

LIGHTHOUSE GREEN FUELS PROJECT

Preliminary Environmental Information Report

Chapter 17: Major Accidents and Disasters

The Inspectorate Reference: **EN010150**

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Volume 1

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17. MAJOR ACCIDENTS AND DISASTERS

17.1. INTRODUCTION

- 17.1.1. This Chapter reports the preliminary assessment of the vulnerability of the Proposed Scheme to Major Accidents and Disasters (MA&D) during construction and operation and describes:
- relevant policy, legislation and guidance;
 - consultation undertaken to date;
 - the methodology for assessment; and
 - a summary of the potential effects resulting from the vulnerability of the Proposed Scheme to the risk of MA&D.
- 17.1.2. 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 adopted.
- 17.1.3. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider PEIR, with particular reference to:
- **Chapter 5: Air Quality (Volume 1);**
 - **Chapter 7: Terrestrial Ecology (Volume 1);**
 - **Chapter 8: Freshwater and Marine Ecology (Volume 1);**
 - **Chapter 9: Water Environment and Flood Risk (Volume 1);**
 - **Chapter 12: Climate Change Resilience (Volume 1);**
 - **Chapter 15: Population and Human Health (Volume 1);**
 - **Chapter 16: Traffic and Transport (Volume 1);** and
 - **Chapter 18: Marine Navigation (Volume 1).**
- 17.1.4. The above Chapters also outline the proposed measures to prevent or mitigate significant effects and where they have identified emergency scenarios, provide details of the preparedness for, and proposed response.
- 17.1.5. This Chapter should also be read in conjunction with the following appendices:
- **Appendix 17A: MA&D Long List (Volume 3);** and
 - **Appendix 17B: PEIR Risk Record (Volume 3).**

MATTERS SCOPED OUT

- 17.1.6. **Appendix 17A: Major Accidents and Disasters Long List (Volume 3)** presents those potential MA&D event types to which the Proposed Scheme is not considered to be vulnerable and therefore, as agreed by the Planning Inspectorate (the Inspectorate) in the Environmental Impact Assessment (EIA) Scoping Opinion¹ have not been considered further in this assessment.

17.2. POLICY, LEGISLATION, AND GUIDANCE

17.2.1. The policy, legislation, and guidance relevant to the assessment of MA&D for the Proposed Scheme is detailed in **Appendix 4A: Policy, Legislation and Guidance (Volume 3)**. The policy, legislation and guidance relevant to this Chapter is outlined below:

- Policy:
 - National Planning Policy Framework (NPPF) 2023²;
 - Overarching National Policy Statement (NPS) for Energy 2023 (EN-1)³;
 - NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines 2023 (EN-4)⁴;
 - Stockton-on-Tees Borough Council - Local Plan 2019⁵; and
 - Redcar and Cleveland Local Plan Adopted May⁶ 2018.
- Legislation:
 - Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations)⁷;
 - Health and Safety at Work etc. Act 1974 (c. 37)⁸;
 - Construction (Design and Management) (CDM) Regulations 2015⁹;
 - Control of Major Accident Hazards (COMAH) Regulations 2015¹⁰;
 - The Planning (Hazardous Substances) Regulations 2015¹¹;
 - The Supply of Machinery (Safety) Regulations 2008¹²;
 - The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)¹³;
 - The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 1996¹⁴ and 2016¹⁵;
 - Occupier’s Liability Act 1984 (c.3)¹⁶;
 - The Pipelines Safety Regulations 1996¹⁷;
- Guidance:
 - Institute of Environmental Management and Assessment (IEMA): Major Accidents and Disasters in EIA: A Primer 2020¹⁸;
 - ‘Green Leaves III’ Guidelines for Environmental Risk Assessment and Management 2011¹⁹;
 - Guideline – Environmental Risk Tolerability for COMAH Establishments 2013²⁰; and
 - ISO 31000:2018 Risk Management –Guidelines 2018²¹.

17.3. SCOPING OPINION AND CONSULTATION

- 17.3.1. An EIA Scoping Opinion¹ was received by the Applicant from the Planning Inspectorate on behalf of the Secretary of State on 01 September 2023. The responses from the Inspectorate and statutory consultees in relation to MA&D and how these requirements should be addressed by the Applicant are set out in **Table 17-1**.

Table 17-1: Summary of EIA Scoping Opinion in relation to MA&D

Section ID	Applicant’s Proposed Matters to Scope Out	Scoping Opinion Comments	Response
3.15.1	Geophysical, hydrological, climatological and meteorological hazards: <ul style="list-style-type: none"> ■ Earthquakes ■ Volcanic Activity ■ Landslides ■ Sinkholes ■ Tsunamis ■ Avalanches – all phases	<i>“The Applicant proposes to scope these impacts out of the ES on the basis that the geographical location of the Proposed Development makes it highly improbable that any would occur. The Inspectorate agrees that these impacts are not likely to occur on the Proposed Development. These matters can be scoped out of further assessment.”</i>	No further assessment required.
3.15.2	Climatological and meteorological hazards: <ul style="list-style-type: none"> ■ Extreme temperatures: (heatwaves, low (sub-zero) temperatures and heavy snow) ■ Drought – all phases	<i>“The Scoping Report²² states that despite the Proposed Development being vulnerable to these impacts it is unlikely to increase the risks associated with them or result in a major accident. The Inspectorate agrees that the Proposed Development is unlikely to increase the risk of major accidents and disasters associated with these hazards occurring. These matters can be scoped out of the assessment. However, the ES should still assess the vulnerability of the Proposed Development to these hazards.”</i>	Section 17.12 of this PEIR Chapter presents the in-combination climate change impact assessment. Climate change has been considered as an integral part of the MA&D assessment. The potential MA&D events that have been considered within this Chapter have been assessed against likely climate hazards. An assessment of the potential impacts associated with extreme temperatures and drought is provided in Chapter 12: Climate Change Resilience (Volume 1) .
3.15.3	Industrial and urban accidents: Fire – all phases	<i>“The Applicant intends to scope this matter out on the basis that standard fire control measures and an</i>	An assessment of the risk of a major accident and/or disaster as a result of fire/explosion from the accidental

