



Norwich Western Link

Environmental Statement

Chapter 18: Major Accidents and Disasters (MAD)

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Appendices

Environmental Statement Chapter 18: Major Accidents and Disasters (MAD)
Appendix 18.1: Long List (Document Reference 3.18.01)

Environmental Statement Chapter 18: Major Accidents and Disasters (MAD)
Appendix 18.2: Risk Record (Document Reference 3.18.02)



Glossary of Abbreviations and Defined Terms

The definition of key terms used in this report are provided below. These definitions have been developed by reference to the definitions used in EU and UK legislation and guidance relevant to Major Accidents or Disasters as well as professional judgement based on knowledge and experience of similar schemes in the context of the Proposed Scheme.

Term	Definition
(Major) Accident	In the context of the Proposed Scheme, an event that threatens immediate or delayed serious damage to human health, welfare 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 takes into account the extent, severity and duration of harm and the sensitivity of the receptor.
ALARP	"ALARP" stands for "as low as reasonably practicable". Reasonably practicable involves weighing a Risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which the Health & Safety Executive (HSE) expect to see workplace risks controlled.
Adaptive Capacity	The capacity of receptors to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.



Term	Definition
Consultation Zone (CZ)	The HSE sets a Consultation Distance (CD) around major Hazard sites and Major Accident Hazard Pipelines after assessing the Risks and likely effects of Major Accidents at the major Hazard. The area enclosed within the CD is referred to as the Consultation Zone. The Planning Authority is notified of this CD and has a statutory duty to consult HSE on certain proposed schemes within the zone the CD forms.
Disaster	In the context of the Proposed 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.
Environmental Receptor	Environmental Receptor is specifically defined as features of the environment that are subject to assessment under Article 3 of the EIA Directive, namely population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape.
External Influencing Factor	A factor which occurs beyond the Red Line Boundary that may present a Risk to the Proposed Scheme (e.g. earthquake, COMAH site major accident)..
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 Red Line Boundary that may present a Risk to the Proposed Scheme.



Term	Definition
Magnitude of Impact	<p>The magnitude of an impact is typically defined by the following factors:</p> <ul style="list-style-type: none"> • Extent – the area over which an effect occurs; • Duration – the time for which the effect occurs; • Frequency – how often the effect occurs; • Severity – the degree of change relative to existing environmental conditions.
Major Accident Hazard (MAH) Pipeline	<p>A Major Accident Hazard Pipeline is one which conveys a dangerous fluid which has the potential to cause a Major Accident.</p>
MA&D Event	<p>A term used to encompass both the term Major Accident and the term Disaster.</p>
Risk	<p>The likelihood of an impact occurring combined with effect or consequence(s) of the impact on a receptor if it does occur.</p>
Risk Event	<p>An identified, unplanned event, which is considered relevant to the Proposed Scheme and has the potential to be a Major Accident or Disaster subject to assessment of its potential to result in a significant adverse effect on an Environmental Receptor.</p>
Sensitivity of a Receptor	<p>The Sensitivity of a Receptor is a function of its value, and capacity to accommodate change reflecting its ability to recover if it is affected. It is typically defined by the following factors:</p> <ul style="list-style-type: none"> • Adaptability – the degree to which a receptor can avoid, adapt to or recover from an effect. • Tolerance – the ability of a receptor to accommodate temporary or permanent change. • Recoverability – the temporal scale over and extent to which a receptor would recover following an effect.



Term	Definition
Vulnerability	In the context of the EIA Regulations 2017, the term refers to the “exposure and resilience” of the Proposed Scheme to the Risk of a Major Accident or Disaster. Vulnerability is influenced by sensitivity, adaptive capacity and Magnitude of Impact.



