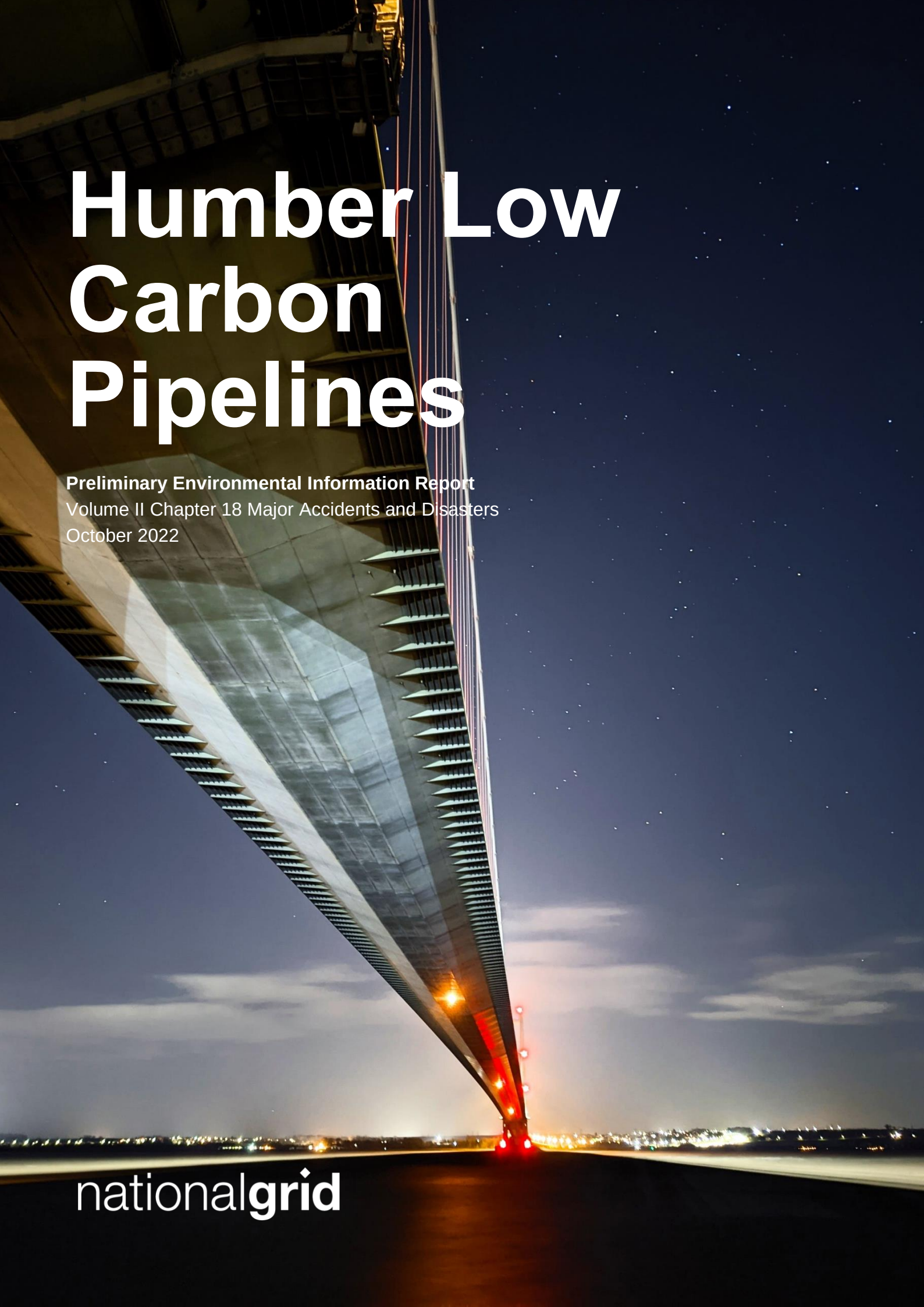

Humber Low Carbon Pipelines

Preliminary Environmental Information Report

Volume II Chapter 18 Major Accidents and Disasters

October 2022

nationalgrid

Contents

18. Major Accidents and Disasters

18.1 Introduction

18.1.1 This Chapter reports the preliminary assessment of the vulnerability of the Project to the risk of Major Accidents and Disasters (MA&D) during construction, operation and decommissioning. More specifically, this Chapter describes:

- Relevant legislation, policy and guidance;
- Engagement undertaken to date;
- The proposed assessment methodology and associated significance criteria;
- Preliminary baseline conditions;
- The preliminary assessment of vulnerability to the risk of MA&D;
- Potential design, mitigation and enhancement measures;
- Summary of the preliminary assessment of potential significant effects; and
- Next steps.

18.1.2 This assessment considers the simultaneous construction of a dual pipeline system (one for carbon dioxide and one for hydrogen), as well as the associated Above Ground Installations (AGIs). The majority of the carbon dioxide pipeline would be up to 600 mm (24”) nominal diameter and the hydrogen pipeline will be up to 900 mm (36”) nominal diameter. This is referred to as the Base Case in this Preliminary Environmental Information Report (PEIR). Also under consideration is the possibility of deploying a larger carbon dioxide pipeline, with a diameter up to 750mm (30”) (with the hydrogen pipeline remaining the same diameter as within the Base Case). This is referred to in this PEIR as Sensitivity 1. Further details regarding the Base Case and Sensitivity 1, as well as the diameter and capacity of the pipelines are provided in Sections 2.3 and 2.4 of Chapter 2: Project Description (Volume II). This chapter assesses the impacts and effects associated with the Base Case. It is anticipated that the types of potential impacts for the Base Case and Sensitivity 1 would be the same, although the magnitude of impacts may differ. A full assessment of Sensitivity 1 will be undertaken and recorded within the Environmental Statement (ES) if the larger carbon dioxide pipeline diameter is taken forward into the Development Consent Order (DCO) application.

18.1.3 This Chapter (and associated appendices) is intended to be read as part of the wider PEIR, with particular reference to:

- Chapter 7: Ecology and Biodiversity (Volume II);
- Chapter 9: Geology and Hydrogeology (Volume II);
- Chapter 10: Heritage (Volume II);
- Chapter 13: Socio-economic (Volume II);
- Chapter 14: Human Health and Wellbeing (Volume II);
- Chapter 15: Traffic and Transport (Volume II);

- Chapter 16: Waste and Materials (Volume II); and
- Chapter 17: Hydrology and Land Drainage (Volume II).

18.1.4 These Chapters describe the broader environmental context of the risks associated with these major event types. These Chapters also outline the proposed measures to prevent or mitigate potential impacts and effects and where they have identified emergency scenarios, details of the preparedness for those, and a proposed response.

