or maintenance phase, a 'N' was indicated. If it is, then a 'Y' was given. Where all columns of an entry in the Long List received a 'N', for an identified Major Event type, this Major Event type was scoped out. If a 'Y' was identified in any of the columns, a Major Event was scoped in for inclusion in the assessment.

2.2.5. Those Major Events that were screened in make up the Short List of Major Events and have undergone further detailed assessment.

2.3 METHOD OF BASELINE DATA COLLECTION

2.3.1. The assessment has utilised baseline information collected from other chapters of the ES to define the receptors and the Scheme's vulnerability to a major event. In particular, baseline information from chapters in the ES (e.g. Climate, Population and Human Health, Biodiversity and Road Drainage and the Water Environment) and other documents (e.g., traffic and transport (**Ref. 17**)) are pertinent to the assessment.

2.3.2. In accordance with Schedule 4 Paragraph 8 of the EIA Regulations 2017 (**Ref. 1**), available safety assessments undertaken for the Scheme have been used to inform the identification and assessment of likely significant environmental effects. For the purposes of the Scheme these include, for example, Construction, Design and Management (CDM) risk registers and hazard identification studies current at the time of undertaking the assessment.

2.3.3. The assessment has been based on a review of available documentation and regulatory requirements.

2.3.4. Additional baseline information has been obtained on features external to the Scheme which could contribute a potential source of hazard to the Scheme. This information was obtained from a desk based study. Such features included but were not limited to:

- Presence of COMAH sites.
- Potentially hazardous ground conditions.
- Proximity to other infrastructure (road, rail, aviation, energy).

2.4 ASSESSMENT METHODOLOGY

2.4.1. To date, there is no specific guidance on how to consider major accidents and disasters within the context of Environmental Impact Assessment (EIA). However, the assessment takes account of emerging EIA good practice, which refers to other relevant documentation, including the Cabinet Office's National Risk Register of Civil Emergencies (**Ref. 11**).

2.4.2. The assessment of major events will be achieved through a review of available documentation and regulatory requirements; the EIA will not involve assessment from 'first principles' as it is recognised that existing legislation and health and safety requirements already identify risks and help to protect human beings and the environment (**Appendix B**).

2.4.3. The assessment will present any identified risks along with whether they are managed to be As Low As Reasonably Practicable (ALARP) or require further precautionary mitigation actions beyond those already integrated into the design and execution of the Scheme (for example Construction Environmental Management Plan (CEMP).

2.4.4. The potential for identified relevant major events to result in a significant adverse environmental effect have been evaluated using a risk-based approach. The approach has considered the environmental consequences of a Major Event, the likelihood of these consequences occurring, taking into account planned design and embedded mitigation, and the acceptability of the subsequent risk to the environment. The following process was applied to each of the scoped in major event categories:

- Identifying risks
- Screening these risks
- Defining the impact
- Assessing the likelihood
- Assessing the risk

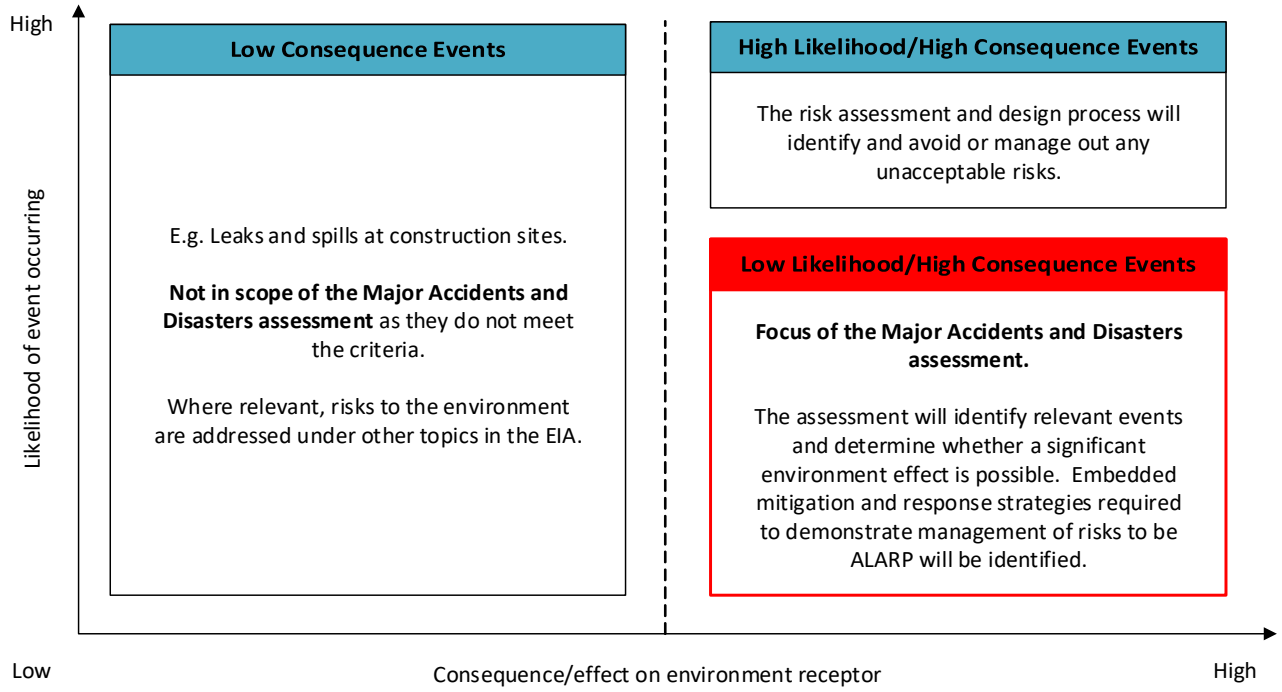
Identify Risks

2.4.5. The major events considered in the assessment are rare events.

2.4.6. All low consequence events, whatever their likelihood, do not meet the definition of major events (**Section 7**). For example, minor spills which may occur during construction, but would be limited in area and volume and temporary in nature do not meet the definition of a major accident. Such minor events would be dealt with under the construction contractor's or managing agent contractor's (MAC) Environmental Management System (EMS) and do not fall within the scope of this assessment.

2.4.7. This assessment focuses on low likelihood but potentially high consequence events as illustrated in **Figure 1**.

Figure - 1 Graphical representation of major accidents and disasters consequence significance



2.4.8. Low likelihood is defined for the purposes of this assessment, as:

- May occur during the lifetime of the Scheme, so no more than once in 10 years for the construction phase, and no more than once in 100 years for the operational phase.

2.4.9. This is an upper boundary for low likelihood. Very low likelihood events will also be included in the assessment, which may only occur at most once in every 1,000 years. Mitigation measures will reflect what is reasonable for such rare events, considering their potential consequence, within the guiding principle of risks being As Low as Reasonably Practicable (ALARP).

2.4.10. High consequence events are considered to lead to a significant adverse effect.

2.4.11. The risk identification process has used existing sources of information wherever possible, as described in **Section 2.3**, such as risk assessments undertaken for the Scheme as part of other processes (many of which are required by law) or Risk Events identified within the UK's current National Risk Register. No additional risk assessments have been undertaken and the risk identification activity has focused on collating and reviewing the existing sources.

2.4.12. In order to identify whether a Risk Event has the potential to be a Major Event, which also has the potential to have a significant adverse effect on an environmental receptor, three components need to be present: a source, a pathway (between source and receptor) and a

receptor. As such, and as recommended by Defra (**Ref. 18**), the assessment uses the following conceptual model:

- The **source** is the original cause of the hazard, which has the potential to cause harm.
- The **pathway** is the route by which the source can reach the receptor.
- The **receptor**, which is the specific component of the environment that could be adversely affected, if the source reaches it.

2.4.13. Risk Events which do not have all three components have been screened out from the assessment.

Screen Risks

2.4.14. The following screening process has been used to identify those Risk Events which would require further consideration within the assessment:

1. Is there a potential source, and/or pathway and/or receptor as defined in Paragraph **2.4.12** above? If not, no further assessment required;
2. Is there a relevant environmental receptor (**Section 2.1**) present in the locations where the risk event could occur, and a pathway whereby the source of harm can reach the receptor? If not, no further assessment required; and
3. Does the potential impact on the environmental receptor meet the definition of a significant adverse effect given in Paragraph **2.4.10**? If not, no further assessment required.

2.4.15. For those Risk Events which are not screened out during the three-step process, the following assessment methodology has been used. The assessment forms the basis for recommending additional mitigation measures, as appropriate.

Define Impact

2.4.16. Several mechanisms are in place to reduce the vulnerability of the Scheme to major events, or mitigate significant effects on the environment should they occur. All measures to manage and reduce risk of significant adverse effects occurring as a result of the vulnerability of the Scheme to major events are considered to be primary mitigation measures for the purposes of the assessment. It has been assumed that:

- The design of the Scheme will take into consideration the relevant potential mitigation measures set out in National Policy Statement for National Networks (NPSNN) (**Ref. 19**).
- The design of the Scheme will be subject to relevant Road Safety studies and actions identified integrated into the final design to reduce risks to as low as reasonably practicable.
- The design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment and machinery, including associated systems, will take into account Good Engineering Practice (GEP).
- The construction stage(s) of the Scheme will be managed through the implementation of the Construction Phase Plan and CEMP.

2.4.17. This framework and the measures therein of relevance to the assessment are described in the ES.

2.4.18. A reasonable worst case environmental impact(s) has been identified for each scoped-in Risk Event. Impacts have been identified in consultation with relevant disciplines for each environmental topic within the ES. The environmental impacts are identified through a qualitative process which seeks to answer the question 'could this event constitute a major accident or disaster in terms of the definitions provided (see **Section 1.4**)?' Where relevant, specific sensitive receptors around the Scheme are considered (see **Table 5-1**). The Risk Record (**Appendix D**), record the outcome of this process.

Assess Risk

2.4.19. The likelihood of the reasonable worst case environmental effect(s) occurring has been evaluated taking into account the following:

- The likelihood of the risk event occurring considering the measures already embedded into the design and execution of the Scheme; and
- The likelihood that an environmental receptor is affected by the risk event.

2.4.20. Likelihood assessments evaluate whether the effect (for example, loss of life) is a possible outcome of the risk event.

2.4.21. This evaluation refers to existing risk assessments as well as consultation with relevant discipline specialists.

2.4.22. The assessment of the risk has been carried out using a major accidents and disasters assessment tool, developed by WSP. Where likely significant adverse effects are identified, mitigation measures must be in place, commensurate with the likelihood of the event occurring. The assessment considers, in consultation with relevant disciplines, whether the risk to the environmental receptor is managed to be ALARP with the existing measures. If gaps are identified, where the existing measures do not represent management of risks to an environmental receptor to be ALARP, then additional measures would be required. The Risk Record presented in **Appendix D** records the outcome of the assessment.

Appraise Risk Management Options

2.4.23. Risk management options fall into the following categories:

- Eliminate (or 'avoid') the risk, by adopting alternative processes in order to eliminate the source of the hazard, or remove the receptor.
- Reduce the risk by adapting proposed processes such that either the likelihood or the impact of the risk event can be reduced.
- Isolate the risk, by using physical measures to ensure that should the risk event occur, it can be effectively isolated such that there is no pathway.
- Control the risk, by ensuring that appropriate control measures are in place (for example emergency response) so that should a risk event occur, it can be controlled and managed appropriately. The EIA mitigation hierarchy of repair and compensate any

significant damage to environmental receptors may then apply following a control measure.
- Exploit the risk, if it presents potential benefits or new opportunities.

2.4.24. As safety risks will be required to be adequately addressed within the regulatory framework for the Scheme, it is not anticipated that significant residual effects will be identified as an output of the assessment.

2.5 ASSESSMENT OF SIGNIFICANCE

2.5.1. Significance has been assessed using professional judgement taking into account the following factors:

- The geographic extent of the effects. Effects beyond the Scheme boundaries are more likely to be considered significant.
- The duration of the effects. Effects which are permanent (specifically irreversible) or long lasting are considered significant.
- The severity of the effects in terms of number, degree of harm to those affected and the response effort required. Effects which trigger the mobilisation of substantial civil emergency response effort are likely to be considered significant.
- The sensitivity of the identified receptors.
- The effort required to restore the affected environment. Effects requiring substantial clean-up or restoration efforts are likely to be considered significant.