18 Major accidents and disasters

18.1 Introduction

- 18.1.1 This chapter reports the outcome of the assessment of the potential Vulnerability of the Proposed Scheme to the Risk of Major Accident(s) and / or Disaster(s) (MA&D) as required by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.
- 18.1.2 This chapter describes the assessment methodology and the baseline conditions relevant to the assessment and a summary of the likely significant effects resulting from the Vulnerability of the Proposed Scheme to the Risk of a MA&D. Significant environmental effects relating to MA&D could include the loss of life, permanent injury and temporary or permanent destruction of an Environmental Receptor which cannot be restored through minor clean-up and restoration. Where appropriate, this chapter includes the further mitigation measures required to prevent, reduce or offset any significant adverse effects, the preparedness for and proposed response to emergencies, and the expected residual effects after these measures have been employed.
- 18.1.3 This chapter (and its associated appendices) is intended to be read as part of the wider Environmental Statement (ES), with particular reference to Environmental Statement **Chapter 6: Air Quality** (Document Reference: 3.06.00), Environmental Statement **Chapter 10: Biodiversity** (Document Reference: 3.10.00), Environmental Statement **Chapter 12: Road Drainage and the Water Environment** (Document Reference: 3.12.00), Environmental Statement **Chapter 13: Geology and Soils** (Document Reference: 3.13.00), Environmental Statement **Chapter 16: Climate Resilience** (Document Reference: 3.16.00) and Environmental Statement **Chapter 19: Traffic and Transport** (Document Reference: 3.19.00).



18.2 Legislative framework, policy and guidance

Legislative framework

18.2.1 The applicable legislative framework is the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, Schedule 4 Paragraph 8 (EIA Regulations 2017).

18.2.2 The applicable legislative framework covering the design, construction, operation and maintenance of the Proposed Scheme is summarised as follows:

- Health and Safety at Work etc. Act 1974;
- Management of Health and Safety at Work Regulations 1999;
- Construction (Design and Management) Regulations 2015 (CDM Regulations);
- Pipelines Safety Regulations 1996;
- Control of Major Accident Hazards Regulations 2015; and
- Occupiers Liability Act 1984.

Policy

18.2.3 There are no applicable policy documents at the time of writing.

Guidance

18.2.4 There is currently no published guidance for the application of the legal requirements to the assessment of MA&D. However, selected relevant guidance for Risk assessment methodology is summarised as follows:

- IEMA (2020) Major Accidents and Disasters in EIA Guide;
- Defra (2011) Guidelines for Environmental Risk Assessment and Management;
- Chemical and Downstream Oil Industries Forum, (2013), Guideline - Environmental Risk Tolerability for COMAH Establishments;



- The International Standards Organization's ISO 31000: 2018 Risk Management - principles and guidelines; and
- Design Manual for Roads and Bridges, LA104 Environmental assessment and monitoring, Revision 1, Highways England, 2020.

18.2.5 Additionally, the following have been consulted to support the identification of all potential MA&D:

- The Cabinet Office National Risk Register of Civil Emergencies (2023 Edition). This document is the unclassified version of the National Risk Register and it identifies the main types of civil emergencies that could affect the UK in the next five years. It is recognised, however, that this document does not provide an all-encompassing list of all potential accidents and disasters and its timescales are short term;
- The International Federation of Red Cross & Red Crescent Societies Early Warning, Early Action (2008). This guidance looks to other countries including those in warmer climates, thereby identifying Risks that the UK may encounter in the future in light of climate change and global warming; and
- The International Disaster Database. This online source contains data covering over 22,000 mass Disasters in the world since 1900 to the present day and aims to *"rationalise decision making for disaster preparedness, as well as provide an objective base for vulnerability assessment and priority setting"*.

18.3 Consultation, scope, methodology and significance criteria

Consultation undertaken to date

18.3.1 **Table 18-1** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 18-1 Summary of Consultation Undertaken