18.1.5 In order to provide an industry-wide understanding of MA&D, the Institute of Environmental Management and Assessment's (IEMA) 'Major accidents and disasters in EIA: A primer' guidance (Ref 18.1) provides the following key definitions:

- Major accident – *"events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events".*
- Disaster – *"may be a natural hazard (e.g. earthquake) or man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident".*

18.2 Legislation, policy and guidance

18.2.1 A summary of the international, national, and local legislation, planning policy and guidance relevant to the MA&D assessment for the Project is set out below.

Legislation

18.2.2 The following relevant legislation has been used to determine the methodology to be applied for the MA&D assessment:

Health and Safety at Work etc. Act 1974 (HSWA) (Ref 18.2)

18.2.3 This Act provides the framework for the regulation of workplace health and safety in the United Kingdom (UK). It provides a legal framework for the provision of safe plant and equipment and prevention of harm to people from occupation hazards present in a workplace, including emergencies which may affect those off site or visiting a site.

Control of Major Accident Hazards (COMAH) Regulations 2015 (Ref 18.3)

18.2.4 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.

Pipelines Safety Regulations (PSR) 1996 (Ref 18.4)

18.2.5 PSR defines a range of general duties which are applicable to all pipelines, and additional duties for major accident hazard pipelines. PSR requires that the design, construction, operation and maintenance of any major hazard asset must be in accordance with associated regulations and recognised codes and standards.

Pressure Systems Safety Regulations (PSSR) 2000 (Ref 18.5)

18.2.6 PSSR cover the safe design and use of pressure systems. The aim of PSSR is to prevent serious injury from the hazard of stored energy (pressure) as a result of the failure of a pressure system or one of its component parts.

Policy

Overarching National Policy Statement for Energy (EN-1) (2011) (Ref 18.6)

18.2.7 This Policy Statement outlines generic policy with respect to occupational health and safety in Section 4.11. EN-1 states that, where relevant, energy infrastructure will be subject to the COMAH Regulations 1999.

Draft Overarching National Policy Statement for Energy (EN-1) (2021) (Ref 18.7)

18.2.8 In the subsequent Draft Overarching National Policy Statement for Energy (Ref. 18.7), it also outlines generic policy with respect to occupational health and safety in Section 4.11. The previous COMAH Regulations 1999 are updated to the COMAH Regulations 2015.

National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (2011) (Ref 18.8)

18.2.9 EN-4 reiterates the commitment in EN-1 to the COMAH Regulations 1999, outlining that "*gas storage and supply infrastructure sites are subject to stringent safety standards under the Control of Major Accident Hazards (COMAH) Regulations 1999*".

18.2.10 It states that the principal legislation governing the safety of pipelines (Pipelines Safety Regulations 1996 (Ref 18.4)) requires that pipelines are designed, constructed and operated so that the risks are as low as reasonably practicable (ALARP).

Draft National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (2021) (Ref 18.9)

18.2.11 EN-4 reiterates the above commitment to the COMAH Regulations but they are updated to the COMAH Regulations 2015.

18.2.12 The draft EN-4 reiterates that the principal legislation governing the safety of pipelines (Pipelines Safety Regulations 1996 (Ref 18.4)) requires that pipelines are designed, constructed and operated so that the risks are ALARP.

The East Riding Local Plan Strategy Document (2016) (Ref 18.10)

18.2.13 The Strategic Document is a long-term plan providing the over-arching strategic planning framework for East Riding up to 2029. The Local Plan does not outline any principles relating to the assessment of MA&D.

The East Riding Emerging Local Plan: Publication Document (2021) (Ref 18.11)

18.2.14 The East Riding Emerging Local Plan is a draft update of the long-term plan providing the over-arching strategic planning framework for East Riding up to 2039. The Emerging Local Plan does not outline any principles relating to the assessment of MA&D.

The North Lincolnshire Local Development Framework Core Strategy (2011) (Ref 18.12)

18.2.15 The Core Strategy sets out the long-term vision for North Lincolnshire and provides a blueprint for managing growth and development in the area up to 2026. The Core Strategy does not set out any principles for the assessment of MA&D.

The Selby District Core Strategy Local Plan (2013) (Ref 18.13)

18.2.16 This sets out the high-level strategic policies for the District for the period 2012 - 2028. The Core Strategy does not set out any principles for the assessment of MA&D.

Selby New Local Plan: Publication Local Plan (August 2022) (Ref 18.14)

18.2.17 The New Local Plan identifies where new housing, employment and other development could take place. It also sets out the policies that will be utilised to decide planning applications. The New Local Plan does not set out any principles for the assessment of MA&D.

Central Lincolnshire Local Plan 2012-2036 (Ref 18.15)

18.2.18 The Central Lincolnshire Local Plan provides the over-arching strategic planning framework for Central Lincolnshire until 2036. The Local Plan does not outline any principles relating to the assessment of MA&D.

Central Lincolnshire Local Plan Review 2021-2040 (Ref 18.16)

18.2.19 The updated draft Central Lincolnshire Local Plan provides the updated over-arching strategic planning framework for Central Lincolnshire until 2040. The draft Local Plan does not outline any principles relating to the assessment of MA&D.

Guidance

18.2.20 The following relevant guidance has been used to determine the methodology to be applied for the MA&D assessment:

The Institute of Environmental Management and Assessment (IEMA) 'Major Accidents and Disasters in Environmental Impact Assessment (EIA): A Primer' (2020) ('The IEMA Primer') (Ref 18.1)

18.2.21 The Primer offers a proportionate method for considering major accidents and/or disasters through screening, scoping and assessment. It provides a 'Hazard Identification Record Template' which can aid in the assessment process - this has been adjusted accordingly and utilised as part of this assessment. Furthermore, the guidance aims to increase awareness of MA&D within EIA and its application. The methodology outlined offers a transparent platform to communicate to stakeholders how development vulnerabilities to major accidents and/or disasters have been reduced to an acceptable level.

The Health and Safety Executive's (HSE) Reducing Risks, Protecting People (R2P2) (2001) (Ref 18.17)

18.2.22 The aim of the R2P2 document is to explain the basis for HSE's decisions regarding the degree and form of regulatory control of risk from occupational hazards. It aims to open up HSE's decision-making process, outlining how their approach to the assessment and

management of risk shapes the form and content of the regulations and guidance, and informs HSE's compliance activities.

18.2.23 Within this assessment, this guidance document has been utilised to provide context to the assessment, proffering criteria to ensure a consistent basis for the study against common benchmarks for MA&D applied across the UK.

The Chemical and Downstream Oil Industries Forum (CDOIF) Guideline - Environmental Tolerability for COMAH Establishments v2 (2016) (Ref 18.18)

18.2.24 The aim of CDOIF is to provide a common methodology to inform a risk assessment which identifies Major Accident scenarios, establishes their level of severity, determines the surrounding environmental receptors tolerability, and subsequently establishes the risk frequencies.