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<p><i>emergency preparedness and response plan will be in place for construction and operation of the Proposed Development. The Inspectorate is content that the risk of fire during construction is not likely to result in significant effects in terms of Major Accidents and Disasters and can be scoped out of further assessment. However, the Inspectorate considers that the ES should assess the risk of fire/explosion from the accidental release/ignition of flammable gasses and liquids such as SAF, Naphtha, Syngas etc. Any mitigation measures relevant to safety risks associated with fire/explosion, should be described in the ES (with reference to the proposed emergency preparedness and response plan, where relevant) and their delivery secured through the DCO. Effort should be made to agree any necessary measures with relevant consultation bodies.”</i></p>	<p>release/ignition of flammable gasses and liquids such as SAF, Naphtha, Syngas during the operational phase has been presented within Appendix 17B: PEIR Risk Record (Volume 3). The assessment identifies the mitigation measures which will be put in place to manage the risk to be As Low As Reasonably Practicable (ALARP). These measures will be secured through the DCO. Where necessary, the Applicant will engage with relevant consultation bodies to agree mitigation measures.</p>
3.15.4	Transport accidents: Road – all phases	<p><i>“It is not clear why this matter is proposed to be scoped out from the construction phase. The rationale provided states that there will be an increase in heavy construction plant and equipment on the local road</i></p>	<p>The Traffic and Transport assessment in the ES will consider the potential impacts associated with the increase in heavy construction plant and equipment on the local road network. It will also consider, using risk analysis,</p>

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<p><i>network which would lead to increased risks but does not explain why this would not be significant. The Inspectorate is therefore unable to scope this matter out of the construction phase. The ES should assess the potential for transport accidents to occur as a result of the construction of the Proposed Development.</i></p> <p><i>The Scoping Report²² states that the transport chapter identifies that operational trip attraction is unlikely to require significant enhancements to the local road network. The Inspectorate agrees that the operation of the Proposed Development is unlikely to generate trips on a level that would lead to significant MA&D impacts. This matter can be scoped out of the operational phase. However, the ES should provide information on hazardous loads during the operational phase, including the number of trips and composition of the loads. These loads should also be subject to risk analysis."</i></p>	<p>the potential impact associated with hazardous loads during the operational phase, including the number of trips and composition of the loads.</p>
3.15.5	Pollution accidents: Air Climatological and meteorological hazards: Poor air quality	<p><i>"The Inspectorate agrees that an assessment of poor air quality and air pollution accidents in relation to MA&D</i></p>	No further assessment required.

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<i>can be scoped out of further assessment."</i>	
3.15.6	Pollution accidents: Land and Water – construction and decommissioning	<i>"The Scoping Report²² proposes to scope these matters out on the basis that, whilst there may be an increased risk of spillages and leaks during construction and decommissioning, standard control measures would be implemented through the CoCP to mitigate the risk. The Inspectorate agrees that with the implementation of standard control measures, the Proposed Development would not result in a significantly elevated risk of spillages and leaks occurring. This matter can be scoped out from further assessment. However, the ES should describe the mitigation measures relied on to avoid significant effects and explain how these have been secured."</i>	The mitigation measures to avoid significant effects as a result of an accidental spillage or leak are outlined in Chapter 9: Water Environment and Flood Risk (Volume 1) and will be described in the Outline Code of Construction Practice (OCoCP) and Outline Decommissioning Plan which will both be secured through the DCO.
3.15.7	Unexploded ordnance (UXO) – operation	<i>"The Scoping Report²² proposes to scope this matter out during operation on the basis that although there would be a limited risk from UXO, it would be no greater than other similar schemes in the vicinity. The Inspectorate agrees that the risk of UXO during operation would be minimal. This matter can be scoped out of further assessment."</i>	No further assessment required.

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
3.15.8	<p>Climatological and meteorological hazards:</p> <ul style="list-style-type: none"> ■ Severe space weather; ■ Fog; ■ Wildfire; ■ Cyclones, hurricanes, typhoons, storms and gales; ■ Thunderstorms; and ■ Wave surges. <p>Biological hazards:</p> <ul style="list-style-type: none"> ■ Disease epidemics; ■ Animal diseases; and ■ Plants (Invasive). <p>Societal hazards:</p> <ul style="list-style-type: none"> ■ Demonstrations; ■ Societal or economic damage; ■ Humanitarian disasters (assistance political and military constraints, security risks); ■ Famine; and ■ Displaced population. <p>Industrial and urban accidents:</p> <ul style="list-style-type: none"> ■ Nuclear; ■ Dam breaches; and ■ Mines and storage caverns. 	<p><i>Based on the reasoning and evidence presented in the Scoping Report²², 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."</i></p>	<p>No further assessment required.</p>

