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20.0 MAJOR ACCIDENTS AND DISASTERS

20.1 Introduction

20.1.1 This chapter of the Preliminary Environmental Information (PEI) Report presents an assessment of the potential Major Accidents and Disasters (MA&Ds) being considered as part of the Environmental Impact Assessment (EIA) for the Proposed Development. The assessment has been undertaken in accordance with best practice guidance, including “Major Accidents and Disasters in EIA: An IEMA Primer”, published by the Institute of Environmental Management and Assessment (IEMA) (IEMA, 2020).

20.1.2 This chapter includes:

- an assessment of reasonably foreseeable worst-case MA&D scenarios that could credibly arise during the construction, operation and decommissioning of the Proposed Development;
- the potential environmental consequences;
- the measures envisaged to prevent or mitigate potentially significant adverse effects of such events on the environment; and
- details of the preparedness for, and proposed response to, MA&D hazards.

20.1.3 The assessment of MA&Ds has incorporated the findings of a number of other key studies, carried out in support of the PEI Report, including the identification of environmental and human health receptors in the vicinity of the Proposed Development, Appendix 9A: Preliminary Flood Risk Assessment (PEI Report, Volume III), and the assessment of the sensitivity of receptors such as ground, groundwater and others.

20.1.4 The main objective of this preliminary assessment is to identify appropriate precautionary actions to prevent, or mitigate, potentially significant risks associated with MA&Ds.

20.1.5 This chapter is supported by the following figure (PEI Report, Volume II) and technical appendix (PEI Report, Volume III):

- Figure 20-1: Major Accidents and Disasters Study Area; and
- Appendix 20A: Long List of MA&Ds Risk Events.

20.2 Legislation and Planning Policy Context

Legislative Background

International Legislation

The Environmental Impact Assessment Directive 2014/ 52/ EU

20.2.1 The topic of MA&Ds was introduced into the EIA Regulations as a result of EU Directive 2014/ 52/ EU, which states, “In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which,

because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment.”

National Legislation

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the ‘EIA Regulations’)

20.2.2 Regulation 5, paragraph 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 states that: *“The significant effects to be identified, described and assessed include, where relevant, the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development.”*

20.2.3 Schedule 4, paragraph 8 requires an Environmental Statement (ES) to provide: *“A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned.”*

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

20.2.4 The HSWA provides a regulatory framework to ensure the provision of a safe working environment of those in the UK. It also includes provision for those visiting a worksite and those who may be affected offsite by workplace emergencies. It includes the requirement to undertake a risk assessment of occupational hazards and apply the hierarchy of controls to mitigate identified risks such that the residual risks are reduced to a level that is As Low As Reasonably Practicable (the ‘ALARP’ principle).

20.2.5 Many associated regulations have been made under the HSWA including, but not limited to the following of relevance to the control of MA&Ds of the Proposed Development:

- The Pipelines Safety Regulations (PSR) (SI 1996 No. 825) (HMSO, 1996) (as amended SI 2023 No. 284);
- The Gas Safety (Management) Regulations (SI 1996 No. 551) (HMSO, 1996);
- The Management of Health and Safety at Work Regulations (SI 1999 No. 3242) (HMSO, 1999);
- The Dangerous Substances and Explosive Atmospheres Regulations (SI 2002 No. 2776) (HMSO, 2002);
- The Control of Substances Hazardous to Health Regulations (SI 2002 No. 2677) (HMSO, 2002);
- The Construction (Design and Management) (CDM) Regulations (SI 2015 No. 51) (HMSO, 2015); and

- The Control of Major Accident Hazards (COMAH) Regulations (SI 2015 No. 483) (HMSO, 2015).

20.2.6 The Proposed Development will be subject to the HSWA and associated regulations, including those listed in paragraph 20.1.5. These regulations will be referenced where appropriate throughout the assessment, however, this assessment does not seek to duplicate the assessment of matters covered by these regulatory regimes. Instead, it assumes that they are embedded in the design and operation of the Proposed Development and are effective in their intent to reduce residual risks to ALARP.

Other Relevant Legislation

20.2.7 The legislative basis for issues which may influence the control of, or responsibility for, MA&Ds, in the UK, includes, but is not limited to, the following regulations. This legislation is referenced where appropriate in the course of this assessment, but, as above, this assessment does not substitute for the appropriate assessment of matters required by these regulations:

- Occupier's Liability Act (SI 1984 No. 3) (HMSO, 1984);
- Civil Contingencies Act (SI 2004 No. 36) (HMSO, 2004);
- The Supply of Machinery (Safety) Regulations (SI 2008 No. 1597) (HMSO, 2008);
- The Provision and Use of Work Equipment Regulations (SI 1998 No. 2306) (HMSO 1998);
- Classification, Labelling and Packaging (CLP) Regulations (SI 2015 No. 21) (HMSO, 2015), which have been retained in law with modifications due to the UK exit from the EU within:
 - The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use) (Amendment etc.) (EU Exit) Regulations (SI 2019 No. 720) (HMSO, 2019) (as amended);
- The Planning (Hazardous Substances) Regulations (SI 2015 No. 627) (HMSO, 2015);
- The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (SI 2016 No. 1107) (HMSO, 2016);
- The Pressure Equipment (Safety) Regulations (SI 2016 No. 1105) (HMSO, 2016); and
- The Environmental Permitting (England and Wales) Regulations (EPR) (SI 2016 No. 1154) (HMSO, 2016).

Planning Policy Context

National Planning Policy

The National Policy Statement for Energy (EN-1) (2011)

20.2.8 The National Policy Statements (NPSs) for energy infrastructure set out the Government's policy for delivery of major energy infrastructure (Department of Energy and Climate Change (DECC), 2011).

20.2.9 The overarching NPS for Energy (EN-1) (Department of Energy & Climate Change, 2011a) provides the primary policy framework within which the Proposed Development will be considered. Published in 2011, this policy statement pre-dates the EIA Regulations and does not contain any specific requirements in relation to MA&D assessment. Of relevance, however, are Section 4.11 of NPS EN-1 'Safety', Section 4.12 'Hazardous Substances', and Section 4.15 'Security Considerations'. Section 4.11 states that the HSE is responsible for enforcing health and safety legislation, some of which is relevant to energy infrastructure, and that some energy infrastructure will be subject to the COMAH Regulations. Section 4.12 states that all establishments wishing to hold stocks of certain hazardous substances above a threshold need Hazardous Substances consent. Section 4.15 states that the Department of Energy and Climate Change (now the Department for Energy Security and Net Zero, (DESNZ) works closely with UK Government security agencies to reduce the vulnerability of the most 'critical' infrastructure assets in the sector to terrorism and other national security threats.

The National Policy Statement for Energy (EN-4) (2011)

20.2.10 The NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Department of Energy & Climate Change, 2011b) references Major Accidents in Section 2.5 'Control of Major Accident Hazards', which refers back to Section 4.11 of EN-1 with respect to the COMAH Regulations; and in Section 2.19 'Gas and Oil Pipelines', which states that the HSE enforces the Pipeline Safety Regulations which are the principal legislation governing the safety of pipelines.

The National Policy Statement for Energy (EN-5) (2011)

20.2.11 The NPS for Electricity Networks Infrastructure (EN-5) (Department of Energy & Climate Change, 2011c) makes no reference to MA&D assessment.

Draft National Policy Statement for Energy (EN-1) (2023)

20.2.12 A revised draft of the NPS for Energy (EN-1) (Department for Energy Security and Net Zero, 2023a) was published in March 2023. No specific requirements in relation to MA&D assessment are included. Sections 4.12 'Safety', 4.13 'Hazardous Substances' and 4.15 'Security Considerations' are analogous to those described above with no major relevant updates.

Draft National Policy Statement for Energy (EN-4) (2023)

20.2.13 A revised draft of the NPS for Energy (EN-4) (Department for Energy Security and Net Zero, 2023b) was published in March 2023. No specific requirements in relation to

MA&D assessment are included. Sections 2.6 'Control of Major Hazards' is analogous to that described above with no major relevant updates.

Draft National Policy Statement for Energy (EN-5) (2023)

20.2.14 A revised draft of the NPS for Energy (EN-5) (Department for Energy Security and Net Zero, 2023c) was published in March 2023. No specific requirements in relation to MA&D assessment are included.