2.6 DATA SOURCES

2.6.1. The following data sources were used in the preparation of this assessment report:

- Cabinet Office, National Risk Register of Civil Emergencies, 2017 Edition (**Ref. 11**).
- The International Disaster Database (**Ref. 13**).
- British Geological Survey Geo Index Onshore (**Ref. 14**).
- Prevention Web Europe: Tsunamis Hazard Map (**Ref. 15**).
- Met Office (2013) England and Wales drought 2010-2012 (**Ref. 16**).
- Environment Agency (January 2012) Yorkshire and North East Region Drought Plan (**Ref. 20**).
- Northumbrian Water Draft Drought Plan 2018, Northumbrian water, August 2017 (**Ref. 21**).
- A1 Birtley to Coal House, PCF Stage 3 Safety Plan, February 2018, WSP Report: HE551462-WSP-GEN-ZZ-RP-ZS-0001, WSP UK Limited. (**Ref. 17**).
- Health & Safety Executive's Planning Advice Web App (**Ref. 22**).
- Health & Safety Executive's COMAH 2015 Public Information Search (**Ref. 23**).

2.7 POLICY AND GUIDANCE

2.7.1. There is currently no applicable policy relating to the methodology for assessing Major Events.

2.7.2. There is currently no published guidance for the application of the legal requirements to Major Events. However, selected relevant guidance for risk assessment methodologies is summarised as follows; further details are presented in **Appendix B**:

- Defra (2011) 'Guidelines for Environmental Risk Assessment and Management (**Ref. 18**).
- Chemical and Downstream Oil Industries Forum, (2013), Guideline - Environmental Risk Tolerability for COMAH Establishments (**Ref. 24**).
- The International Standards Organization's ISO 31000: 2009 Risk Management - principles and guidelines (**Ref. 25**).

2.7.3. To date, there is no specific guidance on how to consider Major Events within the context of EIA. However, WSP has developed and used a process which takes account of emerging EIA good practice (**Ref. 2, 5, 6, 7, 18**) which refers to other relevant documentation, including the Cabinet Office's National Risk Register of Civil Emergencies (**Ref. 11**) and experience in major accident hazard identification when preparing Safety Reports relating to the prevention and control of major accident hazards (**Ref. 26, 27, 28, 29, 30, 31, 32**).

3 ASSUMPTIONS AND LIMITATIONS

3.1.1. Key assumptions for the major accidents and disasters assessment are that:

- The modifications to the NGN gas pipeline will be managed and controlled by the Operator as part of the Safety Report required under the relevant regulations (**Ref. 33, 34, 35**).
- The Scheme is being designed and its implementation guided by other industry standards and codes, many of which are mandatory. These require infrastructure and systems to be designed so that risks to people and the environment are either eliminated or reduced to levels that are ALARP.
- Environmental effects associated with unplanned events that do not meet the definition of a major accident and / or disaster e.g. minor leaks and spills that may be contained within the construction sites are addressed in the topic chapters and not in this assessment.
- It is recognised that the management framework for the Scheme is not fully defined at this stage; however, a presumption of standard practice and regulatory compliance within the adopted management framework has been assumed and will be developed following the appointment of the EPC contractor.
- The design of the Scheme will take into consideration the relevant potential mitigation measures set out in the National Policy Statement for National Networks.
- The design of the Scheme will be subject to relevant Road Safety studies and actions identified integrated into the final design to reduce risks to as low as reasonably practicable.
- The design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment and machinery, including associated systems, will take into account Good Engineering Practice (GEP).
- The environmental management of the construction stage(s) of the Scheme would follow the measures as detailed within the Construction Phase Health and Safety Plan and CEMP.

3.1.2. The following limitations apply to this assessment:

- No site visits were conducted, the assessment was desk-based.
- No modelling or detailed calculations were undertaken, the qualitative assessment took the form of ‘sign-posting’ to existing risk assessments, and assessment of potential gaps or residual risks which are not considered to be managed using the ALARP principle.
- Where information was not available, professional judgement was used to reach a conclusion.
- In accordance with good safety management principles, it was assumed that all risks that have the potential to be major accidents or disasters, and could impact a local environmental receptor, would be managed using the ALARP principle.

4 STUDY AREA

4.1.1. The Study Area for Major Events has been developed based on professional judgement as there is no specific regulatory guidance nor significant precedent/standardised methodology.

4.1.2. At the scoping stage a 5km corridor either side of the centre line of the Scheme was used in order to capture internal and external influencing factors which may have high adverse consequences on the Scheme. The following factors and associated distances were adopted for setting the Study Area in order to capture:

- Manmade features
  - COMAH facilities within 5km
  - Major accident pipelines within 1km
  - Fuel retail sites (including LNG, LPG) within 1km
  - Rail infrastructure within 1km
  - Transmission (gas, electrical, oil/fuels) crossing the development limits
- Natural features with the potential to create risks within:
  - 3km (chiefly hydrological (dam failure) and geological (seismic activity))
  - 1km (chiefly hydrological (flood risk) and geological (unstable ground conditions, contamination)

4.1.3. The extent of the Study Area used for the Major Events assessment is a narrower area that that used for the scoping study as the updated scoping work found that the key influencing external factors lay within a 1km corridor either side of the centre line of the Scheme.

5 BASELINE CONDITIONS

5.1.1. The baseline relevant to this topic comprises:

- Features external to the Scheme that contribute a potential source of hazard to the Scheme
- Sensitive environmental receptors at risk of significant effect
- Current (without the Scheme) major accident and disaster risks.

5.1.2. Within the Scheme, the widening of the existing A1 dual carriageway would be constructed across agricultural land, most of it lying to the south of the existing A1 between junction 66 (Eighton Lodge) and 67 (Coal House) and to the north between junction 65 (Birtley) and junction 66 (Eighton Lodge). There is also some grazing land next to junction 67 (Coal House) in the south of the Scheme and between junction 65 (Birtley) and junction 66 (Eighton Lodge) in the north of the Scheme. In addition, some land would be taken from woodland at Longacre Wood.

Baseline Features

5.1.3. As far as is reasonably practicable, the route avoids existing features that have the potential to present a hazard to the construction or operation of the Scheme. However, there are three sites within 5km of the Scheme where hazardous materials and/or substances are stored, used or made in types or quantities to trigger registration under the Control of Major Accidents Hazards (COMAH) Regulations:

- Brenntag UK Limited, Birtley
- Tor Coatings Limited, Birtley
- Huntsman Pigments and Additives UK Limited, Tyne and Wear

5.1.4. Features external to the Scheme that lie within 1km of the Scheme (including those detailed above) that present a potential source of hazard, either during construction or operation or are sensitive receptors are detailed in **Table 5-1** below:

Table 5-1 – Major events baseline

Name	Hazard Source or Receptor	Comment	Regulatory Status of Feature	Approximate Distance & Direction from Scheme
Brenntag UK Limited	Hazard source	Chemical storage and distribution	Lower Tier COMAH installation	1km south of junction 66 (Eighton Lodge)
Tor Coatings Limited	Hazard source	Chemical manufacturing and storage	Lower Tier COMAH installation	1.1km south of junction 66 (Eighton Lodge)

Name	Hazard Source or Receptor	Comment	Regulatory Status of Feature	Approximate Distance & Direction from Scheme
Huntsman Pigments and Additives UK Limited	Hazard source	Chemical manufacturing and storage	Upper Tier COMAH installation	4.5km North of junction 67 (Coal House)
Sainsburys petrol station	Hazard source	Retail fuel station	Petroleum Licenced site	75 metres to the north
James Jones & Son Sawmill and warehouse	Hazard source	Fire and dust cloud explosion risk.	-	15 metres south-west
Northern Gas Network (NGN) pipeline	Hazard source and receptor	Buried natural gas transmission pipeline		Under a section of the Scheme near the Allerdene Bridge
River Team	Hazard source and receptor	Fluvial floodplain of the River Team has been classified as of high importance with respect to flood risk and with respect to human safety.	Classified as a Main River The Scheme crosses over the fluvial floodplain (Flood Zones 2 and 3) of the River Team. The western half of junction 67 (Coal House) as well as a small proportion of the industrial area immediately north of the Scheme is located within Flood Zone 2 of the River Team.	Runs underneath junction 67 (Coal House) and continues to flow in a northerly direction through Team Valley Trading Estate where it is heavily modified

Name	Hazard Source or Receptor	Comment	Regulatory Status of Feature	Approximate Distance & Direction from Scheme
			Moderate WFD status.	
Allerdene Burn	Hazard source and receptor	Classified as of high importance with respect to flood risk and human safety due to the close proximity of the residential areas approximately 130m upstream and the railway which it crosses immediately upstream of the A1	Ordinary watercourse	Passes under the Allerdene Bridge
A1	Hazard source and receptor	A1 Birtley to Coal House: % fatal collisions = 0.93% % serious collisions = 5.56%	GB average dual carriageway % fatal collisions = 1.69% % serious collisions = 14.1%	N/A

Baseline Accident and Disaster Risks

5.1.5. Major accident and disaster risk relevant to the baseline in the absence of the Scheme include extreme weather events and associated flooding and road traffic collisions. Baseline 'without Scheme' conditions are described in detail in the following ES chapters: **Chapter 9 Geology and Soils, Chapter 13 (Road drainage and the Water Environment) and Chapter 14 (Climate).** Those aspects of most relevance to the major accidents and disasters chapter are summarised below.

Surface Water Floods

5.1.6. Historic flood records in the flood risk assessment in **Appendix 13.1 - Chapter 13 (Road Drainage and the Water Environment)** highlight that the following events have been recorded in the vicinity of the Scheme:

- Fluvial flooding affecting the southbound off and northbound on slips at junction 67 (Coal House) and the land to the south of the junction during June 2012.

- Surface water flooding in the land bordering the Scheme at the Team Valley Retail Park during June 2012.
- Flooding of the River Team where the channel capacity was exceeded (no raised defences) during November 2000, impacting junction 67 (Coal House) and the land to the north and south of junction along the river. Fluvial flooding of an unknown cause along the River Team south of the Scheme extending south towards Lamesley during 1981.

Droughts

5.1.7. Droughts are caused by insufficient rainfall and in the UK context, a drought is defined as at least 15 consecutive days where there is no more than 0.2 mm of precipitation.

5.1.8. For England and Wales, the drought of 2010 to 2012 was one of the ten most significant droughts of one to two years duration in the last 100 years. The drought was due to a sequence of dry months from winter 2009/10 to March 2012, particularly in the spring, autumn and winter seasons. The drought resulted in concerns for farming due to the very dry ground, water resources and the environment generally.

5.1.9. Between April 2010 and March 2012, the Gateshead area only received 75-115% of rainfall compared with the 1981-2010 average (**Ref. 16**).

5.1.10. Major impacts from drought is not expected in the north-east Area although catchments not supported from reservoirs such as Kielder can be expected to see reduced flows and public concern may be raised the area of the Scheme (**Ref. 20**).

5.1.11. Northumbrian Water (NWL) investment in Kielder reservoir, the largest man made reservoir in Europe, means that restrictions on customers use of water, even during the most severe droughts with the area of the Scheme, should be not necessary. NW's Levels of Service for "Appeal for Restraint" frequency is 1 in 20 years, "Temporary Water Use Ban" and "Drought Order ban" frequency are never. (**Ref. 21**)

Hurricanes, Storms and Gales

5.1.12. Hurricanes cannot form in or around the UK as the sea temperatures are not warm enough to sustain a wind of at least 120km/h, which is one of the measurements used to classify a hurricane. However, deep depressions that were originally hurricanes are experienced in the UK.

5.1.13. According to the latest meteorological data (2017) from Newcastle Airport used in the air quality dispersion modelling for the Scheme, the greatest wind speed recorded was 83.52 km/h (in 2017 during Storm Doris).

Extreme Temperatures: Heatwaves, Low (sub zero) Temperature and Heavy Snow

5.1.14. Between 1981 and 2010, there were 15 occurrences where summer mean temperatures exceeded 22.3°C on five or more consecutive days.

5.1.15. Between 1981 and 2010, there have been 1,186 days with a maximum minimum temperature below zero degrees Celsius.

5.1.16. Between 1981 and 2010, there were 418 days with snow lying at 0900 hours however, there are no records from the Met Office of the depth of snow.

Poor Air Quality (Construction Phase)

5.1.17. According to **Chapter 5 (Air Quality)**, current baseline air quality within the Scheme does not exceed the relevant air quality objectives for NOx, NO_2, PM_{10} and $PM_{2.5}$. During the construction phase it is anticipated that with appropriate mitigation (specifically measures detailed within the Outline CEMP) air quality would remain below the relevant air quality objectives for NOx, NO2, PM10 and PM2.5.