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
	<p>Utilities failures:</p> <ul style="list-style-type: none"> ■ Electricity; ■ Gas; ■ Water supply; and ■ Sewerage system. <p>Malicious Attacks:</p> <ul style="list-style-type: none"> ■ Chemical, biological, radiological and nuclear attacks; ■ Transport systems; ■ Crowded places; ■ Cyber; and ■ Infrastructure. <p>Engineering Accidents and Failures:</p> <ul style="list-style-type: none"> ■ Bridge failure; ■ Mast and tower collapse; ■ Property or bridge demolition accidents; ■ Tunnel failure/fire; and ■ Flood defence failure. <p>Transport Accidents:</p> <ul style="list-style-type: none"> ■ Aviation. <p>– all phases</p>		
3.15.9	Other developments	<i>“The Inspectorate notes that the Proposed Development is in proximity to Seal Sands salt caverns, which are under consideration for temporary</i>	An assessment of the risk of major accidents and/or disasters as a result of potential domino effects associated with major accident hazard sites in the

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<p><i>hydrogen storage. The ES should consider the potential MA&D implications for this site e.g., the uncontrolled release of hydrogen gas or subsidence as a result of the deformation of the salt caverns.”</i></p>	<p>Study Area has been presented in Appendix 17B: PEIR Risk Record (Volume 3).</p>

17.3.2. No further consultation has been undertaken to inform the MA&D assessment to date.

17.4. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

17.4.1. The MA&D assessment of the Proposed Scheme has been undertaken in line with the policy, legislation and guidance described in **Section 17.2** and **Appendix 4A: Policy, Legislation and Guidance (Volume 3)**.

POTENTIAL SIGNIFICANT EFFECTS

17.4.2. As identified in the EIA Scoping Report²² and **Appendix 17A: Major Accidents and Disasters Long List (Volume 3)**, the following MA&D event types are considered further in this assessment:

- Construction phase:
 - Coastal Flooding (hydrological);
 - Fluvial Flooding (hydrological);
 - Pluvial Flooding (hydrological);
 - Groundwater Flooding (hydrological);
 - Major Accident Hazard Chemical Sites (industrial and urban accidents);
 - Major Accident Hazard Pipelines (industrial and urban accidents);
 - Fuel Storage (industrial and urban accidents);
 - Waterways (transport accidents); and
 - Unexploded Ordnance (malicious attacks).
- Operation phase:
 - Coastal Flooding (hydrological);
 - Fluvial Flooding (hydrological);
 - Pluvial Flooding (hydrological);
 - Groundwater Flooding (hydrological);
 - Major Accident Hazard Chemical Sites (industrial and urban accidents);
 - Major Accident Hazard Pipelines (industrial and urban accidents);
 - Fuel Storage (industrial and urban accidents);
 - Rail (transport accidents);
 - Waterways (transport accidents);
 - Land (pollution accidents); and
 - Water (pollution accidents).
- Decommissioning phase:
 - Coastal flooding (hydrological);
 - Fluvial Flooding (hydrological);
 - Pluvial Flooding (hydrological);
 - Groundwater Flooding (hydrological);

- Major Accident Hazard Chemical Sites (industrial and urban accidents);
- Major Accident Hazard Pipelines (industrial and urban accidents);
- Fuel Storage (industrial and urban accidents); and
- Waterways (transport accidents).

KEY DEFINITIONS

17.4.3. The definition of key terms used in this Chapter are provided in **Table 17-2** below. These definitions have been developed by reference to the definitions used in EU and UK legislation and guidance relevant to major accidents and/or disasters^{23, 24, 25, 26, 27} as well as professional judgement in the context of the Proposed Scheme.

Table 17-2: MA&D Key Definitions

Term	Definition
(Major) Accident	An event that threatens immediate or delayed serious damage to human health, welfare and/or the environment and requires the use of resources beyond those of the Applicant or its contractors to respond to the event. Serious damage includes the loss of life or permanent injury and/or permanent or long lasting damage to an environmental receptor that cannot be restored through minor clean-up and restoration efforts. The significance of this effect will consider the extent, severity and duration of harm and the sensitivity of the receptor.
Adaptive Capacity	The capacity of receptors to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
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) expects to see workplace risks controlled.
Consultation Zone	The Office for Nuclear Regulation (ONR) and the HSE set Consultation Distances (CD) around nuclear installations, major hazard sites and major accident hazard pipelines after assessing the risks and likely effects of major accidents at the nuclear installation/major hazard site/pipeline. The area enclosed within the CD is referred to as the Consultation Zone (CZ) and is the area within which there could be potentially significant consequences from major accidents to people (or to the environment). The Local Planning Authority is notified of this CD and has a statutory duty to consult the ONR/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.
External Influencing Factor	A factor that occurs beyond the Site that may present a risk to the Proposed Scheme, e.g. if an external major event occurred (e.g. earthquake or a Control of Major Accident Hazards (COMAH) site major accident) it would increase the risk of serious damage to a receptor associated with the Proposed Scheme.

Term	Definition
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 Site that may present a risk to the Proposed Scheme.
Magnitude of Impact	The magnitude of an impact is typically defined by the following factors: <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; and ■ severity – the degree of change relative to existing conditions.
MA&D Group	A MA&D which can be grouped as either a Natural Hazard (Disaster) or Technological or Manmade Hazard (Major Accident).
MA&D Category	A set of values used to categorise events within a related parent MA&D Group.
MA&D Type	A set of values used to sub-categorise events within a MA&D Category.
Risk	The likelihood of an impact occurring, combined with effect or consequence(s) of the impact on a receptor if it does occur.
Risk Event	An identified, unplanned event, which is considered relevant to the Proposed Scheme and has the potential to be a MA&D subject to assessment of its potential to result in a significant adverse effect on a receptor.
Sensitivity	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: <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 will recover following an effect.
Vulnerability	In the context of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ⁸ (on the assessment of the effects of certain public and private projects on the environment) the term refers to the ‘exposure and resilience’ of the Proposed Scheme to the risk of a MA&D. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

SENSITIVE RECEPTORS

17.4.4. In line with Schedule 4 of the Infrastructure Planning EIA Regulations 2017⁸ the following sensitive receptors were considered with respect to MA&D:

- members of the public and local communities;
- infrastructure and the built environment;

- the natural environment, including ecosystems, land and soil quality, air quality, surface and groundwater resources and landscape;
- the historic environment, including archaeology and built heritage; and
- the interaction between the factors above.