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
HSE	LUP Unit	08/01/2019 – HSE LUP Web app	<p>Advice: HSL-200108111934-715; HSL-200108130151-715; HSL-200108130654-715 and HSL-200108131321-715</p> <p>The proposed development site which you have identified currently lies within the consultation distance (CD) of at least one major hazard site and / or Major Accident Hazard Pipeline; HSE needs to be consulted on any developments on this site.</p> <p>The pipeline operator will also need to be contacted as they may have additional constraints on development near their pipeline (7450_1709 National Grid Gas PLC).</p>
Health & Safety Executive (HSE)	Land Use Planning (LUP) Unit	24/10/2019	<p>HSE advise to utilise the free enquiry on HSE's Planning Advice Web App to determine whether or not the associated land parcel is affected by HSE Consultation Zones.</p> <p>HSE confirmed that there are HSE Consultation Zones for a Major Accident Hazard (MAH) Pipeline that affect the Proposed Scheme.</p> <p>Details of the MAH and their associated contents were provided, and it was noted that the Applicant would need to contact the pipeline operator for the exact layout of the pipelines, as well as to establish whether the pipeline has been modified in this area. If so, HSE would be willing to reassess the risks from the pipeline (additional costs may apply), relative to the proposed development, if specific details are supplied.</p>
HSE	LUP Unit	03/01/2020 – Ref: D1164: Consultation Zones - HP Feeder 3 Felthorpe - Hardingham, Norfolk	HSE summarised the information required to be submitted to obtain formal pre-application advice for the Proposed Scheme.
HSE	LUP Unit	03/01/2024 – e-mail	Request submitted for formal pre-application advice for the Proposed Scheme.

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
HSE	LUP Unit	31/01/2024 – Ref: Proposal for Norwich Western Link Road – D2139	Pre application advice received from the HSE LUP Unit where they have confirmed “HSE does not advise against a sensitivity level 2 development (such as a dual carriageway road) in the outer consultation zone of a major accident hazard pipeline.” However, “As the proposed Link Road is close to a major accident hazard pipeline, HSE considers that the pipeline operator (National Grid Gas PLC) should also be consulted.”



Scope of the Assessment

18.3.2 The scope of this assessment has been established through an ongoing scoping process. Further information can be found in Environmental Statement **Chapter 5: Approach to EIA, Section 5.2** (Document Reference: 3.05.00).

18.3.3 This chapter provides an update to the scope of the assessment (Environmental Statement **Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference: 3.18.01)), taking into account the Scoping Opinion received from Norfolk County Council (County Planning Authority) on 15 October 2020 and Scoping Opinion Addendum 2022.

Elements screened out of the further detailed assessment

18.3.4 The MA&D Event types not considered to make the Proposed Scheme vulnerable to the Risk of MA&D are shown in the Long List of potential MA&D Events provided in Environmental Statement **Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference: 3.18.1). Those MA&D Event types which have been screened out have not been considered further for detailed assessment within the ES.

Elements screened into further detailed assessment

18.3.5 The Short List of screened in potential MA&D Events, as identified at the scoping stages, with respect to the construction and operation phases is shown and further discussed in **Table 18-2**.

Table 18-2 Major Accidents and Disaster Events Short List

Major Accident(s) and / or Disaster(s) Group	Major Accident(s) and / or Disaster(s) Category	Major Accident(s) and / or Disaster(s) Type	Relevant to Location	Construction	Operation / Maintenance	Basis on which further consideration is required
Natural Hazards	Geophysical	Sinkholes	Yes	Yes	Yes	<p>Although this is likely to be addressed in the geotechnical design, there are sufficient examples of roads that have been affected by sinkholes in England to warrant taking this event forward, particularly given the nature of the underlying local geology (Chalk Group) as there is a potential for natural cavities, such as sinkholes and solution pipes. The nearest sinkholes which have occurred to the Proposed Scheme occurred in Norwich city on Earham Road which is approximately 10km southeast of the Proposed Scheme, and on Merton Road approximately 11km away from the Proposed Scheme to the south-east.</p> <p>Chalk mining, sinkholes and dissolution features present a general Risk for the Proposed Scheme. The design would take into consideration the associated Risks and include any required mitigation measures.</p>
Technological or Manmade Hazards	Industrial and Urban Accidents	Major Accident Hazard Pipelines	Yes	Yes	Yes	<p>A National Grid high pressure natural gas pipeline, parts of whose inner and outer zones overlap with several areas within the Red Line Boundary of the Proposed Scheme, is present. This is classified as a Major Accident Hazard (MAH) Pipeline.</p> <p>Construction and Maintenance: The Proposed Scheme involves construction works in close proximity to the existing pipeline. There would be an increased Risk of a MA&D Event during the construction and maintenance phases due to the nature of the work required. However, any work within the MAH Consultation Zone of the pipeline must be undertaken with the agreement of the pipeline operator, which would include providing Risk assessment and method statements covering the works before they can commence, under existing legal requirements of the Pipelines Safety Regulations 1996. The construction phase and maintenance of the road will be considered further as part of the assessment.</p> <p>Operation: Compared to the baseline there would be an increase in the societal Risk due to the presence of road users which did not previously exist within the MAH Consultation Zone. However, this would be a transient population with only a small period of time exposed to Risk. There would also be periods of time with no population present. Therefore, it is considered unlikely that the presence of the pipeline would lead to a MA&D Event during the operational phase.</p>