The National Planning Policy Framework (2011)

20.2.15 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government (MHCLG), 2021) refers to hazards in the context of planning decision making in paragraphs 45 and 97 as follows:

"Local planning authorities should consult the appropriate bodies when considering applications for the siting of, or changes to, major hazard sites, installations or pipelines, or for development around them."

"Planning policies and decisions should promote public safety and take into account wider security and defence requirements by ... anticipating and addressing possible malicious threats and natural hazards, especially in locations where large numbers of people are expected to congregate...this includes appropriate and proportionate steps that can be taken to reduce vulnerability, increase resilience and ensure public safety and security."

The Planning Practice Guidance (PPG) for Hazardous Substances (2019)

20.2.16 The Planning Practice Guidance (PPG) for Hazardous Substances (MHCLG, 2019) explains land use planning controls relating to the storage of hazardous substances in England and how to handle development proposals around hazardous establishments. This includes guidance on:

- hazardous substances consent;
- dealing with hazardous substances in plan-making; and
- handling development proposals around hazardous installations.

Local Planning Policy

Redcar and Cleveland Borough Council (RCBC) Local Plan (2018)

20.2.17 The RCBC Local Plan (RCBC, 2018) does not set out any principles for the assessment of MA&Ds. However, it does consider public safety within the context of local development within Policy SD4 – General Development Principles, which states:

"In assessing the suitability of a site or location, development will be permitted where it... avoids locations that would put the environment, or human health or safety, at unacceptable risk."

Stockton-on-Tees Borough Council (STBC) Local Plan (2019)

20.2.18 The STBC Local Plan (STBC, 2019) does not set out any principles for the assessment of MA&Ds. However, it does consider public safety within the context of local development within Policy SD8 – Sustainable Design Principles, which states:

“All proposals will be designed with public safety and the desire to reduce crime in mind, incorporating, where appropriate, advice from the Health and Safety Executive, Secured by Design, or any other appropriate design standards.”

20.2.19 Further, hazardous installations are considered in Policy EG4 – Seal Sands, North Tees and Billingham, which states:

“Proposals which require hazardous substance consent will be designed and located to prevent an unacceptable increase in the level of risk to human health and the environment from an industrial accident or prejudice adjacent operational facilities or allocated sites.”

Hartlepool Borough Council (HBC) Local Plan (2018)

20.2.20 The HBC Local Plan (HBC, 2018) does not set out any principles for the assessment of MA&Ds. However, it does consider public safety within the context of local development within Policy QP5 – Safety and Security which states inter-alia:

“The Borough Council will seek to ensure that all developments are designed to be safe and secure.

Developers will be expected to have regard to the following matters, where appropriate:

1) Adhering to national safety and security standards as set out by central government...”

20.3 Assessment Methodology and Significance Criteria

Definitions

20.3.1 “Major Accidents and Disasters in EIA: An IEMA Primer” published by IEMA (IEMA, 2020) defines ‘major accidents’ and ‘disasters’ as follows:

“A major accident is an event (for instance, train derailment or major road traffic incident) that threatens immediate or delayed serious effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (e.g., contractors) to manage.

A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation, which meets the definition of a major accident above.”

20.3.2 Both natural and accidental causes of MA&Ds are considered in this preliminary assessment to determine the potential impact on sensitive receptors.

20.3.3 The definition of a “major accident” in the context of the PSR (HMSO, 1996) means death or serious injury involving a dangerous fluid (where ‘dangerous fluid’ encompasses certain flammable, toxic, and oxidising fluids, and fluids which react violently with water as specified in Schedule 2 of the PSR) from a fire, explosion or uncontrolled emission from a pipeline.

20.3.4 More specifically, the criteria included in this assessment to define an accident or disaster as ‘major’, has been chosen to align with the criteria for an incident which

would be notifiable to the European Commission as listed within Schedule 5 of the COMAH Regulations. This notification is no longer required following the UK's exit from the EU, however the criteria are still considered relevant to the identification of MA&D, in that it causes:

- an injury to a person which is fatal;
- up to six persons are injured within the establishment and hospitalised for at least twenty-four hours (hrs);
- one person outside the establishment is hospitalised for at least twenty-four hrs;
- a dwelling outside the establishment is damaged and is unusable as a result of the accident;
- the evacuation or confinement of persons for more than two hrs, where the value (persons × hrs) is at least five hundred;
- the interruption of drinking water, electricity, gas or telephone services for more than two hrs, where the value (persons × hours) is at least one thousand;
- damage to property in the establishment, to the value of at least EUR two million;
- damage to property outside the establishment, to the value of at least EUR five hundred thousand;
- permanent or long-term damage to terrestrial habitats involving:
 - 0.5 hectares (ha) or more of a habitat of environmental or conservation importance protected by legislation; or
 - 10 ha or more of more widespread habitat, including agricultural land.
- significant or long-term damage to freshwater and marine habitats involving:
 - 10 km or more of river or canal;
 - 1 ha or more of a lake or pond;
 - 2 ha or more of delta; or
 - 2 ha or more of a coastline or open sea; or
- significant damage to an aquifer or underground water of 1 ha or more.

Guidance

20.3.5 There is no specific guidance available which sets out the approach for undertaking a MA&Ds assessment within an EIA. However, the scope of the assessment has been developed with reference to “Major Accidents and Disasters in EIA: An IEMA Primer” (IEMA, 2020) which lays out emerging best practice. In addition to this guidance, there is a considerable amount of information and guidance available to developers on the identification and control of major hazards associated with industrial chemical

processes, the storage and use of chemicals, and major accident hazard pipelines conveying hazardous fluids.

20.3.6 The Health and Safety Executive (HSE) publishes a number of applicable guidance notes on its website, including:

- Emergency Planning for Major Accidents (HSG 191): COMAH Regulations 2015 (HSE, 2015a);
- Further Guidance on Emergency Plans for Major Accident Hazard Pipelines (HSE, 1996); and
- Reducing Risks, Protecting People: HSE's Decision Making Process (HSE, 1999).

20.3.7 Other guidance that is of relevance to the assessment of MA&Ds includes:

- Chemicals and Downstream Oil Industries Forum Guidelines, Environmental Risk Tolerability for COMAH Establishments (CDOIF, 2017); and
- Chapter 4 of the Cabinet Office's Emergency Preparedness Guidance on Part 1 of the Civil Contingencies Act 2004 (HM Government, 2006).

Study Area

20.3.8 The study area for assessment of MA&Ds is not defined within regulatory guidance or standardised methodology.

20.3.9 A preliminary 5 km study area around the Proposed Development Site (the 'Study Area') has been considered, based on professional judgement, taking into consideration that this area of Teesside includes several installations regulated by the COMAH Regulations (HMSO, 2015) and major accident hazard pipelines regulated by the PSR (HMSO, 1996).

20.3.10 There have been no changes to the MA&Ds Study Area since the publication of the Scoping Report. The Study Area may be refined during the ES stage, as information on the location and risks associated with particular hazards are developed.

Impact Assessment Methodology

20.3.11 MA&Ds scenarios are being considered for each phase of the Proposed Development, namely construction, operation and decommissioning.

20.3.12 The following steps are being followed to identify credible MA&D scenarios for detailed assessment:

- Baseline information relevant to MA&Ds is being collated, including the potential for natural disasters (e.g., as a result of seismic activity or climate change), and the presence of neighbouring industrial facilities, for example, any sites regulated by the COMAH Regulations (HMSO, 2015).
- An assessment of the substances which will be present within the Proposed Development Site is being carried out to identify those classified as hazardous, in accordance with the CLP Regulations (HMSO, 2015). The storage requirements and process uses of hazardous substances are being identified to determine the potential for Risk Events which could constitute a MA&D related to these

substances. Substances which are not classified as hazardous, or are present in relatively minor quantities, can be discounted at this stage.