17.4.5. The specific potential receptors of effects resulting from MA&D are reported in the relevant other Technical Chapters as described in **Section 17.1**. Certain receptors have been excluded from the assessment, for the reasons described in **Table 17-3**.

Table 17-3: Excluded Receptors

Term	Definition
Staff of the Applicant and/or their suppliers, whether during the construction or operation phase 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 ⁹ .
Members of the public who are wilfully trespassing, for example, a breach of the Proposed Scheme’s perimeter fencing.	Outside the occupier’s legal requirements under the Occupiers’ Liability Act 1984 ¹⁷ .

BASELINE DATA COLLECTION

17.4.6. A desk-based data collection exercise has been undertaken, including review of available information, to determine the baseline conditions.

17.4.7. The key sources of information used to determine the baseline for MA&D are:

- National Risk Register of Civil Emergencies²⁸;
- British Geological Survey (BGS) GeoIndex Onshore²⁹;
- Tsunamis Hazard Map³⁰;
- International Disaster Database³¹;
- Health and Safety Executive's (HSE) Planning Advice Web App³²;
- HSE's COMAH 2015 Public Information Search³³;
- Google aerial and Street View maps³⁴; and
- Technical Topic Chapters (**Chapter 5: Air Quality (Volume 1)** to **Chapter 18: Marine Navigation (Volume 1)**).

ASSESSMENT METHODOLOGY

17.4.8. To date, there is no regulatory guidance on how to consider MA&D within the context of EIA. However, the assessment takes account of emerging EIA good practice^{35, 36, 37} which refers to other relevant documentation, including the Cabinet Office’s National Risk Register²⁹.

17.4.9. The assessment of MA&D has been achieved 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.

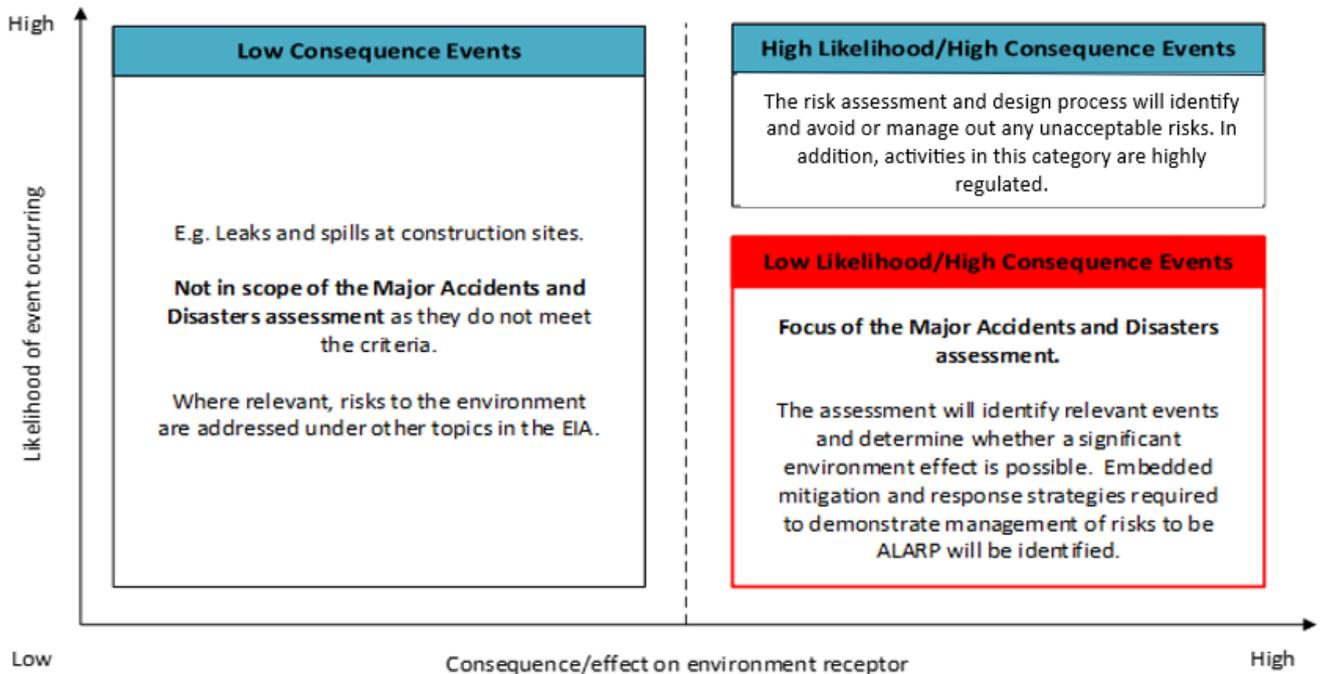
- 17.4.10. The assessment presents any identified risks along with whether these are managed to be ALARP or require further precautionary mitigation actions beyond those already integrated into the design and execution of the Proposed Scheme.
- 17.4.11. The potential for identified relevant MA&D to result in a significant adverse environmental effect have been evaluated using a risk-based approach. The approach has considered the environmental consequences of a MA&D, the likelihood of these consequences occurring, considering planned design and embedded mitigation, and the acceptability of the subsequent risk to the relevant receptor. The following process has been applied to each of the MA&D categories included for assessment:
- identifying risks;
 - screening these risks;
 - defining the impact;
 - assessing the risk; and
 - appraising risk management options.
- 17.4.12. The long list in **Appendix 17A: Major Accidents and Disasters Long List (Volume 3)** together with **Table 17-1** provides the justification for whether risk event types are considered within the assessment.