Industrial Accidents

5.1.18. There are a number of industrial sites located in proximity to the Scheme, of which there are three Lower Tier COMAH sites within 5km. Additionally, there is a sawmill within 75 metres and a petrol station within 100 metres both of which have the potential for major fires which could impact the Scheme (see **Table 5-1**).

Pollution Incidents

5.1.19. According to the Envirocheck Report (dated 14 October 2014), 20 pollution incidents to controlled waters have occurred within 1km of the Scheme.

Transport Accidents

5.1.20. The A1 NGWB is one of the most congested highway links in the north-east Region with more than 110,000 vehicles using the route every day on the busiest section.

5.1.21. The existing speed limits of 50mph southbound from junction 67 (Coal House) to Smithy Lane Overbridge, 70mph southbound from Smithy Lane to junction 65 (Birtley) and 50mph throughout the northbound carriageway will be retained.

5.1.22. Between 2012 and 2016, there have been seven serious collisions, one fatal collision and 161 slight casualties reported on the existing section of the A1 which is being widened by the Scheme.

Electricity, Gas, Water Supply or Sewerage System Failures

5.1.23. There is a NGN pipeline which runs under a section of the Scheme.

5.1.24. There is no foul water drainage or water supply connection to the existing A1 within the area of the Scheme. However, there are existing connections to commercial, industrial and residential properties located within and close by to the area of the Scheme.

5.1.25. There is one overhead transmission line that crosses the A1 and one that passes under before emerging at junction 66 (Eighton Lodge).

Acts of Terrorism

5.1.26. No acts of terrorism have been recorded within or close to the Scheme.

6 MAJOR EVENTS LONG LIST AND SHORT LIST

6.1.1. As detailed in the Scoping Methodology, **Section 2.2** above, the output from the scoping study was a Major Events Long List and Short List.

6.2 LONG LIST

6.2.1. A copy of the "Long List" of Major Event types is provided in **Appendix C**. Although some of these Major Events are already considered under other legislative or design requirements, this is not considered to be sufficient reason to automatically eliminate the major event from any further consideration.

6.2.2. In accordance with emerging EIA practice, occupational health and safety (H&S) was scoped out of this topic as it is covered by detailed H&S legislation, such as:

- The Control of Major Accident Hazard Regulations 2015 (**Ref. 27**).
- The Dangerous Substances and Explosive Atmospheres Regulations 2002 (**Ref. 32**).
- The Workplace (Health, Safety and Welfare) Regulations 1992 (**Ref. 36**).
- The Health & Safety at Work Act 1974 (**Ref. 8**), Sections (1) and (2).
- Management of Health & Safety at Work Regulations 1999 (**Ref. 37**).

6.2.3. Other health issues are covered in relevant topic sections of Air Quality, Noise and Vibration, Population and Human Health, and Road Drainage and the Water environment. As such, human health impacts are "in combination" impacts and are considered under the Cumulative Effects chapter of the ES.

6.3 SHORT LIST

6.3.1. Those Major Events that were included on the Short List of Major Event and taken forward for further assessment are included in **Table 6-1** below.

Table 6-1 - Short list potential major events

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Natural Hazards	Hydrology	Fluvial Flooding	Y	Y	Y	The majority of the Study Area is located within Flood Zone 1, which is associated with a low risk of flooding from fluvial and coastal sources (an annual probability of less than 1 in 1000). The Scheme crosses over the fluvial floodplain of the River Team, land designated as both Flood Zone 2 and 3. The Environment Agency's Flood Map for Planning shows the western half of junction 67 (Coal House) and part of the slip roads (to the west of the junction) to be within Flood Zone 2 with respect to fluvial flooding from the River Team. Flood Zone 2 equates to an annual probability of fluvial flooding of between 1 in 1000 and 1 in 100 (0.1-1%). Flood Zone 3 extends up to the south of the junction, and close to the A1 main carriageway within the centre of the junction. Flood Zone 3 equates to an annual probability of fluvial flooding of greater than 1 in 100 (>1%). The fluvial floodplain of the River Team has been classified as of High importance with respect to human safety. The ordinary watercourse that passes under the Allerdene Bridge has been classified as of High importance with respect to flood risk due to the close proximity of the residential areas upstream. Whilst the finished road level is elevated at this point, construction operations may need to be disrupted during a flood event. The areas of high and medium risk could represent a health and safety risk for motorists if this is not mitigated.	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 Road Drainage and the Water Environment** and **Appendix 13.1**).	Road Users Public and local community
Natural Hazards	Hydrology	Pluvial (Surface Water) Flooding	Y	Y	Y	The Environment Agency's Risk of Flooding from Surface Water Map identifies the following areas as being at medium to high risk of pluvial flooding: - Pluvial flooding is predicted along the highway at junction 67 (Coal House) in the 1 in 30 year event with depths below 300mm predicted for the southbound slip road, and depths between 300 and 900mm on the northbound slip road. - The western part of the junction 67 (Coal House) roundabout is shown to be at risk of surface water flooding to	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 Road Drainage and the Water Environment** and **Appendix 13.1**)	Public and local community

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
						depths of 300 to 900mm in the 1 in 100 year event. - Pluvial flooding is also predicted at depths below 300mm in the 1 in 30 year event on Allerdene Bridge (between junction 67 (Coal House) and junction 66 (Eighton Lodge). - An area at high risk of surface water ponding is also predicted on one of the slip roads at junction 65 (Birtley), with depths up to 900mm predicted by the Environment Agency's Risk of Flooding from Surface Water Map. The safety of human motorists with respect to the pluvial flooding and changes to surface water runoff has been classified as of High importance. The sensitivity of the pluvial floodplain has been assessed to be low. The increase in impermeable surfaces as a result of the Scheme along with the likely increase in rainfall as a result of climate change over the lifetime of the Scheme would increase flood risk if not mitigated in addition to a potential pollution threat to nearby water courses. The Scheme design will need to take into account drainage of the additional road surface which would potentially exacerbate existing issues.		
Natural Hazards	Hydrology	Ground Water Flooding	Y	Y	Y	Based on the Scoping Opinion, there appears to be a concern regarding groundwater flooding of mine caverns. Potentially this could adversely impact the structural integrity of the Scheme and warrants further consideration in the preparation of the ES and should be included in the design risk register (HA551462-WSP-HGN-BCH-RE-D-0000_008).	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 Road Drainage and the Water Environment** and **Appendix 13.1**)	Road users Rail users Public and local community
Natural Hazards	Climatological and Metrological	Cyclones, hurricanes, typhoons, storms and gales	Y	N	Y	The winter of 2015/2016 was the second wettest winter on record and a series of storms (including 'Desmond' and 'Eva') resulted in heavy and sustained rainfall. 17,600 UK properties were flooded and several bridges collapsed, disrupting access to and from local communities. (**Ref.24**) The Scheme crosses over the fluvial floodplain of the River Team therefore the vulnerability of the Scheme to storms should be carried forward for consideration in the design and flood risk assessment with respect to the risk to the Scheme but also the increased risk due to the Scheme impacting local flood risks.	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 Road Drainage and the Water Environment** and **Appendix 13.1**) which has taken into account the output of the Climate Change assessment (See ES **Chapter 14 – Climate**).	Road Users Public and local community

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Technological or Manmade Hazards	Industrial and Urban Accidents	Major Accident Hazard Chemical sites	Y	Y	Y	There are at least 4 COMAH sites within a 5km corridor along the Scheme, one of which is an Upper Tier site 4.5km North of junction 67 (Coal House) and the nearest being a Lower Tier site 1km south of junction 66 (Eighton Lodge).	Y	Road Users
Technological or Manmade Hazards	Industrial and Urban Accidents	Major Accident Hazard Pipelines	Y	Y	Y	NGN natural gas pipeline runs under a section of the Scheme near the Allerdene Bridge.	Y	Road users Public and local communities
Technological or Manmade Hazards	Industrial and Urban Accidents	Mines and storage caverns	Y	Y	Y	The Scheme is within the Durham Coal Field and classified by the Coal Authority as being within the Gateshead District (B). Significant historical surface and underground coal mining is known to have occurred throughout the area. Although, the Coal Authority has not received a damage notice or claim for any property on site or within 50m of the Scheme since 31st October 1994. Also there is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the Scheme. This is a relatively short period of time for a Major Event where we are looking at a 1 in 100 year event.	Y A geology and soils assessment has been undertaken for the Scheme (see ES **Chapter 9 Geology and Soils**).	Road users Public and local communities
Technological or Manmade Hazards	Industrial and Urban Accidents	Fires	Y	Y	Y	There is a sawmill located 150m south west of the Scheme between junction 66 (Eighton Lodge) and junction 67 (Coal House) and also a petrol station within approximately 75 metres of the Scheme.	Y	Road users Public and local communities
Technological or Manmade Hazards	Transport accidents	Road	N	Y	Y	Significant transport accidents occur across the UK on a daily basis, mainly on roads, and involving private and/or commercial vehicles leading to spillage of hazardous materials such as those which are flammable, hazardous to human health or dangerous to the environment. The existing speed limits of 50mph southbound from junction 67 (Coal House) to Smithy Lane Overbridge, 70mph southbound from Smithy Lane to junction 65 (Birtley) and 50mph throughout the northbound carriageway will be retained. The use of existing road alignment retains some stop sight distances which are sub-standard for visibility.	Y Stage 3 – Safety Plan for the implementation of the Scheme at Stage Gate Assessment Review (SGAR).	Road users

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Technological or Manmade Hazards	Transport accidents	Rail	Y	Y	Y	The Allerdene Bridge ((part of the East Coast Main Line (ECML)) spans the Scheme and will require lengthening to enable the widened A1 to pass under. The replacement of Allerdene Bridge will require careful consideration during construction so as to maintain a safe crossing over the railway. Should be included in the design risk register (HA551462-WSP-HGN-BCH-RE-D-0000_008)	Y Stage 3 – Safety Plan for the implementation of the Scheme at Stage Gate Assessment Review (SGAR).	Road users Rail users
Technological or Manmade Hazards	Pollution accidents	Land	N	Y	N	Use of fossil fuels and storage of lubricants and oils for mobile plant and equipment during the construction phase.	Y A geology and soils assessment has been undertaken for the Scheme (see ES **Chapter 9 Geology and Soils**).	Local heritage Public and local community
Technological or Manmade Hazards	Pollution accidents	Water	N	Y	Y	Potential fuel/lubricant spillages from transportation accidents reach surface waters.	Y A road drainage and water environment assessment has been undertaken for the Scheme (see ES **Chapter 13 – Road Drainage and the Water Environment**).	Public and local community Water environment
Technological or Manmade Hazards	Utilities failures	Electricity	Y	Y	Y	Instances of electricity failure (also referred to as power loss or blackout) can be caused by a number of things, such as severe weather (e.g. very strong winds, lightning and flooding) which damage the distribution network. These tend of be mainly specific place, local (e.g. metropolitan area) and less frequently regional (e.g. north-east) as a result of severe winter storms and consequent damage to the distribution overhead line network. Overhead distribution powerlines cross and/or run close to the Scheme at several points which are likely to be at risk during construction of the Scheme. There are buried supply cables within the urban areas of the Scheme which could be struck during construction and result in widespread local power outages. These will need consideration in the development of the ES to ensure they are adequately addressed within the design and CDM risk register and possible impact on local community resources Loss of power to A1 traffic monitoring and control systems could adversely impact road safety.	Y	Public and local community

6.4 MITIGATION MEASURES

6.4.1. Key management and mitigation measures are described in the Risk Record (**Appendix D**). In all cases, compliance with the legal and regulatory requirements described in this section to manage risks to be ALARP must be demonstrated, including the requirement to:

- Manage all road accident risks in accordance with A1 Birtley to Coal House Scheme, Stage 3 Safety Plan (**Ref. 17**).
- Comply with design standards, this will include designing to appropriate environmental parameters (flood, wind, lightning) including climate change. Design standards apply to controls and systems, civil infrastructure, gas pipeline and electrical infrastructure.
- Co-ordination between Highways England and its maintenance contractors.