- A review of the operations and activities carried out throughout the lifecycle of the Proposed Development is being undertaken to determine the potential for Risk Events which could constitute a MA&D related to these activities.
- A long list of Risk Events for MA&Ds is being collated, considering the substances, process and baseline conditions that have been identified. The MA&Ds long list has been updated since the publication of the Scoping Report. The long list of credible MA&D Risk Events is subject to change as more information becomes available over the course of the assessment.
- The long list will not include:
 - Risk Events which could have relatively minor consequences, regardless of the likelihood of occurrence, as they do not fall into the definition of a MA&D; or
 - Risk Events with a high likelihood of occurrence and significant consequences; legislation including COMAH (HMSO, 2015) and PSR (HMSO, 1996) ensures that facilities with this category of risk are not permitted.
- The resulting long list will be subject to a screening assessment. Those MA&D Risk Events which are considered very unlikely to occur (for example, due to the location of the Proposed Development) or for which there is no credible source-pathway-linkage, will not be taken forward for further assessment.
- All remaining MA&D Risk Events will be shortlisted for further assessment. The MA&Ds shortlist has been updated following receipt of the Scoping Opinion dated 17th May 2023 (Appendix 1B: Scoping Opinion, PEI Report, Volume III). The shortlist of MA&D Risk Events is subject to change as more information becomes available during the assessment.

20.3.13 For those MA&D Risk Events which have been scoped in for detailed assessment, the following assessment process is being followed:

- identify Credible Scenarios related to the Risk Event - these constitute a reasonably foreseeable worst-case incident of the identified Risk Event;
- determine the potential impact of Credible Scenarios on receptors using the source – pathway – receptor model;
- assess the magnitude of potential impacts of Credible Scenarios, considering the severity of harm, its duration, and its consequences, as well as its probability of occurrence;
- identify mitigation measures to eliminate the risk where possible; and if not possible, to reduce the risk to a level demonstrated to be ALARP; and
- qualitatively consider the tolerability of any residual risk.

Significance Criteria

- 20.3.14 The MA&Ds chapter provides a qualitative assessment of the tolerability of the residual risk of a significant effect, determined by combining the reasonably foreseeable worst-case consequence and probability categories. Residual risks are categorised via the application of professional judgement as:
- tolerable;
 - tolerable if ALARP (acceptable if appropriate mitigation is enacted to reduce risk to as low as reasonably practicable); or
 - intolerable.
- 20.3.15 The definitions of the above terms are contained in the document, 'Reducing Risks, Protecting People' (HSE 2001).
- 20.3.16 As a general rule, 'tolerable' and 'tolerable if ALARP' risks are considered as being Not Significant in the context of MA&Ds. 'Intolerable risks' are considered to be Significant and require further consideration. Based on professional judgement, a deviation from the general rule may be necessary on a case-by case basis.
- 20.3.17 Risks categorised as 'tolerable if ALARP' generally require further assessment, typically carried out as part of the development of a Safety Report or Safety Case, which may include detailed study, such as a Quantitative Risk Assessment (QRA) or similar, for review by the regulatory authorities. A QRA can demonstrate if the proposed mitigation measures result in an appropriate level of risk reduction based on reasonable practicability. A quantitative assessment of this kind has not been carried out for this preliminary assessment but may be included within the engineering design phase of the project.

Sources of Information and Data

- 20.3.18 The following data sources are being used to inform the assessment, where relevant, supplemented by the knowledge and experience of the assessor who has spent over 20 years working in process engineering and safety for organisations based in Teesside:
- National Risk Register of Civil Emergencies (Cabinet Office, 2017);
 - British Geological Survey (BGS) GeoIndex Onshore (BGS, 2020);
 - HSE's COMAH 2015 Public Information Search (HSE, 2020); and
 - Google aerial and street view maps covering the Study Area (Google, 2020).

Consultation

- 20.3.19 An EIA Scoping Opinion was requested from the Planning Inspectorate ('the Inspectorate') in April 2023. A response was received on 17th May 2023. A high-level summary of responses to the Scoping Opinion relevant to major accidents and disasters is outlined in Table 20-1.



Table 20-1: Responses to Scoping Comments

CONSULTEE	DATE AND METHOD OF CONSULTATION	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
The Inspectorate	17 th May 2023 – Scoping Opinion	An assessment of the potential for leaks and spills of specified substances (including diesel and aqueous ammonia) to the water environment due to road traffic accident or similar should be conducted.	A risk event concerning a loss of containment due to a road traffic accident has been considered at the long list stage. A Traffic Management Plan will be in place for the Proposed Development’s operational phase which will mitigate against a road traffic accident resulting in a spill. This matter will be addressed in more detail at the ES stage if more information becomes available.
The Inspectorate	17 th May 2023 – Scoping Opinion	Marine accidents may be scoped out.	This matter has been scoped out.
The Inspectorate	17 th May 2023 – Scoping Opinion	Given that hydrogen is an emerging technology, the risk of a failure of electricity supply or other systems / utilities should be assessed, including information on how the risks would be managed, including design standards proposed and why these are appropriate, alongside an outline of any management plans.	A risk event concerning a failure in electricity supply has been considered at the long list stage. Backup power generation will be included in the final detailed design to mitigate against a loss of power. Process equipment and instrumentation will be designed to fail to a safe condition. If available, further detail regarding the proposed backup generation will be provided in the ES.
The Inspectorate	17 th May 2023 – Scoping Opinion	An assessment of the potential significant effects of meteorological hazards should be conducted.	Risk events concerning extreme meteorological conditions have been considered at the long list stage. The Proposed Development will be designed in accordance with appropriate engineering standards to mitigate against meteorological impact. Operating and



CONSULTEE	DATE AND METHOD OF CONSULTATION	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
			Emergency Strategies and Procedures will be developed to ensure, as far as reasonably practicable, that the event will not escalate resulting in further environmental impact. Further information will be included in the ES if available at that time.
The Inspectorate	17 th May 2023 – Scoping Opinion	Earthquakes and ground stability may be scoped out.	This matter has been scoped out.
The Inspectorate	17 th May 2023 – Scoping Opinion	Poor air quality in operational phase may be scoped out of MA&D as accidental release of toxic and / or asphyxiant gas is separately scoped in.	Poor air quality has been scoped out. Release of toxic and asphyxiant gases has been scoped in.
The Inspectorate	17 th May 2023 – Scoping Opinion	Wildfires may be scoped out.	This matter has been scoped out.
The Inspectorate	17 th May 2023 – Scoping Opinion	Malicious attack may be scoped out.	This matter has been scoped out.
The Inspectorate	17 th May 2023 – Scoping Opinion	A summary of consents and licences required, the aspects they cover and the application status should be included within the ES and mitigation measures should be clearly described, including how they will be secured and where this is through the Other Consents and Licences document submitted with the DCO application.	The site is anticipated to be an Upper Tier COMAH installation and as such require COMAH notification. Further details on these and other consents, licences and mitigation measures identified will be provided in the ES.



CONSULTEE	DATE AND METHOD OF CONSULTATION	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
The Inspectorate	17 th May 2023 – Scoping Opinion	Construction hazards to waterways and rail should be assessed, where significant effects are likely to occur.	No construction hazards to the waterways are anticipated. The pipelines will pass under existing rail lines and Horizontal Directional Drilling (HDD), a trenchless construction methodology, is proposed at these locations. Discussions are ongoing with the asset protection team at Network Rail regarding agreement on wayleaves and other mitigation measures.
The Inspectorate	17 th May 2023 – Scoping Opinion	Hazards to and from nuclear facilities (Hartlepool Power Station) should be assessed, where significant effects are likely to occur.	Risk events concerning nuclear facilities have been considered at the long list stage. The Proposed Development is not likely to be directly affected in the case of a nuclear release from Hartlepool Power Station. Process equipment and instrumentation will be designed to fail to a safe condition in the event of an evacuation order.
The Inspectorate	17 th May 2023 – Scoping Opinion	The Health and Safety Executive and other relevant consultation bodies should be consulted to agree the scope and methodology of assessment.	Noted.

Use of the Rochdale Envelope

20.3.20 This assessment has applied the Rochdale Envelope principles, which assesses credible, worst-case MA&D Risk Events associated with the Proposed Development. This conservative methodology establishes the worst-case scenarios, the risk of which would be reduced to ALARP by the design and operation of the facilities. At this stage in the project, safety and control systems have not yet been designed for the Proposed Development, however, standard industry approaches to managing risk will be used. In addition, equipment such as process monitoring and safeguarding systems, and embedded mitigation, such as fire, flammable gas, toxic gas and leak detection, fire protection systems and emergency shutdown systems, will be installed as required.