Identify Risks

- 17.4.13. The assessed MA&D are considered to be rare events.
- 17.4.14. Low consequence events, whatever their likelihood, do not meet the definition of MA&D as defined in the IEMA Primer¹⁹. For example, minor spills which may occur during construction, but will be limited in area and volume and temporary in nature, do not meet the definition of a major accident. Such minor events will be dealt with by the measures included in the OCoCP, to be secured by a DCO requirement and do not fall within the scope of this assessment.
- 17.4.15. High likelihood and high consequence events also do not meet the definition of MA&D as the risk assessment and design process will identify and avoid or design out such risks. In addition, activities which fall into this category are highly regulated to minimise the risk to be ALARP.

17.4.16. This assessment focuses on low likelihood, but potentially high consequence events as illustrated in **Figure 17-1**, which is based on Figure 2 in the IEMA Primer¹⁹.

Figure 17-1: Graphical Representation of Major Accidents and Disasters Consequence Significance



- 17.4.17. Based on professional judgement, low likelihood events are defined, for the purposes of this assessment, as those which may occur during the lifetime of the Proposed Scheme: no more than once in 10 years for the construction phase; and no more than once in 100 years for the operation phase. This is an upper boundary for low likelihood.
- 17.4.18. Very low likelihood events are also included in the assessment, which may only occur at most once in every 1,000 years. Mitigation measures will reflect what is reasonable for such rare events, considering their potential consequence, within the guiding principle of risks being ALARP.
- 17.4.19. High consequence events are considered to lead to a significant adverse effect.
- 17.4.20. The risk identification process has used existing sources of information, wherever possible, 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 Register²⁹. No additional risk assessments have been undertaken and the risk identification activity has focused on collating and reviewing the existing sources of information prepared specifically for the Proposed Scheme.
- 17.4.21. To identify whether a Risk Event has the potential to be a MA&D event, which also has the potential to have a significant adverse effect on an environmental receptor, three components need to be present: a source, a pathway (between source and receptor) and a receptor.

17.4.22. Risk Events which do not have all three components have been screened out from the assessment as presented in **Appendix 17A: Major Accidents and Disasters Long List (Volume 3)**.

Screen Risks

17.4.23. The following MA&D screening process, as recommended by DEFRA²⁰, has been used to identify those Risk Events that will require further consideration within the assessment:

- Is there a potential source (original cause of the hazard which has the potential to cause harm), and/or pathway (route by which the source can reach the receptor) and/or receptor (the specific component of the environment that could be adversely affected)? If not, no further assessment required.
- Is there a relevant environmental receptor 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.
- Does the potential impact on the environmental receptor meet the definition of a significant adverse effect? If not, no further assessment required.

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

Define Impact

17.4.25. Several mechanisms are in place to reduce the vulnerability of the Proposed Scheme to MA&D or to mitigate significant effects on the environment should they occur. All measures to manage and reduce the risk of significant adverse effects occurring due to the vulnerability of the Proposed Scheme to MA&D are considered to be embedded mitigation measures for the purposes of the assessment. It has been assumed that:

- the construction stage(s) of the Proposed Scheme will be managed through the implementation of a Construction Phase Plan (required under the CDM Regulations 201510) and an OCoCP; and
- the design, installation, commissioning, operation and maintenance of plant, drainage systems, equipment, and machinery, including associated systems, will consider Good Engineering Practice.

17.4.26. The measures of relevance to the assessment are described in the relevant Technical Chapters outlined in **Paragraph 17.1.3**.

17.4.27. A reasonable worst case environmental impact(s) has been identified for each Risk Event included for assessment. Impacts have been identified in consultation with relevant disciplines for each environmental factor assessed within this PEIR. The environmental impacts are identified through a qualitative process that seeks to answer the question 'could this event constitute a major accident or disaster in terms of the definitions provided?'. Where relevant, specific sensitive receptors around the Proposed

Scheme are considered. The Risk Record (**Appendix 17B: PEIR Risk Record (Volume 3)**) records the outcome of this process.

Assess Risk

17.4.28. The likelihood of the reasonable worst case environmental effect(s) occurring has been evaluated considering 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.

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

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

17.4.31. The assessment of the risk has been carried out in line with the IEMA Primer¹⁹. Where likely significant adverse effects are identified, mitigation measures must be in place, commensurate with the likelihood of the event occurring. The assessment considers, the relevant environmental topics and whether the risk to the receptor is managed to be ALARP with the embedded mitigation measures. If gaps are identified, where the embedded mitigation measures do not represent management of risks to an environmental receptor to be ALARP, then additional measures will be required. The Risk Record presented in **Appendix 17B: PEIR Risk Record (Volume 3)** records the outcome of the assessment.

Appraise Risk Management Options

17.4.32. Risk management options fall into the following categories:

- Eliminate (or 'avoid') the risk by adopting alternative processes to eradicate 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 decreased.
- 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 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.
- Exploit the risk if it presents potential benefits or new opportunities.