6.5 ASSESSMENT OF POTENTIAL MAJOR EVENTS

Potential Major Risk Events – Construction Phase

6.5.1. The thirteen major events to which the Scheme may be vulnerable during the construction phase and the outcomes of the assessment are summarised in **Table 6-2** below and detailed in the Risk Record (**Appendix D**). Based on the assumptions and mitigation measures put forward by the Topic Specialists in their ES Chapter, it is considered that they will all be managed to be ALARP.

Table 6-2 - Potential major risk events – Construction phase

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low As Reasonably Practicable with Existing Mitigation?
3	Natural Hazards: Geophysical	Collapse/damage to structures	Presence of unrecorded mine workings	Mine workings	Collapse of a mine workings leading to collapse of the roadway into a void.	Death and/or injury to members of the public.	Population and Human Health	Yes
5	Natural Hazards: Geophysical	Ground collapse	Presence of unidentified wells, shafts and boreholes - ungrouted/sealed or only partially sealed - creating uncertainty of surface profile effects and pathway for pressurised grout expulsion.	Mine workings	The Coal Authority Report details the treatment of six mine entries. No details are available with regards to the abandonment and stabilisation of the remaining mine entries. Ground investigation works completed by Central Alliance along the route in 2017/2018 have identified shallow coal workings within 30m from the surface which may present a stability issue to future development. If left untreated could pose a below ground collapse risk if built upon.	Death and/or injury to multiple road users.	Population and Human Health	Yes
7	Natural Hazards: Geophysical	Ground collapse	Presence of recorded mine workings of unknown specification	Mine workings	Collapse of mine workings	Death and/or injury to members of the public.	Population and Human Health	Yes

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low As Reasonably Practicable with Existing Mitigation?
9	Natural Hazards: Geophysical	Major road traffic accident	Ground subsidence leading to damage of roadway and/or associated infrastructure.	Collapse of overhead structure onto carriageway. Collapse of carriageway	The Coal Authority report (**Ref. 43**) states that the Scheme Footprint is within the likely zone of influence from workings in thirteen seams of coal from shallow (<30m) to 240 m bgl, with the Coal Authority database recording past and probable shallow mining below the majority of the Study Area east of junction 67 (Coal House). Ground investigation works completed by Central Alliance along the route in 2017/2018 have identified shallow coal workings within 30 metres from the surface which may present a stability issue to future development. Increased maintenance requirements as a result of settlement.	Death and / or injury to multiple road users.	Population and Human Health Biodiversity	Yes
15	Technological or Manmade Hazards: Engineering accidents and failures	Major road traffic accident	Existing road bridges loaded with additional construction traffic e.g. piling rigs.	Collapsing bridge striking traffic/member of persons nearby	Unknown safe capacity of road bridges - Overloading leading to structural instability - injuries to road users and construction personnel.	Death and/or injury to members of the public.	Population and Human Health	Yes

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low As Reasonably Practicable with Existing Mitigation?
17	Technological or Manmade Hazards: Industrial and Urban Accidents	Fire and/or explosion or release of harmful gas	Presence of underground low, intermediate and high pressure gas pipelines	Presence of existing natural gas transmission pipelines	The intermediate pressure (IP) gas main would be diverted through the installation of a new main via means of by micro tunnelling technique using a slurry drive. The low-pressure (LP) gas main which currently goes underneath the northbound access and southbound exit slip roads would be diverted into Coal House roundabout using a combination of open cut trenches and trenchless techniques. The new LP gas main would be routed between the new foundations for the bridge. Work involving the abandonment and routing of the high pressure (HP), IP, medium pressure (MP) and LP mains affected by the Scheme would be carried out. Striking of underground services/utilities	Fire and/or explosion affects neighbouring property and/or members of the public.	Population and Human Health	Yes
18	Technological or Manmade Hazards: Industrial and Urban Accidents	Fire and / or explosion or release of harmful gas	Presence of underground gas pipework	Release of flammable gas from pipeline	Ground subsidence leading to loss of containment.	Fire and/or explosion affects neighbouring properties and/or those people in the immediate area.	Population and Human Health	Yes

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low As Reasonably Practicable with Existing Mitigation?
21	Technological or Manmade Hazards: Industrial and Urban Accidents	Harm to people	Earthworks and construction activities (e.g. overturning of crane / dropped load) adjacent to operational areas of the existing structures.	Construction activities adjacent to existing structures and live roads.	Damage to highway infrastructure leading to death and/or injury of workers and road users.	Collapse/impact leads to harm to construction and other workers and road users in the vicinity.	Population and Human Health	Yes
25	Technological or Manmade Hazards: Industrial and Urban Accidents	Major road traffic accident	Bridge work over junction 67 (Coal House) roundabout	Falling objects causes major road traffic accident. Poor sight lines due to installation of new bridges.	Construction over roadway carries construction risk and could cause disruption to traffic.	Death and/or injury to members of the public.	Population and Human Health	Yes
28	Technological or Manmade Hazards: Industrial and Urban Accidents	Major Road Traffic Accident Collapse/damage to structure	Phased construction of bridge in immediate proximity of operational public highway	Falling objects cause road traffic accident	1) Injury to third parties; 2) Debris falling on public highway resulting in accident; 3) Damage to third party utilities / services located on or near bridges	Death and/or injury to members of the public	Population and Human Health	Yes
38	Technological or Manmade Hazards: Transport accidents	Collapse/damage to structures	Restricted access causing difficulties with manoeuvring heavy construction plant. Increased traffic.	Construction activities adjacent to existing structures and live roads.	Damage to existing road infrastructure leading to injury of member of the public or workers.	Collapse/impact leads to harm to members of public.	Population and Human Health Cultural Heritage Noise and Vibration	Yes
42	Technological or Manmade Hazards: Transport accidents	Offline train derailment	Earthworks & construction adjacent to operational railway.	Working adjacent to existing railway causes a train derailment.	Increased maintenance requirements as a result of settlement during construction and long term. Inadequate maintenance/monitoring or sudden failure potentially leading to a derailment on the ECML.	ECML train derails off track.	Population and Human Health Biodiversity Cultural Heritage Geology and Soils Landscape and Visual	Yes

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low As Reasonably Practicable with Existing Mitigation?
					Materials falling on to the ECML.			
44	Technological or Manmade Hazards: Utilities failures	Fire and/or explosion or release of harmful gas	Presence of underground services/utilities - gas, electricity,	Presence of existing utilities within the Scheme area which are nearby to residential receptors.	Striking of underground services/utilities	Fire and/or explosion affects neighbouring property and/or members of the public.	Population and Human Health Geology and Soils	Yes

Potential Major Risk Events - Operational and/or Maintenance Phases

6.5.2. The six major events to which the Scheme may be vulnerable during the operation and/or maintenance phase and the outcomes of the assessment are summarised in **Table 6-3** below and are detailed in the Risk Record (**Appendix D**). Based on the assumptions and mitigation measures put forward by the Topic Specialists, in their ES Chapter, it is considered that they will all be managed to be ALARP.

Table 6-3 - Potential major risk events - operational and/or maintenance phases

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low as Reasonably Practicable with Existing Mitigation?
3	Natural Hazards: Geophysical	Collapse/damage to structures	Presence of unrecorded mine workings	Mine workings	Collapse of a mine workings leading to collapse of the roadway into a void.	Death and/or injury to members of the public.	Population and Human Health	Yes
7	Natural Hazards: Geophysical	Ground collapse	Presence of recorded mine workings of unknown specification	Mine workings	Collapse of mine workings.	Death and/or injury to members of the public.	People and Population and Human Health	Yes

Risk Record Entry Number	MAD Scoping Group & Category	Risk Event (high level)	Hazard Description	Hazard Sources and/or Pathways	Risk Description	Reasonable Worst Consequence if Event Did Occur	ES Topic	Is this As Low as Reasonably Practicable with Existing Mitigation?
9	Natural Hazards: Geophysical	Major road traffic accident	Ground subsidence leading to damage of roadway and/or associated infrastructure.	Collapse of overhead structure onto carriageway. Collapse of carriageway.	The Coal Authority Report (**Ref. 43**) states that the Scheme Footprint is within the likely zone of influence from workings in thirteen seams of coal from shallow (<30m) to 240 m bgl, with the Coal Authority database recording past and probable shallow mining below the majority of the Study Area east of junction 67 (Coal House). Ground investigation works completed by Central Alliance along the route in 2017/2018 have identified shallow coal workings within 30 metres from the surface which may present a stability issue to future development. Increased maintenance requirements as a result of settlement.	Death and / or injury to multiple road users.	Population and Human Health Biodiversity	Yes
18	Technological or Manmade Hazards: Industrial and Urban Accidents	Fire and / or explosion or release of harmful gas	Presence of underground gas pipework	Release of flammable gas from pipeline	Ground subsidence leading to loss of containment.	Fire and/or explosion affects neighbouring properties and/or those people in the immediate area.	Population and Human Health	Yes
24	Technological or Manmade Hazards: Industrial and Urban Accidents	Major road traffic accident	Presence of fuel station	Flammable vapour cloud or dense smoke engulfing A1	Fire, explosion of release of flammable vapour cloud	Major road traffic incident involving loss of life or permanent injuries to multiple road users.	Population and Human Health	Yes
42	Technological or Manmade Hazards: Transport accidents	Offline train derailment	Earthworks & construction adjacent to operational railway.	Working adjacent to existing railway causes a train derailment.	Increased maintenance requirements as a result of settlement during construction and long term. Inadequate maintenance/monitoring or sudden failure potentially leading to a derailment on the ECML. Materials falling on to the ECML.	ECML train derails off track.	Population and Human Health Biodiversity Cultural Heritage Geology and Soils Landscape and Visual	Yes

7 GLOSSARY

7.1.1. The definition of key terms used in this report are defined below. These definitions have been developed by reference to the definitions used in EU and UK legislation and guidance relevant to major accidents and/or disasters as well as professional judgement in the context of the Scheme. (**Ref. 38, 39, 26, 27, 28, 29, 24, 30, 40, 41, 42**)

Table 7-1 - Key Terms and Definitions Relevant to this Report

Term	Definition
Disaster	In the context of the Scheme, a naturally occurring phenomenon such as an extreme weather event (for example storm, flood, temperature) or ground-related hazard events (for example subsidence, landslide, earthquake) with the potential to cause an event or situation that meets the definition of a Major Accident as defined above.
External Influencing Factor	A factor which occurs beyond the Scheme redline boundary that may present a risk to the Scheme, e.g. if an external disaster occurred (e.g. earthquake, COMAH site major accident) it would increase the risk of serious damage to an environmental receptor associated with the Scheme.
Hazard	Anything with the potential to cause harm, including ill-health and injury, damage to property or the environment; or a combination of these
Internal Influencing Factor	A factor which occurs within the Scheme redline boundary that may present a risk to the Scheme.
Major Accident	In the context of the Scheme, an event that threatens immediate or delayed serious damage to human health, welfare and/or the environment and requires the use of resources beyond those of the Applicant or its contractors to respond to the event. Serious damage includes the loss of life or permanent injury and/or permanent or long-lasting damage to an environmental receptor that cannot be restored through minor clean-up and restoration efforts. The significance of this effect will take into account the extent, severity and duration of harm and the sensitivity of the receptor.
Major Event	Combined term used for a Major Accident and/or Disaster (as defined in this table).