20.4 Baseline Conditions

20.4.1 This section presents a description of the baseline environmental characteristics within the Study Area.

Existing Baseline

Sensitive Environmental Receptors

20.4.2 The following sensitive receptors which could be vulnerable to MA&Ds risks include:

- private residences (and their inhabitants) within the local area;
- local economic receptors, including businesses and employees;
- community receptors, including Public Rights of Way (PROWs), community land, and community buildings;
- the historic and cultural environment, including archaeology and built heritage;
- designated ecological sites, primarily the Teesmouth and Cleveland Coast Ramsar Site, Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI);
- the water environment, including groundwater, the River Tees and the North Sea;
- infrastructure and the built environment, including transport infrastructure, industrial infrastructure and energy infrastructure; and
- the interactions between the receptors above.

Environmental Baseline

20.4.3 The Main Site is located at the mouth of the River Tees, approximately 150 m from the North Sea coast. The surrounding area is predominantly industrial, with a number of protected ecological sites associated with the Tees Estuary, as well as some residential areas.

20.4.4 The Teesmouth and Cleveland Coast Ramsar Site, SPA and SSSI fall within the Study Area, to the immediate north of the Main Site. This covers the Teesmouth estuary, part of the North Sea and important coastal habitats such as sand dune and saltmarsh, supporting invertebrates, waterbirds, and harbour seals and other

protected species. There are no other SPAs, Special Areas of Conservation (SACs) or Ramsar Sites within the 5 km Study Area. Lovell Hill Pools SSSI is located approximately 2.4 km to the south-east of the Proposed Development Site. For further information relating to sensitive environmental receptors, refer to Chapter 3: Description of the Existing Environment (PEI Report, Volume I) and Chapter 12: Ecology and Nature Conservation (PEI Report, Volume I).

- 20.4.5 Also present within the Study Area are the residential population centres of Middlesbrough, Hartlepool, Stockton-on-Tees, Redcar, Billingham and Seaton Carew. The Main Site is generally remote from residential receptors. Marsh Farmhouse is the closest residential receptor, located approximately 1.3 km east of the Main Site in Warrenby. The next closest residential areas to the Main Site are Dormanstown and Coatham, within the district of Redcar and Cleveland. There are further residential receptors close to the Hydrogen Pipeline Corridor, within the districts of Middlesbrough. The estimated total populations of Middlesbrough, Redcar and Cleveland, Stockton-on-Tees, and Hartlepool are 143,900, 136,500, 196,600, and 92,300, respectively (Office for National Statistics (ONS), 2022).
- 20.4.6 Teesside has a temperate oceanic climate typical of the UK. Four earthquakes (of maximum magnitude 3.1) have been recorded in the Study Area since 1994, but none of these were classified by the BGS as significant.
- 20.4.7 As described in Chapter 9: Surface Water, Flood Risk and Water Resources (PEI Report, Volume I), the main risk of flooding to the Proposed Development Site is tidal/fluvial, associated with the North Sea and watercourses in and around the Proposed Development Site. Whilst the Main Site, the CO₂ Export Corridors and the Natural Gas Connections Corridor are located entirely in Flood Zone 1, a significant amount of the Hydrogen Pipeline Corridor is located within Flood Zones 2 and 3. Small areas of the Electrical Connection Corridor, the Other Gases Connection Corridor and the Water Connections Corridor are also located within Flood Zones 2 and 3.

Infrastructure and Industrial Sites

- 20.4.8 The Teesside area is a significant industrial hub, with the chemical industry operating in this location for over a century. Chemical manufacturing still makes up a large proportion of the industrial sites in the area, along with oil and gas facilities and the nearby Hartlepool nuclear power station.
- 20.4.9 There are currently a number of COMAH regulated sites within the Study Area with operations in the following categories:
- bulk and fine chemical installations, with operations including manufacture / production, disposal, storage / warehousing and distribution;
 - fuel processing and storage installations, including refining and distribution;
 - waste storage, treatment and disposal sites;
 - wastewater and sewage collection, supply and treatment; and
 - power generation, supply and distribution.

20.4.10 These sites include:

- Hartlepool Power Station;
- Bran Sands Wastewater Treatment Works;
- Seal Sands and North Tees, Billingham and Wilton Industrial Areas, including (but not limited to):
 - Chemoxy International Ltd.;
 - CF Fertilisers Ltd.;
 - PX (TGPP) Ltd.;
 - Sabic UK Petrochemicals Ltd.;
 - INEOS Nitriles (UK) Ltd.;
 - Inter Terminals Seal Sands Ltd. (Exolum);
 - Vertellus Ltd.;
 - Navigator Terminals; and
 - British Oxygen Co. Ltd.

20.4.11 Due to the nature of industry in Teesside, there is an existing network of buried and above ground pipelines present within the Study Area, including major hazard pipelines, regulated in accordance with the PSR (HMSO, 1996).

20.4.12 As described in Section 10.4 of Chapter 10: Geology, Hydrogeology and Contaminated Land (PEI Report, Volume I), there are existing operational and redundant underground brinefield cavity storage systems at North Tees and Wilton areas. These store large volumes of substances associated with the industrial installations. In addition, they have historically been utilised for natural gas storage, as part of the national grid system.

20.4.13 There is also significant infrastructure associated with the transmission and distribution of energy in the Study Area, including high voltage 400 kilovolt overhead power lines.

20.4.14 Transport infrastructure within the Study Area includes ports, road and rail. Teesport, located approximately 1 km to the south-west of the Main Site, is the UK's fifth largest seaport, handling approximately 28 million tonnes of cargo annually. Primary roads in the area include the A19, A174, A66 and A689. Middlesbrough, Billingham, South Bank, Seaton Carew and South Bank train stations, and their associated rail lines, also fall within the Study Area. Teesside Airport is the nearest airport, located approximately 11.5 km to the south-west of the Proposed Development Site.

Summary of Current MA&D Risks for the Existing Locality

20.4.15 The Proposed Development Site is located within an area which has a number of COMAH installations, forming a 'domino group' as described in Regulation 24 of

COMAH. These are groups of sites where the risks or consequences of a major accident may be increased due to the proximity of the sites to each other. Potential risks include, but are not limited to, fire, explosion, release of (flammable, toxic, asphyxiant, corrosive, environmentally harmful etc.) substances to air, water, ground and groundwater.

20.5 Proposed Development Design and Impact Avoidance

20.5.1 The following impact avoidance measures will either be incorporated into the Proposed Development design or are standard construction or operational measures. These measures have been taken into account during the impact assessment process described in this chapter.

Construction

20.5.2 In compliance with the CDM Regulations 2015 (HSE, 2015b) the client will develop and provide pre-construction information as soon as is practicable and formally appoint a Principal Designer and Principal Contractor.

20.5.3 In compliance with Regulation 6 of the CDM Regulations 2015 (HSE, 2015b) Notification of Construction Works will be submitted to the HSE prior to the commencement of construction. All Project duty holders will comply with the regulations to ensure the Proposed Development construction is carried out in a way that secures health and safety.

20.5.4 Any appointed Principal Contractor will develop the Construction Phase Plan prior to commencing construction works.

20.5.5 The Principal Designer, or where there is no Principal Designer, the Principal Contractor, will ensure that a final Health and Safety File is drawn up and handed to the Client. This will identify any Environmental, Health and Safety information about the project likely to be needed during any subsequent work activities.

20.5.6 The use of suitably experienced contractors, risk assessments, working method statements, operating procedures and personnel training will minimise the risk of accidental scenarios occurring during Proposed Development construction. A Framework Construction Environmental Management Plan (CEMP) will be prepared to accompany the ES submitted with the DCO Application. This will set out how construction activities will be managed and controlled in compliance with accredited health and safety and environmental management systems, relevant legislation and environmental permits, consents and licences.

20.5.7 A Final CEMP will be prepared by the Principal Contractor in accordance with the Framework CEMP prior to construction. The submission, approval, and implementation of the Final CEMP will be secured by a Requirement of the draft DCO.

Operation

20.5.8 The engineering design of the Proposed Development will incorporate a number of philosophies with regard to process safety and safeguarding, isolation, emergency shutdown and depressurisation. The layout of the Main Site will give due

consideration to safety-in design principles with respect to both on-site and off-site receptors.