18.2.25 Within this assessment, this guidance document has been utilised to aid in the identification of Major Accident scenarios and the assessment of the various facets of significance. This provides a basis which can be applied to the MA&D assessment undertaken as part of this EIA.

HSE Further guidance on emergency plans for major accident hazard pipelines (2006) (Ref 18.19)

18.2.26 This guidance document considers in more detail the nature of pipeline hazards, some technical aspects of major accident hazard pipelines and the likelihood and consequences of pipeline failure, to assist and inform local authorities when preparing emergency plans. This has helped to inform, where necessary, emergency plans which provide a level of mitigation to a MA&D event.

18.3 EIA Scoping Opinion and Engagement

18.3.1 A summary of the EIA Scoping Opinion from the Planning Inspectorate (PINS) and subsequent responses to this EIA Scoping Opinion are outlined below. Furthermore, all relevant engagement undertaken to date is outlined in this Section.

Response to the EIA Scoping Opinion

18.3.2 An EIA Scoping Opinion (Appendix 1.2: EIA Scoping Opinion (Volume III)) was received by the Applicant from PINS on 20 May 2022. Table 18.1 lists the comments that PINS and consultation bodies made in relation to Major Accidents and Disasters and shows how the Applicant is responding to these

Table 18.1: Summary of EIA Scoping Opinion in relation to MA&D

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
3.14.1	Construction phase accidents including dropped objects, heavy plant, temporary works, rock falls from tunnel boring and problems with machinery.	*The Scoping Report states that the potential for accidents to occur during the construction process would be identified and dealt with through appropriate risk assessment and mitigation (as required to comply with UK health and safety legislation and environmental legislation) and through the CEMP.* *In view of the nature and characteristics of the Proposed Development, the Inspectorate is content that construction phase accidents including dropped objects, heavy plant, temporary works, rock falls from tunnel boring and problems with machinery would be addressed through appropriate construction working practices and are unlikely to lead to significant effects on the environment. These matters can be scoped out of the ES.*	PINS comments are noted and no further assessment of construction phase accidents will be undertaken.
3.14.2	Impact of construction phase activities on unexploded ordnance (UXO).	*The Scoping Report explains that the UXO hazard across the preliminary study area is low and that there are well developed construction industry practices which allow safe construction of thousands of projects each year in low hazard areas. The Inspectorate is content to scope out further assessment for areas of low risk.*	PINS comments are noted and no further assessment of the impact of the construction phase on UXO will be undertaken.
3.14.3	Construction traffic accidents.	*The Scoping Report proposes to scope out the assessment of construction phase traffic accidents from the Major Accidents and Disasters ES Chapter. A full assessment of the impact on traffic would instead be presented in the Traffic and Transport ES Chapter.* *The Inspectorate is content with this approach but advises the Applicant to provide clear cross-referencing in the Major Accidents and Disasters ES aspect chapter to where the assessment is located.*	PINS comments are noted and no further assessment of construction phase traffic accidents will be undertaken. Clear cross-referencing to the Traffic shall be provided in the PEIR and ES.

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
3.14.4	Damage to existing utilities - construction phase.	*The Scoping Report states that existing utilities infrastructure would be identified and potential impacts mitigated as required, with the Proposed Development to be constructed around such infrastructure.* *The Inspectorate does not consider sufficient evidence has been provided to scope this matter out of the assessment. The ES Major Accidents and Disasters Chapter should assess impacts from damage to existing utilities during the construction phase (such as from intrusive works including excavation or piling) where significant effects are likely.*	In-line with this comment, the PEIR and ES will assess the impacts from damage to existing utilities during the construction phase.
3.14.5	Impacts on aviation and from aircraft crashes - construction and operational phases.	*The Inspectorate has considered the nature and characteristics of the Proposed Development and the distance from the nearest airport (stated in the Scoping Report to be approximately 250m). The Inspectorate is content that the impacts of the Proposed Development on aviation or impacts from aircraft crashes are unlikely to result in significant effects. These matters can be scoped out of the ES.*	PINS comments are noted and no further assessment of construction or operational phase impacts on aviation will be undertaken.
3.14.6	Impacts on mines and storage caverns - construction and operational phases.	*The Scoping Report proposes to scope out the assessment of impacts on mines and storage caverns from the Major Accidents and Disasters ES Chapter. A full assessment of the impact on mines and storage caverns would instead be presented in the Geology and Hydrology ES Chapter. The Inspectorate is content with this approach but advises the Applicant to provide clear cross-referencing in the Major Accidents and Disasters ES aspect chapter to where the assessment is located.*	PINS comments are noted and no further assessment of the impacts on mines and storage caverns will be undertaken within this Chapter. The assessment within Chapter 9: Geology and Hydrogeology (Volume II) will be cross-referenced in the PEIR and ES chapter.
3.14.7	Impacts on transport networks, from transport networks	*Appendix E of the Scoping Report states that crossings of the rail network would use trenchless techniques, whereas "it is anticipated" that other transport networks would be crossed using trenchless*	PINS comments are noted and no further assessment of the impacts on transport

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
	and from rail accidents - construction and operational phases.	*techniques. The pipeline at a crossing point would be designed such that it would be protected from any road or rail accidents. Pipeline crossings of railways and major roads would be subject to approval by the relevant network authority.* *Regarding construction, on the basis that crossings of the rail network would use trenchless techniques, the Inspectorate is content that impacts from rail accidents are not likely to result in significant effects in terms of major accidents and disasters and agrees that these matters can be scoped out. For crossings of other transport networks, the Inspectorate notes that the use of trenchless techniques for crossings is anticipated but not confirmed at this stage. For any crossings not subject to trenchless techniques, the ES should assess any impacts on and from the transport network from the risk of major accidents and disasters during construction which are likely to result in significant effects. For crossings subject to trenchless techniques, the Inspectorate is content that impacts on the transport network and from the transport network are not likely to result in significant effects in terms of major accidents and disasters and agrees that this matter can be scoped out.* *Regarding operation, as the pipelines would be a buried feature, the Inspectorate considers that impacts on the transport network, from the transport network and from rail accidents are not likely to result in significant effects in terms of major accidents and disasters and agrees that these matters can be scoped out.*	networks during construction and operation will be undertaken.
3.14.8	Impacts on watercourses - construction and operational phases.	*Appendix E of the Scoping Report states "it is anticipated" that major rivers and canals would be crossed using trenchless techniques.* *Regarding construction, the Inspectorate notes that the use of trenchless techniques for crossings is anticipated but not confirmed at this stage. For any crossings not subject to trenchless techniques, the ES should assess any impacts on watercourses during construction which are likely to result in significant effects in terms of*	PINS comments are noted and no further assessment of the impacts on watercourses during construction and operation will be undertaken.