Major Accident(s) and / or Disaster(s) Group	Major Accident(s) and / or Disaster(s) Category	Major Accident(s) and / or Disaster(s) Type	Relevant to Location	Construction	Operation / Maintenance	Basis on which further consideration is required
Technological or Manmade Hazards	Transport Accidents	Aviation	Yes	Yes	No	<p>There have been no major air accidents in the UK since the Kegworth incident in 1989.</p> <p>Norwich International Airport lies approximately 6km east of the Proposed Scheme however, the Proposed Scheme does fall into the 13km safeguarding zone around the airport. At this distance, it is considered that the height of any construction equipment (e.g. cranes) or formation of drainage ponds would significantly increase the Risk to aircraft operating into / out of the airport.</p> <p>The Risk of an aircraft accident impacting the Proposed Scheme is considered no greater than existing roads in the immediate area.</p> <p>A Wildlife Hazard Design Risk Assessment has been undertaken to identify the potential features and activities that could lead to increased wildlife Hazard Risks for aircraft using both Norwich Airport and Norwich Hospital Helicopter Landing Site and their surrounding critical airspace. The Risk assessment identifies required management actions which would be implemented through a Wildlife Hazard Management Plan (WHMP) for the Proposed Scheme.</p>



Extent of the Study Area

18.3.6 MA&D Event types will be considered both within and outside of the Red Line Boundary along with potential factors:

- Internal Influencing Factor - a factor which occurs within the Red Line Boundary that may present a Risk to the Proposed Scheme; and
- External Influencing Factor - a factor which occurs beyond the Red Line Boundary that may present a Risk to the Proposed Scheme.

18.3.7 At the scoping stage, based on professional judgement, a 2.5km corridor either side of the Red Line Boundary was used in order to capture internal and External Influencing Factors which may have high adverse consequences on the Proposed Scheme. A 2.5km corridor was adopted as the identified internal and external influencing factors identified lay within this area. The following factors and associated distances were adopted for setting the Study Area at the scoping stage in order to capture:

Manmade features:

- Operational airports and airfields within 13km of the Red Line Boundary;
- Control of Major Accident Hazard (COMAH) facilities within 5km of the Red Line Boundary;
- MAH pipelines within 1km of the Red Line Boundary;
- Fuel retail sites (including Liquefied Natural Gas, Liquefied Petroleum Gas) within 1km of the Red Line Boundary;
- Rail infrastructure within 1km of the Red Line Boundary; and
- Transmission (gas, electrical, oil / fuels) crossing the Red Line Boundary.

Natural features with the potential to create Risks within:



- 3km of the Red Line Boundary - chiefly hydrological (dam failure) and geological (seismic activity); and
- 1km of the Red Line Boundary - chiefly hydrological (flood Risk) and geological (unstable ground conditions, contamination)).

18.3.8 The extent of the Study Area used for the MA&D assessment is a narrower area than that used at the earlier scoping stages as subsequent work found that the key External Influencing Factors, which could potentially impact the Proposed Scheme, lay within 300m of the Red Line Boundary.

Method of Baseline Data Collation

Desk study

18.3.9 Baseline conditions of the Study Area have been assessed using information from the following sources:

- British Geological Survey Geo Index Onshore;
- Prevention Web Europe: Tsunamis Hazard Map;
- Other ES chapters, in particular Environmental Statement **Chapter 6: Air Quality** (Document Reference: 3.06.00), **Chapter 10: Biodiversity** (Document Reference: 3.10.00), **Chapter 12: Road Drainage and the Water Environment** (Document Reference: 3.12.00), **Chapter 13: Geology and Soils** (Document Reference: 3.13.00), **Chapter 16: Climate Resilience** (Document Reference: 3.16.00) and **Chapter 19: Traffic and Transport** (Document Reference: 3.19.00);
- Health & Safety Executive's Land Use Planning tool;
- Health & Safety Executive's COMAH 2015 Public Information Search;
- and
- Cabinet Office UK Government National Risk Register of Civil Emergencies (2020 Edition).