- 20.5.9 During Proposed Development design, the future operational risks will be managed via a number of studies such as hazard identification (HAZID) and Hazard and Operability (HAZOP). These studies have been, and will continue to be, carried out for the Proposed Development during the ongoing design process. This is a standard approach for the identification of hazards and the development of risk mitigation measures for preventing, or otherwise minimising, hazardous scenarios through appropriate design during the Front-End Engineering Design (FEED) and detailed design stages.
- 20.5.10 The Proposed Development will be operated in line with appropriate standards, whilst the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Proposed Development Site is operating to the appropriate standard.
- 20.5.11 The Production Facility will require an Environmental Permit from the Environment Agency (EA) and will comply with this under the Environmental Permitting (England and Wales) Regulations 2016. The Environmental Permit requires a number of stipulations and requirements to be fulfilled to the satisfaction of the regulators, including use of appropriate control and monitoring procedures, risk assessments, management systems and control measures to minimise the risk of accidents occurring and to minimise the effects of any such accidents on off-site receptors as well as the operational workforce. The permit requires the approach to managing accidents and emergencies to be in accordance with the use of Best Available Techniques (BAT).
- 20.5.12 Due to the expected inventory of dangerous substances which will be present on-site, the Proposed Development is anticipated to be an Upper Tier COMAH installation. The COMAH status will be reviewed as the design develops. The appropriate COMAH notifications are required to be submitted to the Competent Authority (CA), which comprises the HSE and the EA, 3 to 6 months prior to the start of the construction phase. Major accident assessments and studies will be prepared over the course of the design development, and a Safety Case Report and a Major Accident Prevention Plan (MAPP) will be prepared to support the COMAH notification. The COMAH Safety Case Report will include appropriate risk assessment in relation to Major Accidents To The Environment (MATTEs) in line with appropriate HSE Safety Report Assessment Manual (SRAM) criteria used to demonstrate that the application is duly made.
- 20.5.13 Other consents which will be required which are relevant to the design and impact avoidance with respect to MA&Ds include, but are not limited to:
- Hazardous Substances Consent will be obtained from the local planning authority (RCBC) who would consult with the HSE in compliance with The Planning (Hazardous Substances) Regulations (HMSO, 2015);



- A Gas Safety Case will be submitted to the HSE prior to the start of construction of the Natural Gas Connection in compliance with The Gas Safety (Management) Regulations (HMSO, 1996);
- Pipeline Safety Notifications will be submitted to the HSE a minimum of 6 months prior to the start of construction and 14 days before first use of the proposed hydrogen, natural gas and CO₂ pipelines in compliance with the PSR (HMSO, 1996).

20.5.14 Specific operational mitigation measures are also indicated in Table 20-4.

Decommissioning

- 20.5.15 At the end of its design life, decommissioning of the Proposed Development would see the removal of all above ground equipment down to ground level to enable future re-use. It is assumed that all underground infrastructure would remain in-situ; however, all connection and access points would be sealed or grouted to ensure disconnection.
- 20.5.16 All decommissioning and demolition activities will be controlled as applicable in relation to The Dangerous Substances and Explosive Atmospheres Regulations (SI 2002 No. 2776) (HMSO, 2002); The Control of Substances Hazardous to Health Regulations (SI 2002 No. 2677) (HMSO, 2002) and The Construction (Design and Management) (CDM) Regulations (SI 2015 No. 51) (HMSO, 2015).
- 20.5.17 The use of suitably experienced contractors, risk assessments, working method statements, operating procedures and personnel training will minimise the risk of accidental scenarios occurring during Proposed Development decommissioning. The demolition activities will be considered as a HSE notifiable project under The CDM Regulations 2015.
- 20.5.18 A Decommissioning Environmental Management Plan (DEMP) would be produced and agreed with the EA as part of the Environmental Permitting and site surrender process at the appropriate time. The DEMP would set out how decommissioning activities would be managed and controlled in compliance with accredited health and safety and environmental management systems, relevant legislation and environmental permits, consents and licences.

20.6 Likely Impacts and Effects

Construction

Assessment of Hazardous Substances

- 20.6.1 Diesel would be used on the Main Site during construction for fuel for vehicles, plant and mobile power generators. Diesel is classified as flammable and harmful to the aquatic environment. A release which is ignited could cause harm to people via exposure to thermal radiation in a fire. A release which is unignited can cause harm to people if inhaled, ingested or exposed to skin. A release of diesel to the environment such as the River Tees could result in harm to flora and fauna. Quantities of diesel present on the Main Site will, however, be relatively minor.

20.6.2 Liquid concrete could be present in significant quantities during construction of the Proposed Development. It may be produced on the Main Site from cement powder, which is classified as an irritant to skin as contact can cause alkali burns. This substance can harm the eyes and the respiratory system via inhalation of dust. If cement or wet concrete enters drains or watercourses, there is the potential for it to cause harm to the aquatic environment by increasing the pH of the water.

20.6.3 Smaller quantities of other potentially dangerous and / or hazardous materials may also be present on-site. These substances will not be expected to initiate or exacerbate MA&Ds but could be harmful in the event of a major accident that causes loss of containment.

20.6.4 There is the potential for ground contamination to exist within the Proposed Development Site as a legacy of its historic industrial nature. This could include substances which, if released to the environment, have the potential to cause harm.

Review of Activities

20.6.5 Site preparation and remedial works at the Main Site would be completed by Teesworks prior to the commencement of construction of the Proposed Development. Teesworks would obtain the necessary consents and permits to do this work.

20.6.6 The proposed remediation works will be subject to further review following the assessment of ground condition information (a programme of Ground Investigation (GI) works which will include soils and groundwater testing to assess the degree to which the Proposed Development Site is contaminated). The GI will be carried out in accordance with appropriate specifications and standards as laid out in Chapter 10: Geology, Hydrogeology and Contaminated Land (PEI Report, Volume I). Further remedial measures may be required during the construction phase of the Proposed Development. These would be localised, targeted remediation works.

20.6.7 Two phases of construction will then commence as outlined in Chapter 5: Construction Programme and Management (PEI Report, Volume I).

20.6.8 Phase 1 would consist of the construction of the Production Facility at the Main Site, including civil, mechanical and electrical work, connections to the relevant utility networks, including major pipelines, and the majority of the construction of the hydrogen pipeline.

20.6.9 Phase 2 construction at the Main Site would commence once Phase 1 is operational and consist of an additional Hydrogen Unit to increase the capacity of the Production Facility, and three additional spurs of the hydrogen pipeline, amongst other works. Phase 2 would be constructed adjacent to Phase 1 at a suitable safety distance.

Assessment of Shortlisted MA&D Scenarios

20.6.10 Considering the baseline conditions, the hazardous substances present and the identified likely construction activities, a long list of MA&D Risk Events has been prepared. This long list can be found in Appendix 20A: Long List of MA&Ds Risk Events (PEI Report, Volume III), along with justification for the shortlisting of the following MA&D Risk Events:



-
- ground instability;
 - structural collapse / accidental impact;
 - utility (pipeline or electrical cable) strike / unexploded ordnance (UXO) impact;
and
 - release of ground contamination.

20.6.11 Credible Scenarios for construction Risk Events are summarised in Table 20-2. The level of risk presented by all Credible Scenarios has been assessed as ‘tolerable’, taking into consideration the proposed mitigation measures.

20.6.12 Scenarios associated with an accidental release of diesel or liquid concrete were not considered to reach the threshold for a major accident and have not been included within a more detailed assessment.