17.4.33. As safety risks will 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, will be identified as an output of the assessment.

SIGNIFICANCE CRITERIA

17.4.34. By definition, a major accident and/or disaster would have a major significant effect on the environment. Accordingly, any risks that could result in a MA&D without suitable mitigation, management or regulatory controls in place will be assessed as significant.

17.5. STUDY AREA

17.5.1. MA&D types, both within and outside the Site, have been assessed, along with potential internal and external influencing factors. The following factors and associated distances from the Site Boundary were adopted for setting the Study Area:

- Manmade features:
 - Airports and airfields within approximately 13km (the legal distance of the safeguarding zone for licensed airports in the UK^a).
 - COMAH facilities within approximately 3km (distance to furthest COMAH installation centre point whose CZ overlaps the Proposed Scheme).
 - Major Accident Hazard pipelines (MAHP) within approximately 1km (distance to furthest MAHP whose CZ overlaps the Proposed Scheme).
 - Nuclear installations within approximately 3km (distance to the Land Use Planning Outer Consultation Zone^b).
 - Bulk fuel storage facilities (including Liquefied Natural Gas, Liquefied Petroleum Gas) within approximately 500m.
 - Rail infrastructure within approximately 100m.
 - Transmission lines (gas, electrical, oil/fuels) within the Site.
- Natural features with the potential to create risks within:
 - 3km (chiefly hydrological and geological, for example dam failure and seismic activity respectively); and
 - 1km (chiefly hydrological and geological, for example flood risk and unstable ground conditions respectively).

17.5.2. The internal and external influencing factors, which may have high adverse consequences on the Proposed Scheme, were reviewed for the varying distances identified in **Paragraph 17.5.1**. As presented in the EIA Scoping Report²², it was identified that the key factors were within a 400m radius around the Proposed Scheme other than the COMAH sites which are within a 5km radius around the Proposed Scheme. Therefore, the extent of the Study Area used for the MA&D PEIR assessment is 5km.

^a Defined by the Civil Aviation Authority

^b Defined by the Office for Nuclear Regulation

17.6. BASELINE CONDITIONS AND FUTURE BASELINE

BASELINE

17.6.1. The baseline relevant to MA&D comprises:

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

17.6.2. There are 32 COMAH sites within a 5km radius of the Proposed Scheme:

- Exwold Technology Limited – Billingham (lower tier) (approximately 1.2km west from the closest point of the Site Boundary);
- SNF Oil and Gas Limited (upper tier) (approximately 2.1km south west from the closest point of the Site Boundary);
- Univar Solutions UK Limited (upper tier) (approximately 848m south east from the closest point of the Site Boundary);
- Wood Group PSN Limited (upper tier) (approximately 0.2km north from the closest point of the Site Boundary);
- Venator Materials UK Limited (upper tier) (approximately 2.5km north from the closest point of the Site Boundary);
- EDF Energy Nuclear Generation Limited (lower tier) (approximately 2.2km north from the closest point of the Site Boundary);
- BOC Limited (upper tier) (adjacent to the closest point of the Site Boundary);
- Air Products (BR) Limited (lower tier) (within the Site Boundary);
- Chemoxy International Limited (upper tier) (approximately 0.8km south from the closest point of the Site Boundary);
- MP Storage and Blending Limited (lower tier) (approximately 0.6km south east from the closest point of the Site Boundary);
- CF Fertilisers UK Limited - Portrack (upper tier) (within the Site Boundary);
- SABIC UK Petrochemicals Limited – North Tees (upper tier) (approximately 2.4km south east from the closest point of the Site Boundary);
- Navigator Terminals North Tees Limited (upper tier) (within the Site Boundary);
- Exolum Seal Sands Limited (upper tier) (approximately 0.45km south east from the closest point of the Site Boundary);
- Calor Gas Limited (upper tier) (adjacent to the south from the closest point of the Site Boundary);
- Industrial Chemicals Limited (upper tier) (adjacent to the east from the closest point of the Site Boundary);
- Exolum Riverside Limited (upper tier) (adjacent to the north from the closest point of the Site Boundary);

- Fine Organics Limited (upper tier) (adjacent to the west from the closest point of the Site Boundary);
- ConocoPhillips (U.K.) Teesside Operator Limited (upper tier) (approximately 0.2km west from the closest point of the Site Boundary);
- Navigator Terminals Seal Sands Limited (upper tier) (adjacent to the east from the closest point of the Site Boundary);
- Tees Valley Net Zero Limited (lower tier) (approximately 0.72km north west from the closest point of the Site Boundary);
- px (TGPP) Limited (upper tier) (adjacent to the north from the closest point of the Site Boundary);
- Qualitech Environmental Services Limited (lower tier) (approximately 4km north from the closest point of the Site Boundary);
- SABIC UK Petrochemicals Limited - Olefins (upper tier) (approximately 2.4km south east from the closest point of the Site Boundary);
- Huntsman Polyurethanes (UK) Limited (upper tier) (approximately 1.5km south east from the closest point of the Site Boundary);
- Ensus UK Limited (upper tier) (approximately 2.2km south east from the closest point of the Site Boundary);
- Alpek Polyester UK Limited (lower tier) (approximately 2.2km south east from the closest point of the Site Boundary);
- CF Fertilisers – Billingham (upper tier) (approximately 2km west from the closest point of the Site Boundary);
- Chemoxy International Limited – Billingham (upper tier) (approximately 2km west from the closest point of the Site Boundary);
- Mitsubishi Chemical UK Limited (upper tier) (approximately 2.7km west from the closest point of the Site Boundary);
- Origin UK Operations Limited (lower tier) (approximately 2.5km south from the closest point of the Site Boundary); and
- Exwold Technology Limited (upper tier) (approximately 3.4km north west from the closest point of the Site Boundary).