Site visit and surveys

18.3.10 For the purposes of this assessment, no site visit or surveys were required.

Assessment methodology

18.3.11 To date, there is no specific guidance on how to consider MA&D within the context of EIA. However, the assessment takes account of emerging EIA good practice (Temple Group, EIA Quality Mark Article: Major Accidents and Disasters in EIA. 2018; AMEC, EIA Quality Mark Article: What is this MADness? August 2017; TUV SUD, Disasters in EIA. 2018; and Institute of Environmental Management and Assessment, Major Accidents and Disasters in EIA: A Primer. September 2020), which refers to other relevant documentation, including the Cabinet Office's National Risk Register of Civil Emergencies.

18.3.12 The assessment of MA&D has been carried out through a review of available documentation and regulatory requirements. The assessment does 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.

18.3.13 The assessment presents any identified Risks along with whether these 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 Proposed Scheme. "ALARP" involves weighing a Risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which the Health & Safety Executive (HSE) expects to see workplace Risks controlled.

18.3.14 The potential for the identified relevant MA&D Event types to result in a significant adverse environmental effect has been evaluated using a Risk-based approach. The approach has considered the environmental consequences of a MA&D Event, the likelihood of these consequences occurring, taking into account planned design and embedded mitigation, and the acceptability of the subsequent Risk to human health, welfare and / or the



environment. The following process has been applied to each of the screened in MA&D Event categories:

- Identifying Risks;
- Screening these Risks;
- Defining the impact;
- Assessing the likelihood; and
- Assessing the Risk.

Identify Risks

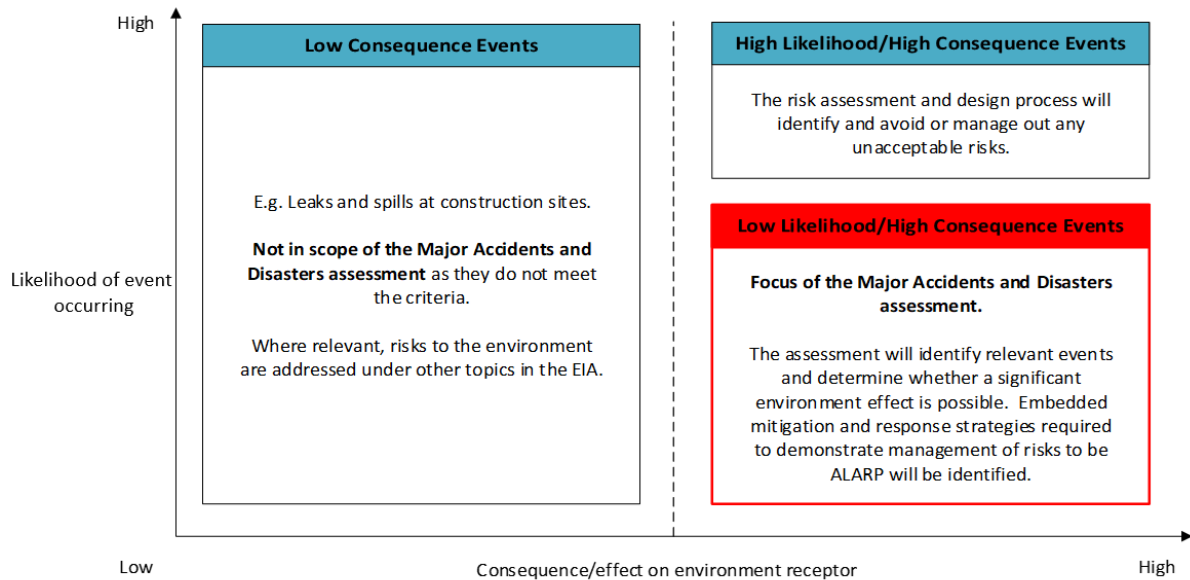
18.3.15 The MA&D Event categories considered in the assessment are rare events.