Table 20-2: Credible Scenarios Related to the Construction of the Proposed Development

SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
C-1	Ground Instability Construction activity results in disturbance of manmade or naturally occurring ground related hazards. Vibration causes ground instability / collapse / settlement.	Localised collapse and subsidence of ground at the surface / surface settlement could lead to uncontrolled movement affecting objects /people / materials / plant / equipment which could cause injury / fatality to persons on site and /or lead to secondary impacts e.g., damage to utilities leading to explosion.	A GI with appropriate testing undertaken according to appropriate specifications and standards will be carried out to understand the potential risks and inform the construction methods to be used. To reduce risks associated with ground instability, there will be use of industry standard construction methods / design features appropriate to the context of the Proposed Development.	Tolerable (Not Significant)
C-2	Structural Collapse / Accidental Impact Construction activity results in damage to structures or impact with workers.	Collapse of new and existing buildings, structures and excavations via accidental impact with vehicles or via other failure mechanism. Other hazards associated with construction traffic movements on site include accidental impact to workers.	Thorough structural engineering design of new structures, assessments of existing structures and temporary structures such as excavations will be in accordance with industry codes and standards. The CEMP will be in place to control potential impacts of construction works. Construction Traffic Management Plan to be submitted with the ES will also be in place.	Tolerable (Not Significant)
C-3	Utility / pipeline / UXO Strike Construction activity such as excavation accidentally	Impact with gas pipeline or UXO, potential risk of fire / explosion and release of harmful gas leading to	Consultation with appropriate stakeholders such as National Grid Gas Transmission, the operator of the Central Area Transmission System (CATS) Pipeline and the EA will be	Tolerable (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
	impacts underground gas pipeline or UXO.	<p>fatality / injury to person(s) on site and member(s) of public.</p> <p>Risk of fire /explosion causes damage to environmental receptor or structural damage to buildings and / or infrastructure.</p> <p>Firewater run-off containing contaminants could contaminate groundwater and / or land or sea habitats including the Teesmouth and Cleveland Coast Ramsar Site, SPA and SSSI.</p>	<p>undertaken to manage interfaces and define appropriate control measures when working close to live pipelines.</p> <p>The DCO Application will be accompanied by a Gas Connection and Pipelines Statement.</p> <p>The CEMP will be in place to control potential environmental impacts of construction works.</p> <p>Control measures will be implemented to prevent fires and procedures will be prepared and implemented to respond to fires, in the event that they were to arise.</p> <p>Possible control measures could include, for example, GPR surveys and magnetometer surveys of site and positive ID of all pipelines prior to construction, in accordance with PAS 120, and will be determined by the Principal Contractor.</p>	
C-4	<p>Release of ground contamination</p> <p>Accidental release of pollutants into groundwater / surface water due to construction activities</p>	<p>Contamination of groundwater.</p> <p>Loss of water supply.</p> <p>Contamination of land or sea habitats including the Teesmouth and Cleveland Coast Ramsar Site, SPA and SSSI, and impacts on dependent species leading to irreversible damage.</p>	<p>A GI including soils testing will be carried out to identify the presence of areas of ground on-site with the potential to contain contaminants.</p> <p>If remedial measures are required based on the GI these may include the placement of clean cover, soil treatment, soil stabilisation,</p>	Tolerable (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
			<p>and/or removal of localised ‘hotspots of identified contamination’ as described in Chapter 10: Geology, Hydrogeology and Contaminated Land (PEI Report, Volume I).</p> <p>Contaminated land removed as part of remediation works will be disposed of as hazardous waste as described in Chapter 21: Materials and Waste (PEI Report, Volume I).</p> <p>The CEMP will be in place to control the potential environmental impacts of construction works.</p> <p>Protective measures related to leaks and spills are presented in PEI Report Chapter 9: Surface Water, Flood Risk and Water Resources (PEI Report, Volume I).</p>	

Operation

Assessment of Hazardous Substances

20.6.13 The key substances which will be present within the Proposed Development Site during operation are summarised in Table 20-3, along with their properties and arrangements for storage and use.

**Table 20-3: Key Hazardous Substances Likely to be Present during Operation of the Proposed Development**

SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
Hydrogen (H ₂)	The production of H ₂ from natural gas is the purpose of the Proposed Development.	H ₂ will be exported off-site using a gaseous phase pipeline network at a maximum operational rate of 44,350 kg/hr. Hydrogen will be stored at the Main Site in an area to the north-west of the main plant area. The storage layout is subject to adjustment following safety engineering consequence modelling. The hydrogen storage will have a capacity of 5 tonnes usable volume (up to 10.3 tonnes total inventory for 100 bar storage pressure or up to 6.4 tonnes at 250 bar storage pressure). Multiple cylinder assemblies are proposed.	Extremely flammable. A qualifying substance under COMAH.	Fire and / or explosion.
Natural gas (comprising a mixture of hydrocarbons; primarily methane (CH ₄))	Raw material for manufacture of H ₂ .	Natural gas will be imported via a pipeline, with a diameter expected to be 24" and connected to the UK high pressure gas supply network. Storage of natural gas on-site is not proposed.	Extremely flammable. A qualifying substance under COMAH.	Fire and / or explosion.
Syngas ('Synthesis Gas') comprising a mixture of hydrogen (H ₂), carbon monoxide (CO), and carbon dioxide (CO ₂)	Produced in an intermediate process stage.	Syngas is a process intermediate and as such transportation and storage of syngas on-site is not proposed.	Toxic and flammable. A qualifying substance under COMAH.	Fire and / or explosion. Harm to people via inhalation if exposed to gas.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
Oxygen (O ₂)	Used in the production process.	O ₂ will be produced on-site in an Air Separation Unit (ASU) or may be supplied from a site nearby. On-site storage of O ₂ is not proposed.	Oxidant. A qualifying substance under COMAH.	May intensify fire. Harm to people via inhalation if exposed to gas in high concentrations.
CO ₂	By-product.	CO ₂ will be compressed and exported off-site using a pipeline network at a maximum rate of 323,420 kg/hr. On-site storage of CO ₂ is not proposed.	Asphyxiant. Not currently a qualifying substance under COMAH.	Harm to people via inhalation if exposed to gas.
Aqueous ammonia (NH ₃)	Used within abatement system to reduce emissions from combustion equipment.	NH ₃ will be imported by road tanker and stored in a chemical storage facility on-site. The initial fill is expected to be 20 m ³ with an annual consumption of 628 m ³ .	Very toxic to aquatic life; Harmful if swallowed; Causes skin burns and eye damage; May cause respiratory irritation. A qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater; Harm to people via inhalation if exposed to vapour or in contact with skin or eyes.
Activated methyldiethanolamine (aMDEA)	Used within carbon capture system.	Amine solution will be imported by road tanker and stored in a chemical storage facility on-site. The initial fill is expected to be 380 m ³ with an annual consumption of 3.1 m ³ .	Causes serious eye irritation. Not a qualifying substance under COMAH.	Minor harm to people if released.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
aMDEA antifoam	Antifoam for use with aMDEA	aMDEA antifoam will be imported by road tanker and stored in a chemical storage facility on-site. The initial fill is expected to be 0.07 m ³ with an annual consumption of 0.1 m ³ .	Toxic to aquatic life with long lasting effects. Not a qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater.
Sodium hypochlorite (NaOCl)	Within the cooling water package	Sodium hypochlorite will be imported by road tanker and a limited quantity will be stored in a chemical storage facility on-site. The initial fill is expected to be 3.4 m ³ with an annual consumption of 46.5 tonnes.	Harmful if swallowed; Causes severe skin burns and eye damage; May cause respiratory irritation; Very toxic to aquatic life with long lasting effects. A qualifying substance under COMAH.	Harm to the environment if released to ground / water /groundwater; Harm to people via inhalation if exposed to vapour or in contact with skin or eyes.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
Bromine (Br)	Within the cooling water package	Bromine will be imported by road tanker and a limited quantity will be stored in a chemical storage facility on-site. The initial fill is expected to be 0.2 m ³ with an annual consumption of 6.5 tonnes.	Fatal if inhaled; Causes severe skin burns and eye damage; Very toxic to aquatic life. A qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater; Harm to people via inhalation if exposed to vapour or in contact with skin or eyes.
Sulphuric acid (H ₂ SO ₄)	Within the cooling water package	Sulphuric acid will be imported by road tanker and a limited quantity will be stored in a chemical storage facility on-site. The initial fill is expected to be 7.2 m ³ with an annual consumption of 153 tonnes.	Causes severe skin burns and eye damage. Not a qualifying substance under COMAH.	Harm to people via inhalation if in contact with skin or eyes.
Carbohydrazide	Within the Boiler Feed Water dosing package	Carbohydrazide will be imported by road tanker and a limited quantity will be stored in a chemical storage facility on-site. The initial fill is expected to be 2.0 m ³ with an annual consumption of 7.9 tonnes.	Harmful if swallowed; Causes skin irritation; May cause an allergic skin reaction; Toxic to aquatic life with long lasting effects.	Harm to the environment if released to ground / water / groundwater; Harm to people in contact with skin.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
			A qualifying substance under COMAH.	
Morpholine	Within the Boiler Feed Water dosing package	Morpholine will be imported by road tanker and a limited quantity will be stored in a chemical storage facility on-site. The initial fill is expected to be 2.0 m ³ with an annual consumption of 17.3 m ³ .	Flammable liquid and vapour; Harmful if swallowed; Harmful in contact with skin; Causes severe skin burns and eye damage; Harmful if inhaled. Not a qualifying substance under COMAH.	Harm to people via inhalation if in contact with skin or eyes.
Hydrogenation catalyst	Process catalyst	Hydrogenation catalyst will be imported by road tanker. The installed volume is expected to be 49.4 m ³ .	Material is considered to be toxic to humans – acute; Material is considered to be a hazard to the aquatic environment chronic.	Harm to the environment if released to ground / water / groundwater; Harm to people in case of release.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
Sulphur removal catalyst	Process catalyst	Sulphur removal catalyst will be imported by road tanker. The installed volume is expected to be 58.4 m ³ .	Material is considered to be a hazard to the aquatic environment -acute.	Harm to the environment if released to ground / water / groundwater;
Ultrapurification sulphur removal catalyst	Process catalyst	Ultrapurification sulphur catalyst will be imported by road tanker. The installed volume is expected to be 6.8 m ³ .	Material is considered to be a hazard to the aquatic environment – acute.	Harm to the environment if released to ground / water / groundwater;
Pre-reforming catalyst	Process catalyst	Pre-reforming catalyst will be imported by road tanker. The installed volume is expected to be 15.3 m ³ .	Material is considered to be toxic to humans – acute. Material is considered to be a hazard to the aquatic environment – chronic. A qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater; Harm to people in case of release.