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
		major accidents and disasters. For crossings subject to trenchless techniques, the Inspectorate is content that impacts on watercourses are not likely to result in significant effects in terms of major accidents and disasters and agrees that this matter can be scoped out. *Regarding operation, as the pipelines would be a sealed and buried feature, the Inspectorate considers that impacts on watercourses are not likely to result in significant effects in terms of major accidents and disasters and agrees that this matter can be scoped out.*	
3.14.9	Impact on intertidal areas - construction and operational phases.	*The proposed pipelines would need to cross two intertidal areas, the River Humber and the Holderness Coast. The Scoping Report explains that the River Humber would be crossed using trenchless techniques and proposes to scope out the assessment of impacts on the Holderness Coast from the Major Accidents and Disasters ES Chapter. An assessment of the impacts on the Holderness Coast would instead be presented in the Biodiversity and Hydrology and Land Drainage ES Chapters.* *Regarding construction, on the basis that the River Humber is crossed utilising trenchless techniques, the Inspectorate is content that impacts on the River Humber intertidal area are not likely to result in significant effects in terms of major accidents and disasters and agrees that this matter can be scoped out. The Inspectorate is content with the approach to present the assessment of impacts to the Holderness Coast intertidal area in the Biodiversity and Hydrology and Land Drainage ES Chapters, but advises the Applicant to provide clear cross-referencing in the Major Accidents and Disasters ES aspect chapter to where the assessment is located.* *Regarding operation, as the pipeline would be a sealed and buried feature, the Inspectorate considers that impacts on intertidal areas*	PINS comments are noted and no further assessment of the impact on the intertidal areas during construction and operation will be undertaken. The assessment within both Chapter 7: Ecology and Biology (Volume II) and Chapter 17: Hydrology and Land Drainage (Volume II) will be cross-referenced within the ES.

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
		are not likely to result in significant effects in terms of major accidents and disasters and agrees that this matter can be scoped out.	
3.14.10	Leaks and spills – construction and operational phases.	*The Scoping Report seeks to scope out impacts from leaks and spills from the Major Accidents and Disasters ES Chapter. The Inspectorate notes that these matters will be considered elsewhere in the ES and is satisfied that they can be scoped out of the Major Accidents and Disasters ES Chapter.*	PINS comments are noted and no further assessment of leaks and spills during construction and operation will be undertaken.
3.14.11	Accidents during maintenance	*In view of the nature and characteristics of the Proposed Development, the Inspectorate is content that accidents during maintenance are not likely to lead to significant effects on the environment and agrees this matter can be scoped out of the ES.*	PINS comments are noted and no further assessment of accidents during maintenance will be undertaken.
3.14.12	Structural collapse of assets – operational phase	*The Scoping Report explains that structural collapse will be prevented through compliance with appropriate codes and standards, and the application of good practice in structural design. Considering this, together with the nature and characteristics of the Proposed Development and that ground stability issues are to be addressed as part of the assessment of Geology and Hydrology (Chapter 8 of the Scoping Report), the Inspectorate is content that further consideration of structural collapse of Proposed Development assets can be scoped out.* *The ES should clearly set out the relevant codes and standards that have been adopted for the design of the pipeline route and the degree to which these have been agreed with relevant regulators.*	The relevant codes and standards adopted for the design of the pipelines route and above ground infrastructure (AGIs) alongside the degree to which they have been agreed with the relevant regulators will be outlined in Chapter 2: Project Description (Volume II) within the PEIR and ES.
3.14.13	Decommissioning activities	*Paragraph 17.8.3 of the Scoping Report identifies potential significant effects in terms of major accidents and disasters resulting from decommissioning. Appendix E then goes on to state that the potential for major accidents and disasters to occur during*	In-line with this comment, this PEIR and the ES will assess the potential major accidents and disasters that

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
		decommissioning will be identified and addressed through appropriate risk assessment and mitigation measures (as required to comply with UK health and safety and environmental legislation) and through the DEMP. *In view of the potential likely significant effects identified in paragraph 17.8.3 of the Scoping Report, the Inspectorate does not agree that an assessment of impacts during decommissioning can be scoped out of the Major Accidents and Disasters ES Chapter. The ES Major Accidents and Disasters Chapter should assess impacts from decommissioning where significant effects are likely.*	could occur during decommissioning.
3.14.14	External nuclear major accidents - construction and operational phases	*Having considered the nature and characteristics of the Proposed Development and the distance from nuclear sites, the Inspectorate is content that risks to the Proposed Development from accidents at nuclear sites can be scoped out.*	PINS comments are noted and no further assessment of risks to the Project during its construction or operation from accidents at nuclear sites will be undertaken.
3.14.15	Scoping out the following matters: • Loss of utilities; • Terrorism; • Widespread public disorder; • Biological threats; • Lightning;	*Based on the reasoning and evidence presented in the Scoping Report, the Inspectorate is content that risks to or from the Proposed Development from these matters are not likely to result in significant effects. These matters can be scoped out of the assessment.*	PINS comments are noted and no further assessment of the following matters will be undertaken: • Loss of utilities; • Terrorism; • Widespread public disorder; • Biological threats; • Lightning; • Seismic; and

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
	• Seismic; and • Space weather.		• Space weather.
3.14.16	Extreme weather conditions	*The Scoping Report seeks to scope out impacts from extreme weather conditions as a separate matter from the Major Accidents and Disasters ES Chapter. The assessments would instead be presented in the Climate ES Chapter.* *The Inspectorate is content with this approach but advises the Applicant to provide clear cross-referencing in the Major Accidents and Disasters ES aspect chapter to where the assessments are located.*	PINS comments are noted and no further assessment of extreme weather conditions will be undertaken. Chapter 8: Climate Resilience (Volume II) will be cross-referenced within the PEIR and ES.
3.14.17	Scoping out the following matters: • Dam/reservoir breaches; • Flood risk; and • Coastal erosion and landslides.	*The Scoping Report seeks to scope out impacts from dam/ reservoir breaches, flood risk and coastal erosion and landslides from the Major Accidents and Disasters ES Chapter. The assessments would instead be presented in the Hydrology and Land Drainage ES Chapter.* *The Inspectorate is content with this approach but advises the Applicant to provide clear cross-referencing in the Major Accidents and Disasters ES aspect chapter to where the assessments are located.*	PINS comments are noted and no further assessment of the following matters will be undertaken: • Dam/reservoir breaches; • Flood risk; and • Coastal erosion and landslides. The relevant aspects chapters will be cross-referenced within the PEIR and ES.
UK Health	Electromagnetic Fields (EMF)	*It is noted that the current proposals do not appear to consider possible health impacts of Electric and Magnetic Fields (EMF).*	The pipelines would not impact any receptors from potential sources of EMF,