17.6.3. Baseline information from the following Chapters has also been used to inform the MA&D assessment:

- **Chapter 5: Air Quality (Volume 1);**
- **Chapter 7: Terrestrial Ecology (Volume 1);**
- **Chapter 8: Freshwater and Marine Ecology (Volume 1);**
- **Chapter 9: Water Environment and Flood Risk (Volume 1);**
- **Chapter 12: Climate Change Resilience (Volume 1);**
- **Chapter 15: Population and Human Health (Volume 1);**
- **Chapter 16: Traffic and Transport (Volume 1);** and
- **Chapter 18: Marine Navigation (Volume 1).**

FUTURE BASELINE

- 17.6.4. 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 of major accident(s) and/or disaster(s), as it is considered that the current industrial land use within the Study Area would remain the same.

17.7. EMBEDDED DESIGN, MITIGATION AND ENHANCEMENT MEASURES

- 17.7.1. This Section sets out the embedded design, mitigation and enhancement measures in place to address the vulnerability of the Proposed Scheme to the risk of MA&D events.
- 17.7.2. The Applicant has committed to constructing and managing the Proposed Scheme in accordance with the following non-exclusive list of standards and systems, some of which will be required by secondary consents such as COMAH and operational phase Environmental Permit applications:
- Programme of hazard studies for the Proposed Scheme to produce an inherently safe design and to ensure residual risks are managed to be ALARP.
 - Environmental, Health & Safety Management systems.
 - CDM Health & Safety Plan (relevant to Construction phase only).
 - Supplier management environmental, health & safety standards (e.g. Construction Skills Certification Scheme).
 - Risk management systems.
 - OCoCP for Construction Phase environmental mitigation (to be submitted as part of the application for development consent).
 - OEPRP for Operational Phase emergency preparedness and response planning (to be submitted as part of the application for development consent).

17.8. PRELIMINARY ASSESSMENT OF VULNERABILITY TO THE RISK OF MAJOR ACCIDENTS AND DISASTERS

- 17.8.1. This section details the output of the preliminary assessment of the vulnerability of the Proposed Scheme to the risk of MA&D during both the construction and operation phases, taking into account the embedded design, mitigation and enhancement measures detailed in **Section 17.7**.

POTENTIAL MAJOR ACCIDENT AND DISASTER EVENTS

- 17.8.2. Based on the information known at this stage of the Proposed Scheme, MA&D Events to which the Proposed Scheme may be vulnerable during construction and operation are summarised below.

Construction and Decommissioning Phase

- 17.8.3. Three MA&D Events have been identified to which the Proposed Scheme may be vulnerable during the Construction and Decommissioning phases as detailed in **Table**

17-4. All events that have been considered are set out in **Appendix 17B: PEIR Risk Record (Volume 3)**.

17.8.4. Based on the assumptions and mitigation put forward in other relevant PEIR Chapters, it is considered that the identified potential MA&D events in **Table 17-4** would be managed to be ALARP.

Table 17-4: Potential MA&D Events Grouped by High Level Risk Event (Construction and Decommissioning Phase)

Risk Record Entry Number	MA&D Category	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence if Event did Occur
23	Technological or Manmade Hazards: Industrial and Urban Accidents.	Striking of third party major accident hazard pipelines leading to a large scale loss of containment event.	Fire and/or explosion or release of harmful gas.	Fire and/or explosion affects neighbouring property and/or members of the public.
24	Technological or Manmade Hazards: Pollution accidents.	Striking of pipelines leading to a large scale loss of containment event.	Physical damage or contamination of aquifer or borehole.	Localised contamination of the soil.
25	Technological or Manmade Hazards: Pollution accidents.	Striking of pipelines leading to a large scale loss of containment event.	Spillage or longer term seepage of pollutants into watercourse.	Localised contamination of surface water features.

Operation Phase

- 17.8.5. Fifteen MA&D Events have been identified to which the Proposed Scheme may be vulnerable during the operation and maintenance phase as detailed in **Table 17-5**. All events that have been considered are set out in **Appendix 17B: PEIR Risk Record (Volume 3)**.
- 17.8.6. Based on the assumptions and mitigation measures put forward in other relevant PEIR Chapters, it is considered that the identified potential MA&D events below would all be managed to be ALARP, other than for risk record entry numbers 19 and 20, where the ALARP status cannot be determined until appropriate mitigation measures have been defined in the ES.

Table 17-5: Potential MA&D Events Grouped by High Level Risk Event (Operation Phase)

Risk Record Entry Number	MA&D Category	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence if Event did Occur
8	Technological or Manmade Hazards: Industrial and Urban Accidents.	Large scale release of toxic gases (carbon monoxide (CO)).	Fire and/or explosion or release of harmful gas.	CO toxicity hazard affects neighbouring properties and/or those people in the immediate area.
9	Technological or Manmade Hazards: Industrial and Urban Accidents.	Major fire initiating a major event on the adjacent COMAH installations.	Fire and/or explosion or release of harmful gas.	Fire contained within the Site with drift of airborne combustion products offsite.
10	Technological or Manmade Hazards: Pollution accidents.	Large scale release of naphtha resulting from a loss of containment event involving a pipeline and/or storage tank.	Physical damage or contamination of aquifer or borehole.	Localised contamination of the soil.
11	Technological or Manmade Hazards: Pollution accidents.	Large scale release of naphtha resulting from a loss of containment event involving a pipeline and/or storage tank.	Spillage or longer term seepage of pollutants into watercourse.	Localised contamination of surface water features.
12	Technological or Manmade Hazards: Pollution accidents.	Large scale release of SAF resulting from a loss of containment event involving a pipeline and/or storage tank.	Physical damage or contamination of aquifer or borehole.	Localised contamination of the soil.
13	Technological or Manmade Hazards: Pollution accidents.	Large scale release of SAF resulting from a loss of containment event involving a pipeline and/or storage tank.	Spillage or longer term seepage of pollutants into watercourse.	Localised contamination of surface water features.