18.3.16 All low consequence events, whatever their likelihood, do not meet the definition of MA&D. 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 Environmental Management System (EMS) and do not fall within the scope of this assessment.

18.3.17 This assessment focuses on low likelihood but potentially high consequence events as illustrated in **Plate 18-1** which is based on Figure 2 in IEMA's Primer.



Plate 18-1 Graphical Representation of Major Accidents and Disasters Consequence Significance



18.3.18 Low likelihood is defined for the purposes of this assessment as it may occur during the lifetime of the Proposed 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.

18.3.19 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 would reflect what is reasonable for such rare events, considering their potential consequence, within the guiding principle of Risks being ALARP.

18.3.20 High consequence events are considered to lead to a significant adverse effect (i.e. loss of life, permanent injury and temporary or permanent destruction of an Environmental Receptor which cannot be restored through minor clean-up and restoration).

18.3.21 The Risk identification process has used existing sources of information wherever possible, as described in paragraph 18.3.12, such as Risk assessments undertaken for the Proposed 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.

18.3.22 In order to identify whether a Risk Event has the potential to be a MA&D Event with 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 in its guidance, this assessment uses the following conceptual model:

- The source is the original cause of the Hazard (a Hazard is anything with the potential to cause harm, including ill-health and injury, damage to property or the environment; or a combination of these), which has the potential to cause harm;
- The pathway is the route by which the source can reach the receptor; and
- The receptor, which is the specific component of the environment that could be adversely affected, if the source reaches it.

18.3.23 Risk Events which do not have all three components have been screened out from the assessment (**Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference: 3.18.01)).

Screen Risks

18.3.24 The following MA&D screening process has been used to identify those Risk Events which would require further consideration within the assessment (**Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference: 3.18.01)):

- Is there a potential source, and / or pathway and / or receptor as defined in paragraph 18.3.22 above? If not, no further assessment required;



- Is there a relevant Environmental Receptor (Section 18.5) 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
- Does the potential impact on the Environmental Receptor meet the definition of a significant adverse effect given in paragraph 18.3.20? If not, no further assessment required.

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

Define Impact

18.3.26 Several mechanisms are in place to reduce the Vulnerability of the Proposed Scheme to MA&D or mitigate significant effects on the environment should they occur. All measures to manage and reduce the Risk of significant adverse effects occurring as a result of the Vulnerability of the Proposed Scheme to MA&D are considered to be primary mitigation measures for the purposes of the assessment. It has been assumed that:

- The design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment and machinery, including associated systems, would take into account good engineering practice; and
- The construction stage(s) of the Proposed Scheme would be managed through the implementation of the Construction Phase Plan (required under the CDM Regulations 2015) and a Construction Environmental Management Plan.

18.3.27 Reasonable worst case environmental impacts have been identified for each screened-in Risk Event. Impacts have been identified in consultation with relevant disciplines for each environmental topic assessed within this ES. The



environmental impacts are identified through a qualitative process which seeks to answer the question 'could this event constitute a MA&D in terms of the definitions provided' (see Glossary). Where relevant, specific sensitive receptors around the Proposed Scheme are considered. The Risk Record (**Appendix 18.2: Risk Record** (Document Reference: 3.18.02)) records the outcome of this process.

Assess Risk

18.3.28 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 Proposed Scheme; and
- The likelihood that an Environmental Receptor is affected by the Risk Event.

18.3.29 Likelihood assessments evaluate whether the effect (for example, loss of life) is a possible outcome of the Risk Event.

18.3.30 This evaluation refers to existing Risk assessments as well as consultation with relevant discipline specialists.

18.3.31 The assessment of the Risk has been carried out using a MA&D 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 18.2: Risk Record** (Document Reference: 3.18.02) records the outcome of the assessment.



Appraise Risk Management Options

18.3.32 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 mitigation hierarchy of repair and compensate any significant damage to Environmental Receptors may then apply following a control measure; and
- Exploit the Risk, if it presents potential benefits or new opportunities.