Section reference	Applicant's proposed matter	Inspectorate's / consultation bodies comments	Response
Security Industry		*We request that the ES clarifies this and if necessary, the promoter should confirm either that the proposed development does not impact any receptors from potential sources of EMF; or ensure that an adequate assessment of the possible impacts is undertaken and included in the ES.*	nor generate EMFs because they would be below ground. This will be reiterated within the ES.
Northern Gas Networks	Potential Major Accident Hazard Pipelines	*NGN has a number of gas assets in the vicinity of some of the identified "site development" locations. It is a possibility that some of these sites could be recorded as Major Accident Hazard Pipelines (MAHP), whilst other sites could contain High Pressure gas and as such there are Industry recognised restrictions associated to these installations which would effectively preclude close and certain types of development. The regulations now include "Population Density Restrictions" or limits within certain distances of some of our "HP" assets. The gas assets mentioned above form part of the Northern Gas Networks "bulk supply" High Pressure Gas Transmission" system and are registered with the HSE as Major Accident Hazard Pipelines.* *Any damage or disruption to these assets is likely to give rise to grave safety, environmental and security of supply issues. NGN would expect you or anyone involved with the site (or any future developer) to take these restrictions into account and apply them as necessary in consultation with ourselves. We would be happy to discuss specific sites further or provide more details at your locations as necessary. If you give specific site locations, we would be happy to provide gas maps of the area which include the locations of our assets.*	An assessment of Northern Gas Networks' assets will be undertaken as part of the potential impact to existing utilities assessment within this Chapter and Chapter 18: Major Accidents and Disasters of the ES. Northern Gas Networks will be consulted surrounding protection provisions to be provided in the DCO to safeguard their apparatus. Northern Gas Networks would also be advised if service searches reveal any assets belonging to Northern Gas Networks that are likely to be affected by the Project, this is likely to be during the Front End Engineering Design (FEED) stage.

Engagement undertaken to date

18.3.3 An initial fact-finding engagement has commenced with the HSE. The Applicant provided the HSE with a high-level overview on the Project in preparation for further engagement as we progress with the EIA process.

18.3.4 Engagement has been undertaken with Humberside Airport to explore the necessity of interactions between the Project and the Airport. A decision was made that there would not be any potential for the two to interact and therefore, the potential for aviation MA&Ds was scoped out during the Scoping process.

18.3.5 Engagement will be progressed as part of the EIA process.

18.4 Assessment methodology and significance criteria

Study Area

18.4.1 Different Study Areas have been applied depending on the nature of the factor (defined below) that is under consideration. Each factor has been grouped into either an external source of major accidents or disasters (where the Project is a receptor), or where the Project is a source of major accident to receptors.

18.4.2 The following factors and associated distances were adopted for setting the Study Area in order to capture internal and external influencing factors which may have high adverse consequences on the Project:

- External major accident Study Areas:
  - COMAH Establishments within 3 km (based upon typical HSE Land Use Planning restrictions (Ref 18.20);
  - Major Accident Hazard Pipelines within 1 km (based on HSE Research (Ref. 18.21));
  - Connected Projects within the East Coast Cluster and Northern Endurance Partnership as outlined in Chapter 2: Project Description (Volume II); and
  - Other utilities (pipelines, electrical, gas, electrical, telecommunications etc.) crossing the Proposed Order Limits.
- Disaster Study Areas:
  - Natural features with the potential to create risks (for example, hydrological and geological - more specifically, flood risk and unstable ground conditions respectively) within 1 km (beyond this Study Area there would be no pathway to affect the Project).
- Receptor Study Areas:
  - Receptors during construction within 500 m (beyond this Study Area there would be no pathway from construction activities to affect receptors);
  - Receptors during operation (including commissioning) within 1 km (based upon a worst-case estimate of potential effects of hydrogen and carbon dioxide releases); and
  - Receptors during decommissioning within 500 m (beyond this Study Area there would be no pathway from decommissioning activities to affect receptors).

18.4.3 The assessment will consider the construction, operation and decommissioning phases.

Baseline data collection

Desk study

18.4.4 Baseline conditions of the Project were established during a desk study using the following sources:

- National Risk Register of Civil Emergencies (Ref. 18.22);
- British Geological Survey 'Onshore GeoIndex' (Ref 18.23);
- Tsunamis Hazard Map (Ref 18.24);
- The International Disaster Database (Ref 18.25);
- HSE's Planning Advice Web App (Ref 18.26);
- HSE COMAH 2015 Public Information Search (Ref 18.27);
- Project specific aerial imagery and mapping covering the Study Area; and
- The Yorkshire and Humber (CCS Cross Country Pipeline) Safety Statement (Ref. 18.28).

18.4.5 The following Chapters have also been utilised to aid in the collection of baseline data:

- Chapter 7: Ecology and Biodiversity (Volume II);
- Chapter 9: Geology and Hydrogeology (Volume II);
- Chapter 10: Heritage (Volume II);
- Chapter 13: Socio-economic (Volume II);
- Chapter 14: Human Health and Wellbeing (Volume II);
- Chapter 15: Traffic and Transport (Volume II);
- Chapter 16: Waste and Materials (Volume II); and
- Chapter 17: Hydrology and Land Drainage (Volume II).

Site visits and surveys

18.4.6 No surveys for MA&D would be required for the EIA.

Short List

18.4.7 Those MA&D Events scoped into the assessment have been utilised to establish the Short List of potential MA&D. The Long List presented during the EIA Scoping Stage is provided in Appendix 18.1: MA&D Long List (Volume III). Those MA&D events scoped in from the Long List have subsequently been considered have been reviewed and refined and are detailed in Table 18.2.

Table 18.2: Short List

Major Event Category and Type	Phase: Construction (C), Operation (O) or Decommissioning (D)	Requires Further Assessment (Yes / No)	Status of Assessment
Accidents during Commissioning	C	Yes	An initial review of potential impacts of these major event types has been undertaken as part of this PEIR (see Appendix 18.2: Risk Record (Volume III) and will be reviewed within the ES).
Damage to Existing Utilities	C and D	Yes	
Industrial Accidents: Chemical	C, O and D	Yes	
Industrial Accidents: Fuel Storage	C, O and D	Yes	
Fires	C, O and D	Yes	
Unplanned Release of hydrogen	O and D	Yes	
Unplanned Release of carbon dioxide	O and D	Yes	
Cyber Attack	O	Yes	

Impact assessment methodology

18.4.8 The only guidance on the assessment of MA&D within the context of EIA in the UK remains the IEMA Primer 'Major Accidents and Disasters in EIA: A Primer' (Ref 18.1). Two clear principles have emerged from this document. These have been adopted in the methodology described below; firstly, the principle of proportionality and secondly, the established principle that only those effects likely to be significant need to be assessed within the EIA.

18.4.9 The approach described is aligned to the IEMA Primer. The context of the guidance for MA&D is that the scope covers those MA&D which could impede the Project's activities and objectives and may have adverse effects upon receptors. The focus of the assessment will therefore recognise the significant risks arising from MA&Ds which may lead to potentially significant environmental effects, thereby building resilience into the Project and reducing any vulnerability.