SUBSTANCE	USE	TRANSPORTATION / STORAGE	HAZARDS	POTENTIAL EFFECTS
Isothermal shift catalyst	Process catalyst	Isothermal shift catalyst will be imported by road tanker. The installed volume is expected to be 15.3 m ³ .	Material is considered to be a hazard to the aquatic environment acute and chronic. A qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater.
Low temperature shift catalyst	Process catalyst	LT shift catalyst will be imported by road tanker. The installed volume is expected to be 146.4 m ³ .	Material is considered to be a hazard to the aquatic environment acute and chronic. A qualifying substance under COMAH.	Harm to the environment if released to ground / water / groundwater.
Diesel	Fuel for backup generators.	Diesel will be imported by road tanker and stored on-site.	Flammable. Harmful to the aquatic environment. A qualifying substance under COMAH.	Minor harm to people on-site in event of release and / or fire; Minor harm to environment if released.



20.6.14 Smaller quantities of other potentially dangerous and / or hazardous materials may also be present on-site. These substances will not be expected to initiate or exacerbate MA&Ds but could be harmful in the event of a major accident that causes loss of containment. For example, if hazardous substances were released during a fire event, due to the failure of storage vessels, which resulted in the hazardous substances being present in the firewater runoff.

Review of Activities

20.6.15 The technology used for the manufacture of H₂ from natural gas is well established and the equipment to be used will be designed and constructed to precise industry standards. This industry is subject to rigorous safety and environmental regulations, with operators of such facilities required to demonstrate integrity via the submission of Safety Case documentation to comply with regulations including COMAH Regulations and PSR. There is a very low risk of failure where that failure could result in the loss of containment of hazardous substances.

20.6.16 Within the Production Facility, natural gas would be treated with heat and steam to break down higher hydrocarbons, primarily to carbon oxides and H₂. This syngas would then be reformed further using pure O₂ and more steam over catalysts in an Auto Thermal Reformer (ATR). After cooling, the syngas would be reacted in water-gas shift reactors to generate H₂ and CO₂. The CO₂ would be removed from the gas via scrubbing with an amine solution.

20.6.17 The pipeline corridors associated with the Proposed Development would contain:

- natural gas and 'other gases' (N₂ and O₂) supplied to the Main Site;
- H₂ delivered to offtakers within the Teesside industrial area; and
- CO₂ which would be exported for storage.

Assessment of Shortlisted MA&D Scenarios

20.6.18 Considering the baseline, the hazardous substances likely to be present, and the operational activities identified, a long list of MA&D Risk Events has been prepared. This long list can be found in Appendix 20A: Long List of MA&Ds Risk Events (PEI Report, Volume III), along with justification for the shortlisting of the following MA&D Risk Events:

- fire caused by loss of containment of flammable gas (H₂ or natural gas), potential for intensification due to presence of O₂;
- explosion;
- toxic gas release (depending on concentration, syngas, CO, CO₂ or O₂);
- asphyxiant gas release (primarily CO₂);
- domino effect (from and to neighbouring industrial facilities); and
- flooding (Coastal, fluvial, pluvial and groundwater).

20.6.19 Credible Scenarios for these Risk Events are drawn up and assessed in Table 20-4. The Credible Scenarios associated with an accidental release of gas have been



assessed as 'tolerable if ALARP' given that at this stage in the assessment process the mitigation measures considered in this assessment are primarily the standard engineering design controls typically included within industrial facilities such as the Proposed Development. These measures are to be confirmed further as the detailed design of the Proposed Development progresses and a QRA or similar detailed safety study(s) produced to assess the level of residual risk. Domino effect and flooding scenarios have been assessed as Tolerable (Not Significant).

- 20.6.20 A risk event associated with a release of environmentally harmful liquids was considered at the long list stage but was not considered to reach the threshold for a MA&D, due to the proposed mitigation measures. Consequently, a potential release of environmentally harmful liquids was not considered to cause significant harm and is assessed as being Tolerable (Not Significant).
- 20.6.21 Another risk event that was considered at the long list stage is a road traffic accident occurring during transport of substances to and from the Main Site via the road network. During operation, the primary raw materials are gaseous and transported via pipeline. Other substances, including catalyst materials and other chemicals in smaller quantities will be transported by road. On public highways, losses in containment of these materials are controlled by regulations for the carriage of dangerous goods including an emergency response plan in case of release of material. Once on site, a Traffic Management Plan will be in place to mitigate the likelihood of a road traffic accident occurring. This may include induction procedures for visiting drivers at site entrance, one-way routes on site, requirements for PPE, and supervision by local staff. Consequently, a road traffic accident resulting in loss of containment of hazardous materials was not considered to cause significant harm and is assessed as being Tolerable (Not Significant).
- 20.6.22 A risk event associated with an incident at the Hartlepool Nuclear Power Station, located approximately 2 km west of the Main Site across the River Tees, was considered at the long-list stage. An incident at this power station could potentially result in a halt of operations associated with the Proposed Development, if it were to fall within any assigned evacuation zone. However, the Proposed Development will be designed to be safe in the event of an extended shutdown and any other effects from an incident at the power station, i.e., thermal radiation and explosion overpressure, are not expected to have a significant impact at the proposed development due to the distance. The Hartlepool Nuclear Power Station has its own set of robust mitigation measures to reduce the risk of a major accident, as such the effect of incident at the power station was assessed as being Tolerable (Not Significant).
- 20.6.23 Accidents as a result of meteorological conditions were also considered as at the long list stage, including consideration of high windspeed, low temperatures and heavy snow, high temperatures / heatwaves, drought, and electrical storms. Operating and Emergency Strategies and Procedures will be developed as part of the Project FEED and Execution Phases to address the Facility's Design Capability and Organisational response to a forecast of a developing Natural Hazards event to ensure, as far as reasonably practicable, that the event will not escalate resulting in further



environmental impact. This will include defining a minimum safe resourcing level for continuing operations which might be appropriate in the event of a natural hazard event or local restrictions to site access, an appropriate basis of design and engineering mitigations to address credible ranges in environmental conditions be that temperature, wind speed, changes in sea level or excess rainfall which could impact continuing safe operations and a range of access routes for the emergency services and site personnel in abnormal conditions. The strategies will define design criteria and the procedures will provide guidance on the actions to be taken at certain threshold levels, including in advance of the event occurring where practicable which may include plant partial or full shutdown, lockdown of the facility or the temporary reduction in activities across the site to ensure the continuing safety of personnel and protection of the environment. Consequently, extreme meteorological conditions were not considered to cause significant harm and is assessed as being Tolerable (Not Significant).