Term	Definition
Risk	The likelihood of an impact occurring combined with effect or consequence(s) of the impact on a receptor if it does occur.
Risk Event	An identified, unplanned event, which is considered relevant to the Scheme and has the potential to be a Major Accident and/or Disaster subject to assessment of its potential to result in a significant adverse effect on an environmental receptor.
Vulnerability	In the context of the 2014 EU Directive, the term refers to the 'exposure and resilience' of the Scheme to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

REFERENCES

1. Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 572)
2. Highways Agency (2008) Design Manual for Roads and Bridges (DMRB) Volume 11 Section 2 Part 5 (HA 205-08) Assessment and Management of Environmental Effects.
3. Scoping Opinion for A1 Birtley to Coal House Improvement Scheme, Case Reference: TR010031, The Planning Inspectorate, December 2017.
4. 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.
5. Institute of Environmental Management and Assessment (IEMA), EIA Quality Mark Article: Assessing Risks of Major Accidents / Disasters in EIA, March 2016.
6. Institute of Environmental Management and Assessment (IEMA), EIA Quality Mark Article: What is this MADness? August 2017.
7. Institute of Environmental Management and Assessment (IEMA), EIA Quality Mark Webinar: Major Accidents and Natural Disasters in EIA, 13th July 2017.
8. Health and Safety at Work etc. Act 1974 (c. 37) (HSWA)
9. Construction (Design and Management) Regulations 2015 (SI 2015 No. 15) (CDM)
10. Occupier's Liability Act 1984 (c.3)
11. Cabinet Office, National Risk Register of Civil Emergencies, 2017 Edition.
12. International Federation of Red Cross and Red Crescent Societies, Early Warning, Early Action, 2008.
13. The International Disaster Database (http://www.emdat.be/)
14. British Geological Survey Geo Index Onshore (http://mapapps2.bgs.ac.uk/geoindex/home.html)
15. Prevention Web Europe: Tsunamis Hazard Map (https://www.preventionweb.net/english/professional/maps/v.php?id=3831)
16. Met Office (2013) England and Wales drought 2010-2012
17. A1 Birtley to Coal House, PCF Stage 3 Safety Plan, February 2018, WSP Report: HE551462-WSP-GEN-ZZ-RP-ZS-0001, WSP UK Limited.
18. Defra (2011), Guidelines for Environmental Risk Assessment and Management: Green Leaves III, Cranfield University and Department for Environment, Food and Rural Affairs, November 2011.
19. Department for Transport (2014) National Policy Statement for National Networks. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf
20. Environment Agency (January 2012) Yorkshire and North East Region Drought Plan
21. Northumbrian Water Draft Drought Plan 2018, Northumbrian water, August 2017, https://www.nwl.co.uk/_assets/documents/NW_Draft_Drought_Plan_-_2017_-_Published.pdf

22. Health & Safety Executive's Planning Advice Web App, (https://pa.hsl.gov.uk/)
23. Health & Safety Executive's COMAH 2015 Public Information Search, https://notifications.hse.gov.uk/COMAH2015/Search.aspx,
24. SEPA (2016a) CDOIF guideline "Environmental Risk Tolerability for COMAH Establishments" v2, accessed 3/3/18 from http://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf
25. The International Standards Organization's ISO 31000: 2009 Risk Management – principles and guidelines.
26. The Seveso III Directive (Directive 2012/18/EU).
27. Control of Major Accident Hazards Regulations 2015 (SI 2015 No. 483) (COMAH)
28. Health and Safety Executive (2015) The Control of Major Accident Hazards Regulations 2015: Guidance on Regulations, L111, Third Edition, June 2015
29. "All Measures Necessary - Environmental Aspects", COMAH CA, accessed 3/3/18 at https://www.sepa.org.uk/media/219152/d130416_all-measures-necessary-guidance.pdf
30. Major Accident Off-Site Emergency Plan (Management of Waste from Extractive Industries) (England and Wales) Regulations 2009
31. Department of Environment, Food and Rural Affairs (2011) Guidance: Major Accident Off-Site Emergency Plan (Management of Waste from Extractive Industries) (England and Wales) Regulations 2009. Mining Waste Directive: Article 6 Category "A" Waste Facilities. Department of Environment, Food and Rural Affairs, August 2011.
32. The Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002 No. 2776) (DSEAR)
33. Pipe-Lines Act 1962 (c. 58)
34. The Pipelines Safety Regulations 1996 (SI 1996 No. 825)
35. Gas Safety (Management) Regulations 1996 (as amended) (SI 1996 No. 551)
36. The Workplace (Health, Safety and Welfare) Regulations 1992 (SI 1992 No. 3004)
37. Management of Health & Safety at Work Regulations 1999 (SI 1999 No. 3242)
38. Civil Contingencies Act 2004 (c36).
39. HM Government (2013) Emergency Response and Recovery – Non-statutory guidance accompanying the Civil Contingencies Act 2004, Cabinet Office, 28 October 2013.
40. International Federation of Red Cross and Red Crescent Societies, What is a Disaster? (http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/what-is-a-disaster/)
41. Oxford English Dictionary.
42. Department of the Environment, Transport and the Regions (DETR) (1999), Guidance on the Interpretation of Major Accident to the Environment for the Purposes of the COMAH Regulations, Department of the Environment, Transport and the Regions, 1999.

43. Highways England A1 Birtley to Coal House Improvement Scheme PCF Stage 3 – Coal Mining Risk Assessment, October 2018.

Appendix A

COMPETENT EXPERT EVIDENCE

Major Accidents and Disasters Assessment Professional Competence

Name	Role	Qualifications and Professional Memberships	Experience
Colin Chambers	Reviewer	▪ MSc Occupational and Environmental Health and Safety Management ▪ BSc (Hons) Chemical Engineering ▪ European Engineer ▪ Chartered Engineer ▪ Chartered Environmentalist ▪ Chartered Scientist ▪ Fellow of the Institute of Chemical Engineers ▪ Member of the Society for the Environment, ▪ Practitioner of Institute of Environmental Management and Assessors ▪ Graduate Member of Institute of Occupational Safety & Health	35 years of experience in the identification, assessment of major accident hazards; preparation of safety reports for Major Accident Hazard sites and emergency preparedness and response. Relevant transport projects: ▪ HS2 Phase 2b major accidents and disasters assessment. ▪ Highways England, A1 Morpeth to Felton major accidents and disasters scoping and assessment. ▪ Highways England, A27 Arundel Bypass major accidents and disasters scoping.
Laura Dugdale	Author	▪ MSc Environmental Management ▪ BSc (Hons) Environmental Science ▪ Chartered Environmentalist ▪ Member of the Society for the Environment ▪ Full member of the Institute of Environmental Management and Assessment ▪ Technical member of the Institute of	16 years of experience in the identification, assessment of major accident hazards and preparation of safety reports for Major Accident Hazard sites. Relevant transport projects: ▪ HS2 Phase 2b major accidents and disasters assessment. ▪ Highways England, A1 Morpeth to Felton major accidents and disasters scoping and assessment. ▪ Highways England, A27 Arundel Bypass major accidents and disasters scoping.

Name	Role	Qualifications and Professional Memberships	Experience
		Occupational Safety & Health	

Appendix B

LEGISLATION AND GUIDANCE SUMMARY

LEGISLATION AND GUIDANCE SUMMARY

Legislation

Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 572)

The objective of these Regulations is to provide a high level of protection of the environment and to help integrate environmental considerations into the preparation of proposals for development to reduce their impact on the environment. The Regulations prohibit the granting of consent for development which is likely to have a significant effect on the environment unless an EIA has been carried out.

The Regulations require:

- The assessment of the expected significant adverse effects of the proposed scheme on the environment arising from the vulnerability of the proposed scheme to risks of major accidents or disasters that are relevant to the project concerned.
- A description of the measures envisaged to prevent or mitigate the significant adverse effects of major accidents and/or disasters on the environment and details of the preparedness for and proposed response to such emergencies.

Health and Safety at Work etc. Act 1974 (c. 37)

The Act provides the framework for the regulation of workplace health and safety in the UK. It places general duties on employers, people in control of premises, manufacturers and employees. The overriding principle is that foreseeable risks to persons will be reduced so far as is reasonably practicable and that adequate evidence will be produced to demonstrate that this has been done.

The Act provides a legal framework for the provision of safe plant and equipment and prevention of harm to people from occupational hazards present in a workplace, including emergencies which may affect those offsite, or visiting the site.

Construction (Design and Management) Regulations 2015 (SI 2015 No. 51)

These regulations place legal duties on almost all parties involved in construction work. The regulations place specific duties on clients, designers and contractors, so that health and safety is taken into account throughout the life of a construction project from its inception to its subsequent final demolition and removal. Under the CDM Regulations, designers have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.

The Client, Designers and Contractors have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards associated with the design, construction, operation and maintenance aspects of the Scheme. Therefore, the regulations ensure that

mechanisms are in place to continually identify, evaluate and manage safety risks throughout the design, construction and operation phases of the Scheme. Many of the risks identified and managed out at the design phase also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases.

Control of Major Accident Hazards Regulations 2015 (SI 2015 No. 483)

The purpose of the COMAH Regulations is to prevent major accidents involving dangerous substances and limit the consequences to people and the environment of any accidents which do occur.

The COMAH Regulations 2015 implement the majority of the Seveso III Directive (2012/18/EU) in Great Britain. There are a number of COMAH sites close to the Scheme whose risk profile could be impacted by the Scheme and/or the Scheme falling within the Public Information Zone (PIZ) of a site.

Any areas of the Scheme which fall within the PIZ of a COMAH site will need to ensure the onward communication of emergency information relating the Major Accident Hazard to relevant person, this will be particularly relevant during the construction phase when the transient workforce may spend significant time within a designated COMAH zone.

Health and Safety at Work etc. Act 1974 (c. 37)

The Act sets down the core principles for managing H&S and goal setting duties for employers, employees, the self-employed and those controlling workplaces; including:

- Securing the health, safety, and welfare of persons at work;
- Protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons at work;
- Controlling the keeping and use of explosive or highly flammable or otherwise dangerous substances, and generally preventing the unlawful acquisition, possession and use of such substances.

Highways England, contractors and sub-contractors have to avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards associated with all work-related activities associated with the Scheme throughout its lifecycle both to their employees and others arising out of or in connection with the activities of persons at work.

This is particularly relevant during the construction and maintenance phases.

Management of Health and Safety at Work Regulations 1999 (SI 1999 No. 3242)

The Regulations reinforce employer's duties to manage health and safety and apply to all work activities. The principal of risk based assessment provides the cornerstone for management of H&S and all employers are required to undertake risk assessments. The regulations require the assessment and management of H&S risks and where required procedures for dealing with emergencies, which would include major accidents.

Many of the risks identified and managed will serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases of the Scheme.

Occupier's Liability Act 1984 (c.3)

This Act amends the law of England and Wales as to the liability of persons as occupiers of premises for injury suffered by persons other than their visitors.

Provides a legal framework for the prevention of harm to people from occupational safety and health hazards present on premises under the control of the Occupier, including to those visiting the premises.

The Scheme includes areas of land designated for marshalling of construction resources which attract visitors who could be impacted by Major Events whilst on/crossing those Highways England controlled premises.

The Planning (Hazardous Substances) Regulations 2015 (SI 2015 No. 627)

These regulations transpose the land-use planning requirements of the European Seveso III Directive and relate to the way hazardous substances consents operate, and the way in which the planning system reduces the likelihood and impact of major accidents.

Hazardous Substance Consents (HSC) focus on ensuring the safety of the public around the consented site from potential major accident hazards.

The scheme might be impacted by a Major Accident at a HSC site and/or increase the risk profile of the HSC site.

Pipe-Lines Act 1962 (c. 58)

The purpose of the Act is to ensure the orderly construction of pipelines in such a way as to meet the requirements of the pipeline users, while at the same time minimising disturbance to farmers and land owners by careful planning of routes and by avoiding unnecessary duplication of pipelines. The provisions of the Act are substantially directed towards industrial pipelines except where these are already covered by existing legislation. Pipelines are divided in to two categories: local pipelines, which are those pipelines not exceeding 10 miles in length, and cross country pipelines, which are those which do exceed 10 miles in length. Section 7(1) of the 1962 Act provides that the construction of a pipeline not exceeding 10 miles in length as an addition to another pipeline is to be deemed to be the construction of a cross country pipeline (and not of a local pipeline) if the length of the two exceeds 10 miles. The Act provides that cross country pipelines may not be constructed without authorisation of the Secretary of State.

The Act requires minimising disturbance to other buried utility providers and land/property owners by careful planning of routes for the Gas Pipeline in the Scheme.

The Pipelines Safety Regulations 1996 (SI 1996 No. 825)

The purpose of these Regulations is to ensure that pipelines are designed, constructed and operated properly to ensure their integrity and reduce environmental risks.

The Regulations require the preparation of a Safety Report which demonstrates that the risks associated with the Gas Pipeline passing under the Scheme and which is to be modified are ALARP and prevent/minimise a potential major accident prior to construction and operation.

Many of the risks identified and managed out at the design, pre-construction phases also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases of the Scheme

Gas Safety (Management) Regulations 1996 (as amended) (SI 1996 No. 551)

These Regulations provide for the preparation and acceptance of safety cases in respect of the conveyance of gas in a network and impose requirements in respect of gas escapes and the composition and pressure of gas

The Regulations require the preparation of a Safety Report which demonstrates that the risks associated with the Gas Pipeline passing under the Scheme and which is to be modified are ALARP and prevent/minimise a potential major accident prior to construction and operation.