18.4.10 MA&Ds are by their nature, high consequence (if they occur) and low likelihood events and are 'unplanned' with the effects not part of the intended design, construction or operational intent. However, where relevant, low likelihood and low consequence events will also be appropriately assessed.

18.4.11 The assessment of significant effects for MA&D focuses on the risk, which is the combination of the severity of harm (consequence), sensitivity of the receptor and likelihood of occurrence.

18.4.12 Risk tolerability for MA&D in the UK is built on the principle of eliminating intolerable risks, and to ensure, particularly at the engineering design stages, that any residual risks are further minimised where 'reasonably practicable'. This principle has been applied in the assessment here, with 'intolerable risk' interpreted as equivalent to 'significant adverse effects'.

18.4.13 A significant adverse effect for MA&Ds is one which would result in the following consequences, with a likelihood that the effect is considered intolerable to general society, based on commonly accepted benchmarks for what is intolerable (as outlined in COMAH Regulations 2015 (Ref 18.17) and R2P2 (Ref 18.18):

- Serious damage to human populations – This includes harm which would be considered substantial, i.e., fatalities, multiple serious injuries or a substantial number requiring medical attention; and
- Serious damage to the environment – Loss or significant detriment to populations of species or organisms, designated sites, cultural heritage sites, contamination of drinking water supplies, ground or groundwater, or harm to environmental receptors in line with other UK major accident regulations.

18.4.14 A significant effect could include both immediate and delayed effects. An immediate effect would be one that is self-evident at the time of the event (e.g. fire damage, injury). A delayed effect is one which becomes evident only after time (e.g. loss of feeding resources for a particular species leading to a change in ecosystem dynamics).

18.4.15 The proposed methodology is qualitative as the Project design is at the planning stage. Should consent be granted and the design advances through the detailed engineering design stages, additional risk assessments (qualitative and, where necessary, quantitative) will be undertaken as part of the normal pre-construction design process, to account for all relevant emerging and contemporary requirements.

18.4.16 The assessment approach will:

- Outline the credible pathways that exist (i.e. the link between a MA&D event and a receptor);
- Qualitatively assess the harm/damage which could be caused to the receptor to estimate the magnitude of accidents and disasters (if they were realised), at the receptor;
- Qualitatively assess the likelihood of the effect, considering the range of impacts which may be associated with the source/initiator of an accident or disaster and taking into account the measures embedded in the Project which would reduce their occurrence and/or severity; and
- Establish whether there are any significant (i.e., intolerable) effects from MA&D.

Assessment of Effects

18.4.17 As noted in Section 18.4, a significant effect for MA&D focuses on risk. This differs from the way in which many other topics in the EIA context are addressed. Typically, other topics examine effects that are considered likely to occur and therefore such effects are unlikely to meet the thresholds required to be considered a major accident or a disaster.

18.4.18 The ES will consider those MA&D which are scoped into the assessment. These are typically of a low likelihood but are important considerations so that resilience against them can be built into a project at the planning stage, and to provide sufficient information for informed decisions to be made for planning purposes. Resilience is built by ensuring that high consequence events are eliminated or, where elimination is not possible, reduced to such an extent that the chance of them occurring is so small that they can be deemed not to be significant.

18.4.19 Risk tolerability for people is well established in the UK and under HSWA it requires that risks to employees and others are ALARP. The primary reference for this is HSE's R2P2 (Ref 18.17). The CDOIF Environmental Tolerability for COMAH Establishments v2 (Ref 18.18) and R2P2 criteria will be used for this assessment to provide a consistent basis for the study against common benchmarks for MA&Ds applied across the UK.

18.4.20 The following factors are important in defining the R2P2 criteria:

- Magnitude of change – the consequence thresholds of MA&D are established from the following dimensions and intrinsically account for receptor sensitivity:
    - Severity of harm (a combination of extent and damage potential); and
    - Duration of harm (the recovery period) for non-human receptors or the numbers of people affected for human receptors.
- Likelihood of the event occurring.

18.4.21 These combine to provide a measure of risk (i.e., the combination of the serious damage arising from a potential event and its likelihood of occurrence). The fact that the Project is currently in the planning stage means that the estimates are qualitative and informed by experience in similar industries and for similar developments.

Magnitude of Change

18.4.22 In order to distinguish between potential major accidents of differing severities, all potential MA&D are categorised into one of four magnitude of change categories: Low, Medium, High and Very High. Any scenario which does not meet the criteria of a MA&D is simply listed as 'Not MA&D'. Magnitude of change within the context of MA&D is assessed from both the severity of the harm, and either the duration over which the receptor experiences that harm or the number of people affected.

18.4.23 Four categories of harm severity are considered:

- Not Significant: This level of harm is below the minimum threshold determined for a major accident or disaster in the CDOIF guidance (Ref 18.17) and/or in R2P2 (Ref 18.18); and
- Severe, Major or Catastrophic: These represent increasing levels of damage or harm to populations or environmental receptors.

18.4.24 For non-human receptor types, four categories of duration are considered: Short, Medium, Long and Very Long Term.

18.4.25 It is not considered possible that an event with a catastrophic severity of harm could have a short duration of harm because of the nature of an event with a catastrophic nature.

18.4.26 The combination of harm severity and harm duration for non-human receptors to determine magnitude of change is given in Table 18.3.

Table 18.3: Magnitude of change matrix – non-human receptors

Severity of Harm	**Catastrophic**		High	Very High	Very High
	Major	Not MA&D	Medium	High	Very High
	Severe		Low	Medium	High
	Not Significant	Not MA&D			
		Short	**Medium**	**Long**	**Very Long**
		Duration of Harm			

18.4.27 For human receptors, the number of people affected is accounted for in assigning the magnitude of change. The combination of harm severity and people affected for human receptors to determine magnitude of change is given in Table 18.4.

Table 18.4: Magnitude of change matrix – human receptors

Severity of Harm	**Catastrophic**	Very High	**Very High**	**Number of people affected**
		High	**Low to High**	
	Major	Medium		
	Severe	Low		
	Not Significant	Not MA&D		

18.4.28 Potential MA&D that have been assigned a magnitude of change (i.e., scoped in) are further assessed for significance.

Significance criteria

18.4.29 The Primer document provided by IEMA (Ref 18.1) highlights that the context for inclusion of MA&Ds in EIA is to ensure that adequate focus is given to the provision for events leading to significant risk, with the objective of building resilience into a development against such effects.

18.4.30 Table 18.5 presents the magnitude of change and a qualitative likelihood scale to determine whether the risk is significant. In the assessment, a significant effect would represent a level of risk that would generally be considered intolerable.