Risk Record Entry Number	MA&D Category	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence if Event did Occur
14	Technological or Manmade Hazards: Pollution accidents.	Large scale release of naphtha/SAF resulting from a loss of containment event involving a pipeline and/or marine vessel/rail tanker wagon.	Physical damage or contamination of aquifer or borehole.	Contamination of soil/groundwater.
15	Technological or Manmade Hazards: Pollution accidents.	Large scale release of naphtha/SAF resulting from a loss of containment event involving a pipeline and/or marine vessel/rail tanker wagon.	Spillage or longer term seepage of pollutants into watercourse.	Contamination of surface water.
16	Technological or Manmade Hazards: Industrial and Urban Accidents.	Large scale release of CO ₂ resulting from a loss of containment event involving a pipeline and.	Fire and/or explosion or release of harmful gas.	CO ₂ toxicity and fogging hazard affects neighbouring properties and/or those people in the immediate area.
18	Technological or Manmade Hazards: Industrial and Urban Accidents.	Fire at adjacent COMAH facility spreads to Proposed Scheme initiating a major event.	Fire and/or explosion or release of harmful gas.	Fire contained within the Site with drift of airborne combustion products offsite.
19	Technological or Manmade Hazards: Transport accidents.	Large scale release of naphtha resulting from a loss of containment event involving the marine vessel.	Spillage or longer term seepage of pollutants into watercourse.	Contamination of surface water.
20	Technological or Manmade Hazards: Transport accidents.	Large scale release of SAF resulting from a loss of containment event involving the marine vessel.	Spillage or longer term seepage of pollutants into watercourse.	Contamination of surface water.

Risk Record Entry Number	MA&D Category	Risk Description	Risk Event (High Level)	Reasonable Worst Consequence if Event did Occur
21	Technological or Manmade Hazards: Pollution accidents.	Large scale release of caustic soda/wastewater treatment plant (WWTP) chemicals resulting from a loss of containment event involving a storage tank/pipeline.	Physical damage or contamination of aquifer or borehole.	Localised contamination of the soil.
22	Technological or Manmade Hazards: Pollution accidents.	Large scale release of caustic soda/WWTP chemicals resulting from a loss of containment event involving a storage tank/pipeline.	Spillage or longer term seepage of pollutants into watercourse.	Localised contamination of surface water features.
28	Technological or Manmade Hazards: Industrial and Urban Accidents.	Combustion of syngas/naphtha/SAF following large scale leakage/loss of containment due to damage to process equipment/storage vessel.	Fire and/or explosion or release of harmful gas.	Fire and/or explosion affects neighbouring property and/or members of the public.

17.9. ADDITIONAL DESIGN, MITIGATION AND ENHANCEMENT MEASURES

17.9.1. Additional design, mitigation and enhancement measures are set out in **Appendix 17B: PEIR Risk Record (Volume 3)**.

17.10. MONITORING

17.10.1. No monitoring specifically driven by MA&D is considered to be proportionate or to be required.

17.11. RESIDUAL EFFECTS

17.11.1. Based on the assumptions and mitigation measures put forward in other relevant PEIR Chapters, it is considered that the identified potential MA&D events identified during the Construction and Decommissioning phase will all be managed to be ALARP. However, at this stage in the assessment the mitigation measures have not been fully defined for all of the potential major accident and/or disaster events identified during the operational and maintenance phase. Therefore, the ALARP status cannot be determined for the operational and maintenance phase of the Proposed Scheme.

17.12. NEXT STEPS

17.12.1. Further work to be completed and included in the ES comprises:

- The MA&D assessment will be further developed and refined based on any relevant responses to the Statutory Consultation.
- Engage with the HSE to understand which COMAH based consultation zones overlap the Proposed Scheme to enable the Study Area to be further refined for the ES.
- The assessment within the ES will involve a review of the potential major accident and/or disaster events presented in this Technical Chapter based on further information as part of ongoing design development.
- Assessment of the MA&D types which could not be addressed in this PEIR due to insufficient information being available at this stage of the Proposed Scheme.
- Confirm the securing mechanisms for embedded measures required by other consents, licences and permits such as the COMAH licence application and Environmental Permits.

17.13. LIMITATIONS AND ASSUMPTIONS

17.13.1. This section outlines the limitations, uncertainties, and assumptions made in assessing the vulnerability of the Proposed Scheme to a MA&D reported in this Chapter.

- The design of the Proposed Scheme 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.

- Environmental effects associated with unplanned events that do not meet the definition of a MA&D e.g. minor leaks and spills that may be contained within the construction sites are addressed in other relevant Technical Chapters.

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The logo for Lighthouse Green Fuels, featuring the company name in a bold, sans-serif font. The text is white and is contained within a white rectangular box. The background of the top half of the page is a vibrant green, with a blue diagonal stripe running from the bottom left towards the top right, partially overlapping the green area.

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