Many of the risks identified and managed out at the design, pre-construction phases also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the construction, operational and maintenance phases of the Scheme

GUIDANCE

Defra (2011) 'Green Leaves III' Guidelines for Environmental Risk Assessment and Management

These guidelines provide generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is provided which identifies four main components of risk assessment:

1. Formulating the problem
2. Carrying out an assessment of the risk
3. Identifying and appraising the management options available
4. Addressing the risk with a risk management strategy

A source-pathway-receptor model is suggested as a tool to assist in risk screening and an example is provided of applying the following filters to prioritise significant hazards for further investigation:

- The plausibility of linkages between the source of a hazard and a receptor;
- The relative potency of a hazard, availability of a pathway, or vulnerability of a receptor;
- The likelihood of an event, on the basis of historic occurrence or of changed circumstances; or
- A view on the performance of current risk management measures that, if they were to fail, may increase the potential for future harm.

Chemical and Downstream Oil Industries Forum, (2013), Guideline – Environmental Risk Tolerability for COMAH Establishments

These guidelines provide a common screening methodology for carrying out an environmental risk assessment under the COMAH Regulations. Amongst other things, the guidance:

- Defines the types of harm that should be considered in an environmental risk assessment, and how the harm should be characterised for the assessment;
- Defines the risk criteria to be used in assessing tolerability of the environmental risk from an establishment, and where appropriate, individual scenarios; and
- Explains how risks may be evaluated.

The guidelines present a series of thresholds that can be used to 'screen' the potential for a Major Accident to the Environment (MATTE) to relevant environmental receptors. The thresholds have been developed based on the criteria for reporting a major accident to the European Commission defined in the Seveso III Directive and COMAH Regulations, and to guidance on MATTE issued by the then Department of the Environment, Transport and the Regions in 1999. The thresholds are presented in two dimensions, namely (i) extent and severity and (ii) duration of harm; and thresholds for both dimensions must be exceeded for the scenario to be considered a potential MATTE.

The International Standards Organization's ISO 31000: 2009 Risk Management – principles and guidelines

This guideline identifies a number of principles that need to be satisfied to make risk management effective. If the standards are adopted and applied the management of any risk should help minimise losses, improve resilience, improve controls and improve the identification of opportunities and threats.

The ISO standard states that when defining risk criteria, the following factors should be considered:

- The nature and types of causes and consequences that can occur and how they will be measured;
- How likelihood will be defined;
- The timeframe(s) of the likelihood and/or consequence(s);

- How the level of risk is to be determined;
- The views of stakeholders;
- The level at which risk becomes acceptable or tolerable; and
- Whether combinations of multiple risks should be taken into account and, if so, how and which combinations should be considered.

Appendix C

SCOPING LONG LIST

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Natural Hazards	Geophysical	Earthquakes	N	N	N	Do not occur in Britain of a sufficient intensity owing to the motion of the Earth's tectonic plates causing regional compression. In addition, uplift from the melting of the ice sheets that covered many parts of Britain thousands of years ago can also cause movement. The BGS acknowledges that on average, a magnitude 4 earthquake happens in Britain roughly every two years and a magnitude 5 earthquake occurs around every 10 to 20 years. As such the Cabinet Office National Risk Register of Civil Emergencies (**Ref.11**) states that "Earthquakes in the UK are moderately frequent but rarely result in large amounts of damage. An earthquake of sufficient intensity (determined on the basis of the earthquake's local effect on people and the environment) to inflict severe damage is unlikely". In terms of geographical proximity, the closest epicentre of an earthquake to the Scheme occurred in 2003, approximately 8km to the east at Heaton with a magnitude of 2.3 on the Richter scale and in 2004 approximately 8km east south-east at Middle Herrington with a magnitude of 2 on the Richter scale (**Ref.14**). As earthquakes have not caused any deaths in the UK since 1950, and buildings are damaged (not devastated) this event type is scoped out.	N	N/A
Natural Hazards	Geophysical	Volcanic Activity	N	N	N	Volcanic activity does not occur in the UK and is not linked to the Scheme.	N	N/A
Natural Hazards	Geophysical	Landslides	N	N	N	No historical landslides have been recorded within the boundary of the Scheme (BGS Geological Survey Geo Index Onshore (**Ref.14**))	N	N/A
Natural Hazards	Geophysical	Sinkholes	N	N	N	This is likely to be covered in the geotechnical design, and there are no examples of roads that have been affected by sinkholes in the locality to warrant taking this event forward.	N	N/A
Natural Hazards	Geophysical	Tsunamis	N	N	N	The Scheme is located inland, outside a tsunamis risk zone (Prevention Web (2005) Europe: Tsunamis hazard map (**Ref.15**)).	N	N/A
Natural Hazards	Hydrology	Coastal Flooding	N	N	N	The Scheme is located inland, outside a coastal area.	N	N/A
Natural Hazards	Hydrology	Fluvial Flooding	Y	Y	Y	The majority of the Study Area is located within Flood Zone 1, which is associated with a low risk of flooding from fluvial and coastal sources (an annual probability of less than 1 in 1000). The Scheme crosses over the fluvial floodplain of the River Team, land designated as both Flood Zone 2 and 3. The Environment Agency's Flood Map for Planning shows the western half of junction 67 (Coal House) and part of the slip roads (to the west of the junction) to be within Flood Zone 2 with respect to fluvial flooding from the River Team. Flood Zone 2 equates to an annual probability of fluvial flooding of between 1 in 1000 and 1 in 100 (0.1-1%). Flood Zone 3 extends up to the south of the junction, and close to the A1 main carriageway within the centre of the junction. Flood Zone 3 equates to an annual probability of fluvial flooding of greater than 1 in 100 (>1%).	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 – Road Drainage and the Water**	Road Users Public and local community

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
						The fluvial floodplain of the River Team has been classified as of High importance with respect to human safety. The ordinary watercourse that passes under the Allerdene Bridge has been classified as of High importance with respect to flood risk due to the close proximity of the residential areas upstream. Whilst the finished road level is elevated at this point, construction operations may need to be disrupted during a flood event. The areas of high and medium risk could represent a health and safety risk for motorists if this is not mitigated.	**Environment Appendix 13.1**).	
Natural Hazards	Hydrology	Pluvial (Surface Water) Flooding	Y	Y	Y	The Environment Agency's Risk of Flooding from Surface Water Map identifies the following areas as being at medium to high risk of pluvial flooding: - Pluvial flooding is predicted along the highway at junction 67 (Coal House) in the 1 in 30 year event with depths below 300mm predicted for the southbound slip road, and depths between 300 and 900mm on the northbound slip road. - The western part of the junction 67 (Coal House) roundabout is shown to be at risk of surface water flooding to depths of 300 to 900mm in the 1 in 100 year event. - Pluvial flooding is also predicted at depths below 300mm in the 1 in 30 year event on Allerdene Bridge (between junction 67 (Coal House and junction 66 (Eighton Lodge). - An area at high risk of surface water ponding is also predicted on one of the slip roads at junction 65 (Birtley), with depths up to 900mm predicted by the Environment Agency's Risk of Flooding from Surface Water Map. The safety of human motorists with respect to the pluvial flooding and changes to surface water runoff has been classified as of High importance. The sensitivity of the pluvial floodplain has been assessed to be low. The increase in impermeable surfaces as a result of the Scheme along with the likely increase in rainfall as a result of climate change over the lifetime of the Scheme would increase flood risk if not mitigated in addition to a potential pollution threat to nearby water courses. The Scheme design will need to take into account drainage of the additional road surface which would potentially exacerbate existing issues.	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 – Road Drainage and the Water Environment Appendix 13.1**).	Public and local community
Natural Hazards	Hydrology	Ground Water Flooding	Y	Y	Y	Based on the Scoping Opinion, there appears to be a concern regarding groundwater flooding of mine caverns. Potentially this could adversely impact the structural integrity of the Scheme and warrants further consideration in the preparation of the ES and should be included in the design risk register.	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 – Road Drainage and the Water Environment**	Road users Rail users Public and local community

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
							Appendix 13.1).	
Natural Hazards	Hydrology	Avalanches	N	N	N	The Scheme's topography is relatively flat and therefore an avalanche will not occur.	N	N/A
Natural Hazards	Climatological and Metrological	Cyclones, hurricanes, typhoons, storms and gales	Y	N	Y	The winter of 2015/2016 was the second wettest winter on record and a series of storms (including 'Desmond' and 'Eva') resulted in heavy and sustained rainfall. 17,600 UK properties were flooded and several bridges collapsed, disrupting access to and from local communities. (**Ref.11**) The Scheme crosses over the fluvial floodplain of the River Team therefore the vulnerability of the Scheme to storms should be carried forward for consideration in the design and flood risk assessment with respect to the risk to the Scheme but also the increased risk due to the A1 Scheme impacting local flood risks.	Y A flood risk assessment has been undertaken for the Scheme (see ES **Chapter 13 – Road Drainage and the Water Environment Appendix 13.1**) which has taken into account the output of the Climate Change assessment (See ES **Chapter 14 - Climate**).	Road Users Public and local community
Natural Hazards	Climatological and Metrological	Wave surges	N	N	N	The Scheme is located inland, and therefore is not subject to wave surges.	N	N/A
Natural Hazards	Climatological and Metrological	Extreme temperatures: Heatwaves Low (sub-zero) temperatures and heavy snow	N	N	N	In August 1990, the UK experienced heatwave conditions with temperatures reaching what was then a record 37.1°C in Cheltenham, England. In August 2003 a UK heatwave lasted 10 days and resulted in over 2,000 deaths. Temperatures reached what was then a record 38.5°C in Faversham, England and 33°C in Anglesey, Wales. High temperature records are now being broken with increasing frequency. The most widespread and prolonged low temperatures and heavy snow in recent years occurred from December 2009 to January 2010. Daytime temperatures were mostly sub-zero across the UK. At night, temperatures in England regularly fell to -5°C to -10°C. Snowfall across the UK lasted for some time, allowing 20cm to 30cm of snow to build up, closing schools and making it very difficult to travel. (**Ref.11**)	N	N/A

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
						Between 1981 and 2010, there were 15 occurrences where summer mean temperatures exceeded 22.3°C on five or more consecutive days. Between 1981 and 2010, there have been 1,186 days with a maximum minimum temperature below zero degrees Celsius. Between 1981 and 2010, there were 418 days with snow lying at 0900 however, there are no records from the Met Office of the depth of snow. However, the risk is no greater than the existing section of the A1 and it is close to and accessible from nearby urban areas.		
Natural Hazards	Climatological and Metrological	Droughts	N	N	N	Over the past 40 years or so England has experienced five long-duration droughts and two shorter periods of drought. During the 2010-12 drought, parts of eastern England recorded their lowest 18 month rainfall total in over 100 years. (**Ref. 16**). The Scheme should not be vulnerable to drought as water is not an essential service during the construction, use or maintenance phases. The design of the sub-structure and bridges will be resilient to ground shrinkage and should remain in the design risk register until designed out.	N	N/A
Natural Hazards	Climatological and Metrological	Severe Space Weather: Solar Flares	N	N	N	Solar flares can cause radio blackouts. Records from solar storms in 1921 and 1960 describe widespread radio disruption and impacts on railway signalling and switching systems. (**Ref.11**) There is increased reliance on roadside technology therefore the Scheme is more vulnerable than the existing route. However, it is no more at risk than other similar Schemes using the same technology.	N	N/A
Natural Hazards	Climatological and Metrological	Severe Space Weather: Solar Energetic Particles	N	N	N	Solar energetic particles which cause solar radiation storms, but only in outer space, so this major event type can be scoped out.	N	N/A
Natural Hazards	Climatological and Metrological	Severe Space Weather: Coronal mass ejections	N	N	N	Coronal mass ejections (CME) causes geomagnetic storms. The geomagnetic storm in 2003 caused the UK aviation sector to lose some GPS functions for a day, however there was no known significant impact on road users or infrastructure.	N	N/A
Natural Hazards	Climatological and Metrological	Fog	N	N	N	Fog is one of the most common weather conditions in the UK, particularly throughout autumn and winter. Severe disruption to transport occurs when the visibility falls below 50m over a wide area. Speeds on the Scheme will be the same as the existing road, so the severity of road traffic accidents should not be any higher than the existing route for which collision data over the period 2012 to 2016 showed there to be no accidents in which fog was a contributory factor.	N	N/A