18.4.31 The assessment will evaluate the likelihood of each potential major accident or disaster occurring once the mitigation is applied. The likelihood and risk reported is that above the baseline (i.e., the incremental likelihood and risk). This is the risk that can be attributed to the development directly or indirectly.

18.4.32 While qualitatively stated, the definition and classifications used for likelihood are designed to be compliant with HSE's R2P2 (Ref 18.17) for societal risk, and CDOIF (Ref 18.18) for environmental tolerability, if considered on a per effect basis rather than in terms of aggregated risk (i.e., the risk from all contributors to a receptor). The qualitative parameters for likelihood categorisation range from 'Remote chance of occurring' through to 'Reasonable chance of occurring'. These then provide an allocation of likelihood against magnitude to determine risk significance, which in turn is an approach that is consistent with major accident tolerability perceptions commonly applied elsewhere in the UK.

Table 18.5: Significance matrix – Major Accidents and Disasters

Magnitude of Change	Likelihood (per receptor per effect)				
	Remote chance of occurring	Very small chance of occurring	Small chance of occurring	Chance of occurring	Reasonable chance of occurring
Very High	Not significant	Significant	Significant	Significant	Significant
High	Not significant	Not significant	Significant	Significant	Significant
Medium	Not significant	Not significant	Not significant	Significant	Significant
Low	Not significant	Not significant	Not significant	Not significant	Significant

18.4.33 Table 18.6 outlines the format in which the MA&D assessment in the ES will be presented. This ensures a clear and rational source-pathway-receptor linkage and subsequent allocation of significance for the specific linkage.

Table 18.6: ES Assessment Matrix

MA&D	Receptors	Pathway	Embedded mitigation	Reasonable Worst Consequence	Magnitude of Change	Likelihood	Risk or significance of effect
A description of the MA&D that was scoped into the assessment at the EIA Scoping stage.	*A description of the receptors potentially affected by the MA&D.*	*A description of the potential pathway between the MA&D and the identified receptors.*	*A description of the embedded mitigation that aims to remove or reduce the potential for the MA&D and considered when determining its severity and likelihood.*	*A description of the reasonable worst consequence for the identified receptors if the MA&D were to occur.*	*The magnitude of change arising because of the pathway between MA&D and receptor as per Table 18.3 and 18.4.*	*Allocation of a category using the Likelihood categories outlined in Table 18.5.*	*Allocation of significance utilising the matrix outlined in Table 18.5.*

Assumptions and limitations

18.4.34 To ensure transparency within the EIA process, the following assumptions and limitations have been identified:

- The design of structures and infrastructure will be subject to relevant Hazard Identification (HAZID) and Hazard and Operability (HAZOP) studies and actions identified integrated into the final design to reduce risks to be ALARP;
- The construction stage of the Project would be managed through the implementation of the Construction Phase Plan (required under the Construction (Design and Management) (CDM) Regulations 2015 (Ref 18.29) and a Construction Environmental Management Plan (CEMP). An outline CEMP be provided with the DCO application;
- The design of the Project and its implementation is 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;
- In accordance with good safety management principles, it has been assumed that all risks that have the potential to be major accidents or disasters, and could impact a local environmental receptor, will be managed using the ALARP principle;
- The design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment, and machinery, including associated systems, would consider Good Engineering Practice; and
- 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 topic chapters as appropriate and not in this section). It is also recognised that the management framework for the Project 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 would be developed following the appointment of the Main Works Contractor(s).

18.5 Baseline conditions

Existing baseline

18.5.1 The baseline relevant to this topic comprises:

- Features external to the Project that contribute a potential source of hazard to it;
- Sensitive environmental receptors at risk of significant effect; and
- Current (without the Project) MA&D risks for the existing locality.

18.5.2 In accordance with Regulation 5(2) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') (Ref 18.30) the following receptors are considered with regard 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.

18.5.3 The specific potential receptors of effects resulting from MA&D are reported in the relevant other PEIR Chapters as listed in Section 18.1.

Future baseline

18.5.4 The future baseline for major accidents and disasters would evolve along a number of factors over the Project lifecycle.

18.5.5 Climate change is predicted to lead to a number of changes including: an increase in peak rainfall intensities and resulting flood flows over time, with wetter winters and drier warmer summers; a rise in sea level. It is anticipated that there will be an increased frequency of lightning strikes and wind gusts. Climate change is expected to alter the prevalence of extreme weather conditions which could lead to a disaster.

18.5.6 The magnitude of changes brought about by climate change is uncertain, but UK climate projections (UK CP18) (Ref 18.31) are available until the end of the 21st century. The anticipated impact of climate change on environmental conditions is considered in Chapter 8: Climate Resilience (Volume II).

18.5.7 Substantial development of technology during the lifetime of the Project is anticipated. This could include advances in power generation, power transmission and decommissioning/maintenance techniques. These may further reduce the risk posed to safety and the environment. However, changes in technology may also introduce new hazards that would need to be managed at the appropriate time and through the appropriate process.

18.5.8 The embedded environmental measures outlined within Section 18.6 are designed to account for these factors. The assessment undertaken is flexible and adaptable to changing context and environmental factors but will ensure that the risk of MA&Ds is reduced to be ALARP.

18.6 Design development, impact avoidance and embedded mitigation

18.6.1 The Applicant has committed to constructing and managing the Project in accordance with the following non-exclusive list of standards and systems:

- Programme of hazard studies and safety assessments to produce an inherently safe design and to ensure residual risks are managed to be ALARP;
- Environmental, Health & Safety Management systems;
- Manage all construction risks in accordance with the CDM Health & Safety Plan;
- Supplier management environmental, health & safety standards (e.g., Construction Skills Certification Scheme (CSCS));
- Risk management systems;

- Construction and Environmental Management systems (an outline CEMP will be provided with the DCO application and the DCO application will contain a requirement for a CEMP); and
- Decommissioning Environmental Management Plan (DEMP).

18.6.2 Confirmed embedded mitigation will be presented within the ES and will align with other technical topics.

18.7 Preliminary assessment of vulnerability to the risk of MA&D

18.7.1 This Section details the preliminary assessment of potential impacts for the Project during construction, operation and decommissioning phases.

Construction

18.7.2 A number of MA&D events have been identified to which the Project may be vulnerable during the construction phase as detailed in Table 18.7 below. All events that have been considered are set out in Appendix 18.2: Risk Record (Volume III).