18.3.33 As safety Risks would be required to be adequately addressed within the regulatory framework for the Proposed Scheme, it is not anticipated that significant residual effects, in terms of safety Risks, would be identified as an output of the assessment.

Significance criteria

18.3.34 By definition, a MA&D would have a major significant effect on the environment (including human health, welfare and / or the environment). Accordingly, any Risks that could result in a MA&D Event (a term used to encompass both the term Major Accident and the term Disaster) with suitable mitigation, management or regulatory controls in place will be assessed as significant.



18.4 Baseline Conditions

18.4.1 The baseline relevant to this topic comprises:

- Features external to the Proposed Scheme that contribute a potential source of Hazard to it (see **Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference: 3.18.01));
- Sensitive receptors at Risk of significant effect (see Section 18.5); and
- Current (without the Proposed Scheme) MA&D Risks for the existing locality (see **Appendix 18.1: Major Accidents and Disasters Long List** (Document Reference 3.18.01)).

Future baseline

18.4.2 In the future baseline and in the absence of the Proposed Scheme, it is considered that the current land use within the development Study Area would remain the same. The future baseline is not anticipated to differ significantly from the current baseline with regards to the Vulnerability of the Proposed Scheme to the Risk (the likelihood of an impact occurring combined with effect or consequence(s) of the impact on a receptor if it does occur) of MA&D.

18.5 Sensitive receptors

18.5.1 The following sensitive receptors were considered with respect to MA&D:

- Population and human health;
- Biodiversity;
- Land, soil, water, air and climate;
- Material assets, cultural heritage and the landscape; and
- The interaction between the factors above.

18.5.2 The specific receptors of potential effects resulting from MA&D are reported in the relevant ES chapters. Reference should be made to the Glossary of



Abbreviations and Defined Terms stating the definition of Sensitivity of Receptor.

18.5.3 Receptors that have been excluded from the assessment, are set out in **Table 18-3** below for the reasons described.

Table 18-3 Excluded Receptors

Receptor	Justification for Exclusion
Employees of the Applicant and / or its suppliers, whether during construction, operation, or maintenance of the Proposed Scheme.	Employer’s commitment and obligations to manage Risks to employees are addressed in the Health and Safety at Work etc. Act 1974.
Members of the public who are wilfully trespassing, for example, a breach of the Proposed Scheme security fencing during construction.	The Applicant’s commitment and obligations under the CDM Regulations to manage Risks during the construction stage are addressed through the requirement to produce a suitable Risk assessment that informs the identification and subsequent implementation of appropriate mitigation measures. In addition, those wilfully trespassing are outside the occupier’s legal requirements under the Occupiers’ Liability Act 1984.

18.6 Assessment of potential Major Accidents and Disasters Events

18.6.1 The measures outlined below and the specific mitigation measures which are detailed in **Appendix 18.2: Risk Record** (Document Reference: 3.18.02) are considered to be primary mitigation measures which would be in place for the construction and operation of the Proposed Scheme to ensure that any potential MA&D Events are managed to be ALARP. **Appendix 18.2: Risk Record** (Document Reference: 3.18.02) provides details of mitigation measures for each potential MA&D Event identified.



18.6.2 The Applicant has committed to constructing and managing the Proposed Scheme in accordance with the following non-exhaustive list of standards and systems:

- Environmental, Health and Safety Management Systems.
- Manage all construction Risks in accordance with the CDM Health & Safety Plan as required by the CDM Regulations 2015.
- Comply with design standards, this would include designing to appropriate environmental parameters (flood, wind, lightning, ground stability) including climate change.
- Design standards apply to controls and systems and civil infrastructure.
- Supplier management environment, health and safety standards (e.g. Construction Skills Certification Scheme) as required by legislative drivers.
- Risk Management Systems as required by health and safety legislative drivers.
- Construction Environmental Management Systems (including a Construction Environmental Management Plan).
- Co-ordination between the Applicant and its maintenance contractors.

Construction Phase

Potential Risk Events

18.6.3 MA&D Events to which the Proposed Scheme may be vulnerable during the construction phase are summarised in **Table 18-4** below. This lists those Risk Events whose impact on an Environmental Receptor has the potential to be a MA&D as defined in the Glossary. All considered events are set out in **Appendix 18.2: Risk Record** (Document Reference: 3.18.02).