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Natural Hazards	Climatological and Metrological	Wildfires: Forest fire, Bush/brush, pasture	N	N	N	In April and May 2011 numerous wildfires broke out across the UK after unusually hot and dry weather. England received only 21% of its usual rainfall for April 2011. Wildfires affected (amongst other areas) West Yorkshire (**Ref.11**). However, the Scheme and surrounding area does not contain vegetation with a potential high fuel load such as gorse.	N	N/A
Natural Hazards	Climatological and Metrological	Poor Air Quality	N	N	N	In 2006 the UK experienced two periods of extended hot weather with associated elevated ozone and harmful airborne particles. In the spring of 2015, two particle pollution episodes caused widespread poor air quality throughout the UK, with multiple areas measuring 'High' on the Daily Air Quality Index and resulted in around 1,100 deaths due to exacerbation of pre-existing ill-health conditions. Summer 2015 also contained two elevated ozone episodes (**Ref. 11**). Defra published revised Pollution Climate Mapping (PCM) that the links along the route are stated as being greater in terms of Nitrogen dioxide than they currently are. The PCM update has now been issued and the initial indication are that the baseline PCM projections exceeds the EU limit value (Design Risk Register Jan 2018). The Scheme is expected to result in changes to emissions of oxides of nitrogen (NOX) and NO2 along the A1 and linked routes as a result of changes in traffic flows and speeds. Improvements to the A1, while leading to an increase in flow on the A1 and potentially an overall increase in traffic within the ARN, are also expected to reduce congestion and provide a more consistent traffic speed. The latter impact may partially offset the impacts of increased flows on emissions. Conversely, where traffic re-routes from roads parallel to the A1 onto the A1, traffic flows, and emissions from traffic, will decrease. Therefore, the Scheme is anticipated to result in both beneficial and adverse changes to local air quality depending on the specific changes to emissions from road traffic in the vicinity of individual receptors. Traffic management measures during construction may also lead to changes in vehicle emissions which may, in turn, result in impacts on local air quality.	N	N/A
Natural Hazards	Biological	Disease epidemics: ¡ Viral ¡ Bacterial ¡ Parasitic ¡ Fungal ¡ Prion	N	N	N	The Scheme is located in a developed country where the population is in general good health. Furthermore, the use of the Scheme (highway) is not going to give rise to any disease epidemics. Public Health England, the executive agency of the Department of Health is responsible for protecting the nation from public health hazards, preparing for and responding to public health emergencies. One of Public Health England's functions is to protect the public from infectious disease outbreaks and the Agency has produced a document providing operational guidance for the management of outbreaks of communicable disease, 'Communicable Disease Outbreak management: Operational Guidance'.	N	N/A
Natural Hazards	Biological	Animal Diseases: ¡ zoonotic: • avian influenza	N	N	N	Low and highly pathogenic avian influenza has been recorded in poultry in the UK several times in the last 10 years, most recently in the winter of 2016/17, although with no human cases reported. There was a devastating foot and mouth outbreak in 2001. (**Ref.11**) No, scoped out as the use of the Scheme (highway) is not going to be the source of any disease	N	N/A

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
		• West Nile virus • Rabies ¡ non-zoonotic: • foot and mouth. • swine fever				epidemics and spread would be controlled through containment of infected animals including prohibition of transportation.		
Technological or Manmade Hazards	Societal	Extensive violence and loss of life.	N	N	N	The Scheme is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts.	N	N/A
Technological or Manmade Hazards	Societal	Widespread damage to societies and economies.	N	N	N	The Scheme is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts.	N	N/A
Technological or Manmade Hazards	Societal	Displaced population	N	N	N	The Scheme does not involve displacement of persons.	N	N/A
Technological or Manmade Hazards	Industrial and Urban Accidents	Major Accident Hazard Chemical sites	Y	Y	Y	There are at least 4 COMAH sites within a 5km corridor along the Scheme, one of which is an Upper Tier site 4.5km north of junction 67 (Coal House) and the nearest being a Lower Tier site 1km south of junction 66 (Eighton Lodge).	Y	Road Users
Technological or Manmade Hazards	Industrial and Urban Accidents	Major Accident Hazard Pipelines	Y	Y	Y	NGN natural gas pipeline runs under a section of the Scheme near the Allerdene Bridge.	Y	Road users Public and local communities
Technological or Manmade Hazards	Industrial and Urban Accidents	Nuclear	N	N	N	Nuclear sites are designed, built and operated so that the chance of accidental releases of radiological material in the UK is extremely low. Last historical major accident in the UK was Windscale in 1957. (**Ref.11**) No nuclear sites within 5km corridor along the Scheme.	N	N/A
Technological or Manmade Hazards	Industrial and Urban Accidents	Fuel storage	N	N	N	In December 2005 Europe's largest peacetime fire occurred at the Buncefield Oil Storage Terminal in Hemel Hempstead, England. The surrounding area was temporarily evacuated and some local businesses experienced long-term disruption to operations (**Ref.11**).	N	N/A

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
						No fuel storage sites within 5km corridor along the Scheme. Sainsbury's petrol station is located within 100m of the Scheme.		
Technological or Manmade Hazards	Industrial and Urban Accidents	Dam breaches	N	N	N	Dam breaches in the UK are rare; the last major breach was at the Cwm Eigiau dam in 1925, which caused 17 fatalities and widespread flooding. (**Ref.11**) No dams within the 5km corridor.	N	N/A
Technological or Manmade Hazards	Industrial and Urban Accidents	Mines and storage caverns	Y	Y	Y	The Scheme is within the Durham Coal Field and classified by the Coal Authority as being within the Gateshead District (B). Significant historical surface and underground coal mining is known to have occurred throughout the area. Although, the Coal Authority has not received a damage notice or claim for any property on site or within 50m of the Scheme since 31st October 1994. Also, there is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the Scheme. This is a relatively short period of time for a Major Event where we are looking at a 1 in 100 year event.	Y A geology and soils assessment has been undertaken for the Scheme (see **Chapter 9 Geology and Soils**).	Road users Public and local communities
Technological or Manmade Hazards	Industrial and Urban Accidents	Fires	Y	Y	Y	There is a sawmill located 150m south west of the Scheme between junction 66 (Eighton Lodge) and junction 67 (Coal House) and also a petrol station within approximately 75 metres of the Scheme.	Y	Road users Public and local communities
Technological or Manmade Hazards	Transport accidents	Road	N	Y	Y	Significant transport accidents occur across the UK on a daily basis, mainly on roads, and involving private and/or commercial vehicles leading to spillage of hazardous materials such as those which are flammable, hazardous to human health or dangerous to the environment. The existing speed limits of 50mph southbound from junction 67 (Coal House) to Smithy Lane Overbridge, 70mph southbound from Smithy Lane to junction 65 (Birtley) and 50mph throughout the northbound carriageway will be retained. The use of existing road alignment retains some stop sight distances which are sub-standard for visibility.	Y Stage 3 – Safety Plan for the implementation of the Scheme at Stage Gate Assessment Review (SGAR).	Road users
Technological or Manmade Hazards	Transport accidents	Rail	Y	Y	Y	The Allerdene Bridge (part of the ECML) spans the Scheme and will require lengthening to enable the widened A1 to pass under. The replacement of Allerdene Bridge will require careful consideration during construction so as to maintain a safe crossing over the railway.	Y Stage 3 – Safety Plan for the implementation of the Scheme	Road users Rail users

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
							at Stage Gate Assessment Review (SGAR).	
Technological or Manmade Hazards	Transport accidents	Waterways	N	N	N	No historical evidence of waterway accidents impacting road network.	N	N/A
Technological or Manmade Hazards	Transport accidents	Aviation	N	N	N	There have been no major air accidents in the UK since the Kegworth incident in 1989. (**Ref.11**). The Scheme is not located near a major airport or on the landing/take-off flight path of Newcastle International Airport.	N	N/A
Technological or Manmade Hazards	Pollution accidents	Air	N	N	N	Use of fossil fuelled mobile plant and equipment during the construction phase. However, emissions from mobile plant and equipment covered under H&S and environmental legislation.	N	N/A
Technological or Manmade Hazards	Pollution accidents	Land	N	Y	N	Use of fossil fuels and storage of lubricants and oils for mobile plant and equipment during the construction phase.	Y	Local heritage Public and local community
Technological or Manmade Hazards	Pollution accidents	Water	N	Y	Y	Potential fuel/lubricant spillages from transportation accidents reach surface waters.	Y	Public and local community Water environment
Technological or Manmade Hazards	Utilities failures	Electricity	Y	Y	Y	Instances of electricity failure (also referred to as power loss or blackout) can be caused by a number of things, such as severe weather (e.g. very strong winds, lightning and flooding) which damage the distribution network. These tend of be mainly specific place, local (e.g. metropolitan area) and less frequently regional (e.g. north-east) as a result of severe winter storms and consequent damage to the distribution overhead line network. Overhead distribution powerlines cross and/or run close to the Scheme at several points which are likely to be at risk during construction of the Scheme. There are buried supply cables within the urban areas of the Scheme which could be struck during construction and result in widespread local power outages. These will need consideration in the development of the ES to ensure they are adequately addressed within the design and CDM risk register and possible impact on local community resources Loss of power to A1 traffic monitoring and control systems could adversely impact road safety.	Y	Public and local community

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
Technological or Manmade Hazards	Utilities failures	Gas	N	N	N	No mains supplied natural gas use associated with the Scheme.	N	N/A
Technological or Manmade Hazards	Utilities failures	Water supply	N	N	N	No water use associated with the Scheme during its operation and relatively low use during construction which could be addressed by tankering in supplies if required.	N	N/A
Technological or Manmade Hazards	Utilities failures	Sewage system	N	N	N	No use of the sewage system associated with the Scheme. During construction phase temporary portable systems will be in place covered by H&S welfare requirements.	N	N/A
Technological or Manmade Hazards	Malicious Attacks	Unexploded ordnance	Y	Y	N	The Team Valley and ECML were targets for WWII bombing raids. A geology and soils assessment has been undertaken for the Scheme which includes a UXO desk study (see ES **Chapter 9 Geology and Soils**). The desk study identifies a low risk of encountering UXO. No further assessment required.	N	N/A
Technological or Manmade Hazards	Malicious Attacks	Attacks Chemical Biological Radiological Nuclear	N	N	N	Extremists remain interested in CBRN materials, however alternative methods of attack such as employing firearms or conventional explosive devices remain far more likely. Historical use has been in closed densely occupied structures (underground, buildings) or targeted at specific individuals (**Ref.11**) rather than the open road network.	N	N/A
Technological or Manmade Hazards	Malicious Attacks	Transport systems	N	N	N	Potential systems would include (but are not limited to) railways, buses, passenger ferries, cargo vessels and aircraft. (**Ref.11**)	N	N/A
Technological or Manmade Hazards	Malicious Attacks	Crowded places	N	N	N	The Scheme does not fall within the definition of a crowed place, i.e. pedestrian routes and other thoroughfares as well as sports arenas, retail outlets and entertainment spaces (**Ref.11**)	N	N/A
Technological or Manmade Hazards	Malicious Attacks	Cyber	N	N	N	Cyber attacks occur almost constantly on key national and commercial electronic information, control systems and digital industries. Current proposals being considered at this stage are the provision of additional CCTV sites to infill in order to achieve comprehensive coverage within the Scheme Footprint; provision of additional variable message signs at new locations and additional Motorway Incident Detection and Automatic Signalling (MIDAS) technology. Increased reliance on roadside technology to control traffic will render the Scheme more vulnerable to a cyber attack which would potentially impact road safety. However, Highways England have a mechanism in place to protect highways communication systems from terrorist attack.	N	N/A

Hazard Group	Hazard Category	Event Type	Location Risk	Construction	Operation	Basis of Decision to Scope In/Out	Scope In?	Potential Receptors
						The risk associated with cyber attacks is no different to other similar schemes, therefore this event type has been scoped out.		
Technological or Manmade Hazards	Malicious Attacks	Infrastructure	N	N	N	Terrorists in the UK have previously attacked, or planned to attack, national infrastructure. Attempts were made to attack electricity substations in the 1990s. Bishopsgate, in the City of London, was attacked in 1993 and South Quay in London's Docklands in 1996. These attacks resulted in significant damage and disruption but relatively few casualties. The Scheme would have minimal impact on local infrastructure or be considered a high profile attack.	N	N/A

Appendix D

RISK RECORD

Risk Record Screened in Major Events

This is an extract from the Major Events assessment process of those risk events to which the Scheme is potentially vulnerable. Therefore, it should be noted that the risk record entry numbers do not run sequentially.