Table 18.7: Construction phase –preliminary assessment of potential risks

Risk record entry number	Risk description	Risk event (high level)	Reasonable worst consequence if event did occur
1	Pre-commissioning failure	Loss of power.	An electrical fault during pre-commissioning activities at the Pump Facility proceeding to a loss of electricity to the surrounding area.
2	Fires during construction activities	Harm to the Project workforce and/or construction equipment.	Fire contained within the relevant construction site.
3	Striking of underground services/utilities	Fire and/or explosion or release of harmful liquid and/or gas.	Fire and/or explosion affecting neighbouring property, members of the public and/or the Project Workforce; and/or the release of a harmful liquid proceeding to the contamination of the surrounding area.
4	Striking of overhead services/utilities	Loss of power and/or harm to the Project Workforce.	Loss of electricity to the surrounding area and/or electrocution of a member of the Project Workforce.
5-18	External major accident	Fire and/or explosion at COMAH establishment.	Carbon dioxide toxicity and dense white cloud and/or hydrogen explosion hazard affects neighbouring property, those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor Site of Special Scientific Interest (SSSI)).

Operation

18.7.3 Several MA&D events have been identified to which the Project may be vulnerable during the operation and maintenance phase as detailed in Table 18.8 below. All events that have been considered are set out in Appendix 18.2: Risk Record (Volume III).

Table 18.8: Operational phase –preliminary assessment of potential risks

Risk Record Entry Number	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence
5-18	External major accident	Fire and/or explosion at COMAH establishment.	Carbon dioxide toxicity and dense white cloud and/or hydrogen explosion hazard affects neighbouring property, those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
19	Fires during operation	Electrical equipment and other consumables in the AGI locations setting alight.	Carbon dioxide toxicity and dense white cloud and/or hydrogen explosion hazard affects neighbouring property, those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
20	Unplanned release of hydrogen from pipeline or AGI	A release of hydrogen from a pipeline or AGI during operation, for example as a result of external interference with the pipeline either accidentally or deliberately, or from operational errors.	Release of flammable gases which leads to fire/explosion hazards which could lead to serious harm to neighbouring property, those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
21	Unplanned release of carbon dioxide from	A release of carbon dioxide from a pipeline or AGI during operation, for example	Asphyxiation and/or toxic contamination effects and a dense white cloud, all of which could lead to serious harm to those people in the

Risk Record Entry Number	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence
	pipelines or AGI during operation	as a result of external interference with the pipeline either accidentally or deliberately, or from operational errors.	immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
22	Cyber attack	Cyber infrastructure associated with the Project is attacked.	Reasonable worst-case consequences could include: • An unplanned shut down leading to a major event; • Overpressure of the pipelines; and • Shut down of carbon dioxide and/or hydrogen pipelines systems that could affect the Connected Projects' ability to operate. Any one of these impacts has the potential to negatively affect the Project Workforce, neighbouring property, members of the public and environmental designations within the vicinity.

Decommissioning

18.7.4 Six MA&D events have been identified to which the Project may be vulnerable during the decommissioning phase as detailed in Table 18.9 below. All events that have been considered are set out in Appendix 18.2: Risk Record (Volume III).

Table 18.9: Decommissioning phase –preliminary assessment of potential risks

Risk Record Entry Number	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence
3	Striking of underground services/utilities	Fire and/or explosion or release of harmful liquid and/or gas.	Fire and/or explosion affecting neighbouring property, members of the public and/or the Project Workforce; and/or the release of a harmful liquid leading to the contamination of the surrounding area.
4	Striking of overhead services/utilities	Loss of power and/or harm to the Project Workforce.	Loss of electricity to the surrounding area and/or electrocution of a member of the Project Workforce.
20	Unplanned release of hydrogen from pipeline or AGI	A release of hydrogen from a pipeline or AGI during operation, for example as a result of long-term degradation.	Release of flammable gases which leads to fire/explosion hazards which could lead to serious harm to neighbouring property, those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
21	Unplanned release of carbon dioxide from pipeline or AGI during operation	A release of carbon dioxide from a pipeline or AGI during operation, for example as a result of long-term degradation.	Asphyxiation and/or toxic contamination effects and a dense white cloud, all of which could lead to serious harm to those people in the immediate area and/or contaminating environmental designations in the surrounding area (e.g., the Manton and Twigmoor SSSI).
23	Release of contaminated contents during decommissioning	A release of contaminated contents during decommissioning as a result of long-term degradation.	Toxic contamination effects which could lead to serious harm to the surrounding environment and to the Project Workforce in the immediate vicinity of a contaminated release.

24	Fires during decommissioning	Harm to the Project Workforce and/or Project equipment.	Fire contained within the decommissioning site.

18.8 Mitigation and enhancement measures

18.8.1 The Project would be one of the UK's first pipeline developments to transport carbon dioxide (to facilitate carbon capture, usage and storage (CCUS)) and hydrogen. This means that, at present, there are no specific enhancement measures pertaining to CCUS and hydrogen pipelines. Therefore, a constant learning culture is pivotal; the Project will utilise United Kingdom Onshore Pipeline Operators' Association's (UKOPA) (Ref 18.32) 'Developing Best Practice and Learning Lessons' and the HSE's 'Learning Lessons' (Ref 18.33) guidance to actively promote knowledge sharing and foster best practice, working in collaboration with UKOPA and HSE to influence the development of standards and safety management principles.

18.9 Summary of the preliminary potential significant effects

18.9.1 Table 18.10 below summaries the significant effect identified within the preliminary assessment of the Project. The full assessment of MA&D events including those identified as not significant is outlined in Appendix 18.2: Risk Record (Volume III).

Table 18.10: Summary of the preliminary assessment of potential significant effects

Assessment Matrix Entry No.	MA&D	Stage (Construction (C), Operation (O) and Decommissioning (D))	Sensitivity of resource/receptor	Description of potential impact/change	Mitigation	Potential significant effects
5-18	Fire and/or explosion at COMAH establishment	C, O and D	**Magnitude of Change:** Very high **Likelihood:** Very small chance of occurring	Carbon dioxide toxicity and dense white cloud and/or hydrogen explosion.	External COMAH establishment site emergency plan to control/contain the initiating event to prevent/reduce the risk of spread to the nearby project infrastructure. These would be periodically tested and discussed and agreed with the emergency services. Fail safe emergency shutdown system on the carbon dioxide and hydrogen pipeline transportation system.	Significant

18.9.2 Based on the assumptions and mitigation measures put forward, it is considered that the potential MA&D event identified as having potential significant events would all be managed to be ALARP.

18.10 Next steps

Engagement

18.10.1 Due to the iterative nature of the design process, stakeholder engagement will continue after the statutory consultation period. Engagement will be undertaken with HSE, relevant electricity generators, distributers and transmitters, public gas transporters and telecommunication providers, alongside relevant local authorities and relevant parish councils.

18.10.2 This will help to inform and refine the design in order to ensure that the vulnerability of the Project to MA&Ds is ALARP.

Assessment

18.10.3 As the design and the EIA evolves, further work is required to ensure a robust assessment of the vulnerability of the Project to MA&D. This will include a review and update of the potential MA&D events identified in Appendix 18.2: Risk Record (Volume III) following the receipt of further detailed design information.

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