Table 18-4 Potential Major Accident and / or Disaster Events during Construction Grouped by High Level Risk Event

Risk Record Entry Number	Risk Description	Risk Event (High level)	Reasonable Worst Consequence if Event Did Occur
3	Striking of underground services/utilities (high pressure gas pipeline).	Fire and / or explosion or release of harmful gas.	Fire and / or explosion affects neighbouring property and / or members of the public.
4	Aircraft impacting crane.	Harm to people.	Damage to aircraft.

18.6.4 Based on the assumptions and mitigation measures put forward in other relevant ES chapters and **Appendix 18.2: Risk Record** (Document Reference: 3.18.02), it is considered that the identified potential MA&D Events above would all be managed to be ALARP.

Operational Phase

18.6.5 MA&D Events to which the Proposed Scheme may be vulnerable during the operational phase are summarised in **Table 18-5** below, which lists those Risk Events whose impact on an Environmental Receptor has the potential to be a MA&D as defined in the Glossary. All considered events are set out in **Appendix 18.2: Risk Record** (Document Reference: 3.18.02).



Table 18-5 Potential Major Accident and / or Disaster Events during Operation and Maintenance Grouped by High Level Risk Event

Risk Record Entry Number	Risk description	Risk Event (High level)	Reasonable Worst Consequence if Event Did Occur
2	Collapse of the roadway into a void due to the presence of chalk beneath the Proposed Scheme.	Ground collapse.	Injury to multiple road users.
3	Striking of underground services/utilities (high pressure gas pipeline).	Fire and / or explosion or release of harmful gas.	Fire and / or explosion affects neighbouring property and / or members of the public.

18.6.6 Based on the assumptions and mitigation measures put forward in other relevant ES chapters and **Appendix 18.2: Risk Record** (Document Reference: 3.18.02), it is considered that the identified potential MA&D Events above would all be managed to ALARP.

Assessment against Future Baseline

18.6.7 The predicted changes in climate due to climate change between now and the operational year (2029) are not anticipated to differ significantly from the current baseline with regards to the Vulnerability of the Proposed Scheme to the Risk of MA&D.

Cumulative Effects

18.6.8 The MA&D assessment has, by its very nature, implicitly considered interactions with external factors such as other proposed developments which may impact on the Study Area. The assessment approach for MA&D considers the Vulnerability of the Proposed Scheme to MA&D Events and the propensity of the Proposed Scheme to exacerbate other pre-existing Risks. It does not assess potential cumulative effects on sensitive receptors as a MA&D Event is a rare, isolated event which does not have on-going impacts.



In-combination climate change impacts

18.6.9 The in-combination climate change impact assessment considers the extent to which climate change may alter the effects which have already been identified within this chapter.

18.6.10 The potential MA&D Events that have been considered within this chapter have been assessed against likely climate Hazards, as set out within **Section 16.4 of Chapter 16: Climate Resilience** (Document Reference: 3.16.00), and the Vulnerability of the Proposed Scheme to the Risk of MA&D Events identified are not anticipated to change as a result of these Hazards.

18.7 Difficulties and uncertainties

18.7.1 Key assumptions for this assessment are that:

- The Proposed 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.
- The MA&D assessment identifies all potential MA&D Events although it is noted that data sources consulted (referenced in paragraph 18.2.5) have their own specific limitations.
- The construction stage(s) of the Proposed Scheme would be managed through the implementation of the Construction Phase Plan (required under the CDM Regulations 2015) and a Construction Environmental Management Plan.
- 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 other relevant ES chapters.



- It is recognised that the management framework for the Proposed 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.
- The design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment and machinery, including associated systems, would take into account good engineering practice.
- In accordance with good safety management principles, it has been assumed that all Risks that have the potential to be MA&D and could impact a local Environmental Receptor, would be managed using the ALARP principle.

18.8 Summary

18.8.1 For the potential MA&D Events identified, the assessment concluded there is no likely requirement for further mitigation measures, as based on the information currently available in other relevant ES chapters it is considered that the Risks are anticipated to be as low as reasonably practicable.