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
1	Route wide	Presence of underground services/utilities - gas, electricity,	C	Presence of existing utilities within the Scheme area which are nearby to receptors	Striking of underground services/utilities	CDM register	Fire and/or explosion affects neighbouring property and/or members of the public.			X			X						Location of utilities is obtained from the statutory undertakers and how the Scheme will affect the utilities is discussed and any diversions required are highlighted. This information is then used in the detailed design of the Scheme. Positive identification of all the utilities prior	Y	Could cause loss of life or permanent injury to multiple members of the public; or significant structural property damage.	Y	Assuming: - Route will be swept with a cable avoidance tool (CAT) prior to breaking ground. - Construction Phase H&S plan. - Remain on the design risk register

	Risk Record Entry number
	Section of Scheme
	Hazard Description
	Applicable Phases (C=Construction, O=Operational, M=Maintenance)
	Hazard sources and/or pathways
	Risk Description
	Documentation in which the event is/will be addressed
	Reasonable worst consequence if event did occur and receptor(s)
	Air quality
	Climate
	Population and Human Health
	Biodiversity
	Cultural Heritage
	Geology and Soils
	Landscape and visual
	Noise and vibration
	Transport
	Material resources
	Road Drainage and the Water Environment
to starting work on site.	**Primary mitigation**
	Could this constitute a major event?
	Justification
	Is this ALARP with existing mitigation?
	Clarification

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
10	Route wide	Ground subsidence leading to damage of roadway and/or associated infrastructure.	C,M ,O	Collapse of overhead structure onto carriage way. Collapse of carriage way.	The Coal Authority report (**Ref. 43**) states that the Scheme Footprint is within the likely zone of influence from workings in thirteen seams of coal from shallow (<30m) to 240 m bgl, with the Coal Authority database recording past and probable shallow mining below the majority of the Study Area east of junction 67 (Coal House). Ground investigation works completed by Central Alliance along the route in	CDM register Method Statements	Death and / or injury to multiple road users.			X	X					X			Ground investigation to inform requirements to grout up and stabilise shallow coal workings and cap shafts, and design suitable earthworks, structures not to be impacted be poorly compacted ground. Mitigation measures during the construction phase would include either incorporating geogrid into the highway construction	Y	Could cause loss of life or permanen t injury to multiple road users.	Y	Assuming that all mine shafts have been capped and shallow mine workings grouted.

Risk Record Entry number	
Section of Scheme	
Hazard Description	
Applicable Phases (C=Construction, O=Operational, M=Maintenance)	
Hazard sources and/or pathways	
Risk Description	2017/2018 have identified shallow coal workings within 30m from the surface which may present a stability issue to future development. Increased maintenance requirements as a result of settlement.
Documentation in which the event is/will be addressed	
Reasonable worst consequence if event did occur and receptor(s)	
Air quality	
Climate	
Population and Human Health	
Biodiversity	
Cultural Heritage	
Geology and Soils	
Landscape and visual	
Noise and vibration	
Transport	
Material resources	
Road Drainage and the Water Environment	
Primary mitigation	or grouting shallow mine workings associated with shallow coal workings.
Could this constitute a major event?	
Justification	
Is this ALARP with existing mitigation?	
Clarification	

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
13	Route wide	Restricted access causing difficulties with manoeuvring heavy construction plant. Increased traffic.	C	Construction activities adjacent to existing structures and live roads.	Damage to existing road infrastructure leading to injury of member of the public or workers.	CDM register	Collapse/impact leads to harm to members of public.			X		X			X	X			Construction traffic management plan. Consultation with the Local Authority on suitability to use the local road network.	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming actions from the CDM register and traffic management plan are implemented.
18	Route wide	Earthworks and construction activities (e.g. overturning of crane / dropped load) adjacent to operational areas of the existing structures.	C	Construction activities adjacent to existing structures and live roads.	Damage to highway infrastructure leading to death and/or injury of workers and road users.	CDM register Lifting Operations Plan	Collapse/impact leads to harm to construction and other workers and road users in the vicinity.			X						X			Construction phase H&S plan	Y	Could cause loss of life or permanent injury to multiple road users	Y	Assuming the effective implementation of the construction phase H&S plan

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
24	A1 running adjacent to ECML	Earthworks & construction adjacent to operational railway.	C,M ,O	Working adjacent to existing railway causes a train derailment.	Increased maintenance requirements as a result of settlement during construction and long term. Inadequate maintenance / monitoring or sudden failure potentially leading to a derailment on the ECML. Materials falling on to the ECML.	CDM register	ECML train derails off track.			X	X	X	X	X		X			Liaison with National Rail on works, agreed controls included in CDM H&S plan. Schedules monitoring of track.	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming the effective implementation of the construction phase H&S plan
25	Route wide, e.g. North Dene Footbridge, Allerdene Bridge.	Phased construction of bridge in immediate proximity of operational public highway	C	Falling objects cause road traffic accident	1) Injury to third parties; 2) Debris falling on public highway resulting in accident; 3) Damage to third party utilities/services located on or near bridges	CDM register	Death and/or injury to members of the public			X						X			Construction phase H&S plan	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming the effective implementation of the construction phase H&S plan

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
27	Route wide	Existing road bridges loaded with additional construction traffic e.g. piling rigs.	C	Collapsing bridge striking traffic/member of persons nearby	Unknown safe capacity of road bridges - Overloading leading to structural instability - injuries to road users and construction personnel.	CDM register	Death and/or injury to members of the public			X						X			Confirming the loading capacity of bridges prior to construction works commencing. Provision of information, instruction and training to construction workers and contractors.	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming embedded mitigation effectively managed and implemented.
29	Kingsway viaduct (junction 67)	Bridge work over junction 67 (Coal House) and junction 66 (Eighton Lodge) roundabouts	C	Falling objects causes major road traffic accident. Poor sight lines due to installatio	Construction over roadway carries construction risk and could cause disruption to traffic.	CDM register	Death and/or injury to members of the public.			X						X			Construction phase H&S plan. Traffic management plan.	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming that access to the area below is excluded whilst work is being undertaken.

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
				n of new bridges.																			
30	Route wide	Presence of unidentified wells, shafts and boreholes - ungrouted/sealed or only partially sealed - creating uncertainty of surface profile effects and pathway for pressurised grout expulsion.	C	Mine workings	The Coal Authority Report details the treatment of six mine entries. No details are available with regards to the abandonment and stabilisation of the remaining mine entries. Ground investigation works completed by Central Alliance along the route in 2017/2018 have identified shallow coal workings within 30m from	CDM register	Death and/or injury to multiple road users.			X						X			Ground investigation to inform requirements to grout up and stabilise shallow coal workings and cap shafts, and design suitable earthworks, structures not to be impacted be poorly compacted ground. Mitigation measures during the	Y	Could cause loss of life or permanen t injury to multiple road users.	Y	Assuming that all mine shafts have been capped and shallow mine workings grouted.

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
					the surface which may present a stability issue to future development. If left untreated could pose a below ground collapse risk if built upon.														construction phase would include either incorporating geogrid into the highway construction or grouting shallow mine workings associated with shallow coal workings.				

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
32	NGN gas pipelines and AGI near Lamesley	Presence of underground low, intermediate and high pressure gas pipelines	C	Presence of existing natural gas transmission pipelines	The intermediate pressure (IP) gas main would be diverted through the installation of a new main via means of by micro-tunnelling technique using a slurry drive. The low-pressure (LP) gas main which currently goes underneath the northbound access and southbound exit slip roads would be diverted into Coal House roundabout using a combination of open cut trenches and trenchless techniques. The new LP gas main	CDM register	Fire and/or explosion affects neighbouring property and/or members of the public.			X									Management of change process (utilities provider), actions identified in the CDM register, coordination & cooperation between all parties involved, use of good engineering practices.	Y	Could cause loss of life or permanent injury to multiple members of the public; or significant structural property damage.	Y	Assuming: - Route of pipeline chosen to minimise crossover of other known buried services/utilities. - Route will be swept with a cable avoidance tool (CAT) prior to breaking ground. - Construction Phase H&S plan.

	Risk Record Entry number
	Section of Scheme
	Hazard Description
	Applicable Phases (C=Construction, O=Operational, M=Maintenance)
	Hazard sources and/or pathways
would be routed between the new foundations for the bridge. Work involving the abandonment and routing of the high pressure (HP), IP, medium pressure (MP) and LP mains affected by the Scheme would be carried out. Striking of underground services/utilities	**Risk Description**
	Documentation in which the event is/will be addressed
	Reasonable worst consequence if event did occur and receptor(s)
	Air quality
	Climate
	Population and Human Health
	Biodiversity
	Cultural Heritage
	Geology and Soils
	Landscape and visual
	Noise and vibration
	Transport
	Material resources
	Road Drainage and the Water Environment
	Primary mitigation
	Could this constitute a major event?
	Justification
	Is this ALARP with existing mitigation?
	Clarification

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
33	NGN gas pipelines and AGI near Lamesley	Presence of underground gas pipework	C,M ,O	Release of flammable gas from pipeline	Ground subsidence leading to loss of containment.	CDM register Safe Systems of Work	Fire and/or explosion affects neighbouring properties and/or those people in the immediate area.			X									Management of change process (utilities provider), actions identified in the CDM register, coordination & cooperation between all parties involved, use of good engineering practices.	Y	Could cause loss of life or permanent injury to multiple members of the public; or significant structural property damage.	Y	Assuming: - Route of pipeline chosen to minimise crossover of other known buried services/utilities - Route will be swept with a cable avoidance tool (CAT) prior to breaking ground. - Construction Phase H&S plan.
35	Route Wide	Presence of unrecorded mine workings	C,M ,O	Mine workings	Collapse of a mine workings leading to collapse of the roadway into a void.	Ground Conditions Report CDM Register Coal Mining Risk	Death and/or injury to members of the public.			X						X			Ground instability risks will be mitigated as part of the construction	Y	Could cause loss of life or permanent injury to multiple members	Y	Assuming primary mitigation effectively managed and

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
						Assessment													phase works (i.e. grouting).		of the public.		implemented.
37	Nanny Pit in the central reserve to the southeast of Smithy Lane	Presence of recorded mine workings of unknown specification	C,M,O	Mine workings	Collapse of mine workings.	Ground Conditions Report CDM Register Coal Mining Risk Assessment	Death and / or injury to members of the public.			X						X			Earthworks to be constructed on rigid inclusion ground improvement and a load transfer platform. Consideration of incorporation of a high strength basal geogrid beneath new earthworks to control settlement in the case of surface movement	Y	Could cause loss of life or permanent injury to multiple members of the public.	Y	Assuming primary mitigation effectively managed and implemented.

Risk Record Entry number	Section of Scheme	Hazard Description	Applicable Phases (C=Construction, O=Operational, M=Maintenance)	Hazard sources and/or pathways	Risk Description	Documentation in which the event is/will be addressed	Reasonable worst consequence if event did occur and receptor(s)	Air quality	Climate	Population and Human Health	Biodiversity	Cultural Heritage	Geology and Soils	Landscape and visual	Noise and vibration	Transport	Material resources	Road Drainage and the Water Environment	Primary mitigation	Could this constitute a major event?	Justification	Is this ALARP with existing mitigation?	Clarification
																			due to the collapse of any unrecorded workings.				
39	Near junction 67 (Coal House)	Presence of fuel station	O	Flammable vapour cloud or dense smoke engulfing A1	Fire, explosion of release of flammable vapour cloud	Fuel Station and local authority off site emergency plan	Major road traffic incident involving loss of life or permanent injuries to multiple road users.			X									Fuel station H&S management system and safe systems of work	Y	Could cause loss of life or permanent injury to multiple road users as predominate wind direction is in the	Y	Assumes liaison between site operator and HE for offsite emergencies.

	Risk Record Entry number
	Section of Scheme
	Hazard Description
	Applicable Phases (C=Construction, O=Operational, M=Maintenance)
	Hazard sources and/or pathways
	Risk Description
	Documentation in which the event is/will be addressed
	Reasonable worst consequence if event did occur and receptor(s)
	Air quality
	Climate
	Population and Human Health
	Biodiversity
	Cultural Heritage
	Geology and Soils
	Landscape and visual
	Noise and vibration
	Transport
	Material resources
	Road Drainage and the Water Environment
	Primary mitigation
	Could this constitute a major event?
south - south west quadrant and therefore towards the north end of Scheme.	**Justification**
	Is this ALARP with existing mitigation?
	Clarification

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