Table 20-4: Credible Scenarios Related to the Operation of the Proposed Development

SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
O-1	<p>Fire and / or Explosion Fire due to loss of containment of natural gas (e.g., by mechanical failure or impact damage) from supply pipeline or process equipment. Ignition of escaped natural gas.</p>	<p>Fire and / or explosion could result in significant harm to people on-site, with the potential for fatal injuries. There is also the potential for harm to people and businesses off-site, such as radiant heat burns and impact injuries from explosions. The environmental impact of a major fire could affect the Teesmouth and Cleveland Coast Ramsar Site, SPA and SSSI, as a result of thermal radiation and run-off of firewater. It is unlikely that this type of accident could impact listed buildings or other heritage sites based on distance. Firewater run-off reaching areas of unmade ground could contain contaminants which</p>	<p>Design of the natural gas systems to industry codes and standards to include separation and segregation of pipework and equipment containing natural gas; inventory isolations and Integrated Control and Safety Systems (ICSS); and minimising operator complexity of operating equipment. Locating occupied buildings away from hazardous zones; and designing occupied buildings within hazardous zones, such as the control room, to withstand a hazardous event and protect the people within for a specific period of time, usually one hour. Compliance with the Pressure Equipment (Safety) Regulations 2016 and the PSR (HSE, 1996). Selection of pipeline routes, depth of cover in areas of higher risk, use of existing established pipe racks and the construction of safety systems to prevent pipeline damage, such as the installation of barriers. Pipeline safety systems and gas / liquid pressure regulation to be installed along with operational controls and monitoring. Leak / natural gas detection systems at the Proposed Development Site and in the vicinity of high hazard areas.</p>	Tolerable if ALARP (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
		<p>would be potentially harmful to ground and groundwater.</p>	<p>Minimising the storage volumes of natural gas by design.</p> <p>Fire detection and fire protection systems will be installed on the Main Site, including passive and active fire suppression systems.</p> <p>The Proposed Development will be designed to contain firewater runoff and prevent material reaching unmade ground or other environmental receptors.</p>	
<p>O-2</p>	<p>Fire and / or Explosion Fire due to loss of containment of H₂ (e.g., by mechanical failure or impact damage) from storage tanks, export pipeline or process equipment.</p>	<p>Immediate ignition of H₂ gas would lead to a localised flash or jet fire depending on gas volume and pressure. Delayed ignition could lead to an explosion and / or fire.</p> <p>Fire and / or explosion could result in significant harm to people on-site, with the potential for fatal injuries.</p> <p>There is also the potential for harm to people and businesses off-site, such as radiant heat burns and impact injuries from explosions.</p> <p>The environmental impact of a major fire could affect the</p>	<p>The H₂ storage location and layout will be subject to adjustment following safety engineering consequence modelling.</p> <p>Design of the hydrogen systems, including storage, to industry codes and standards, including the selection of compatible materials for storage vessels, pipework and process equipment; separation and segregation of pipework and equipment containing hydrogen; inventory isolations and ICSS; and minimising operator complexity of operating equipment.</p> <p>Locating occupied buildings away from hazardous zones, reinforcing and designing occupied buildings within hazardous zones, such as the control room to withstand a hazardous event (safe refuge) and protect the people within for a specific period of time, usually one hour.</p>	<p>Tolerable if ALARP (Not Significant)</p>



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
	<p>Explosion following release of H₂.</p>	<p>Teemouth and Cleveland Coast Ramsar Site, SPA and SSSI, as a result of thermal radiation and run-off of firewater. It is unlikely that this type of accident could impact listed buildings or other heritage sites based on distance.</p> <p>Firewater run-off reaching areas of unmade ground could contain contaminants which would be potentially harmful to groundwater.</p>	<p>Compliance with the Pressure Equipment (Safety) Regulations 2016 and the PSR (HSE, 1996).</p> <p>Selection of pipeline routes, depth of cover in areas of higher risk, use of existing established pipe racks and the construction of safety systems to prevent pipeline damage, such as the installation of barriers.</p> <p>Pipeline safety systems and gas / liquid pressure regulation to be installed along with operational controls and monitoring.</p> <p>Gas leak detection systems such as pressure monitoring instrumentation are to be installed at the Proposed Development Site and in the vicinity of high hazard areas.</p> <p>The details of the containment strategy for the hydrogen storage vessels are not yet known but these will be designed in accordance with industry codes and standards.</p> <p>Fire detection and fire protection systems will be installed on the Main Site, including passive and active fire suppression systems.</p> <p>The Proposed Development will be designed to contain firewater runoff and prevent material reaching unmade ground or other environmental receptors.</p>	



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
			Detailed emergency plans will be produced for the Proposed Development in accordance with all applicable regulations.	
O-3	Fire and / or Explosion Fire or exacerbation of fire due to loss of containment of oxygen (e.g., by mechanical failure or impact damage) from process equipment.	O ₂ is an oxidant and promotes rapid combustion of fuels and other organic materials in the event of ignition. An accidental release of O ₂ could worsen a fire or cause an explosion in a fire scenario, and therefore worsen harm to people and the environment on and off-site, with the potential for fatal injuries.	Design of the O ₂ systems to industry codes and standards. O ₂ will be segregated from flammable materials. Compliance with the Pressure Equipment (Safety) Regulations 2016 and the PSR (HSE, 1996). Pipeline safety systems and gas / liquid pressure regulation to be installed along with operational controls and monitoring. Gas detection and pressure monitoring at the Proposed Development Site and in the vicinity of high hazard areas. Minimising the storage volumes of O ₂ . Fire detection and fire protection systems will be installed on the Proposed Development Site, including passive and active fire suppression systems. Detailed emergency plans will be produced for the Proposed Development in accordance with the Environmental Permit and all applicable Regulations.	Tolerable if ALARP (Not Significant)
O-4	Toxic Gas Release	Release of syngas could result in significant harm to people on the Main Site. The impact	Design of the process systems to industry codes and standards.	Tolerable (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
	<p>Release of syngas containing CO (e.g., by mechanical failure or impact damage) from process equipment.</p>	<p>of the release on people and the environment depends on the pressure, temperature and mass of material that is lost, however, there is the potential for fatal injuries from inhalation of toxic material. The potential for harm to people off-site is low due to the additional levels of containment that would have to be breached and the dispersal and dilution of any toxic materials over the distances involved.</p>	<p>Compliance with the Pressure Equipment (Safety) Regulations 2016 and the PSR (HSE, 1996). Pipeline safety systems and gas / liquid pressure regulation to be installed along with operational controls and monitoring. Gas detection and pressure monitoring at the Proposed Development Site and in the vicinity of high hazard areas. Isolation valves in the pipeline system to minimise inventory release to the atmosphere. Use of containment measures and barriers to prevent further loss of containment. Detailed emergency plans will be produced for the Proposed Development in accordance with the Environmental Permit and all applicable Regulations.</p>	
<p>O-5</p>	<p>Asphyxiant Gas Release Release of CO₂ (e.g., by mechanical failure or impact damage) from export pipeline or</p>	<p>Release of CO₂ could result in significant harm to people on-site. The impact of the release on people and the environment depends on the pressure, temperature and mass of material that is lost, however, there is the potential for fatal injuries from</p>	<p>Design of the process systems to industry codes and standards. Compliance with the Pressure Equipment (Safety) Regulations 2016 and the PSR (HSE, 1996). Pipeline safety systems and gas / liquid pressure regulation to be installed along with operational controls and monitoring.</p>	<p>Tolerable (Not Significant)</p>



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
	process equipment.	asphyxiation as CO ₂ is odourless and heavier than air. The potential for harm to people off-site is low due to the additional levels of containment that would have to be breached and the dispersal and dilution of any asphyxiant materials over the distances involved.	Gas detection and pressure monitoring at the Proposed Development Site and in the vicinity of high hazard areas. Isolation valves in the pipeline system to minimise inventory release to the atmosphere. Use of containment measures and barriers to prevent further loss of containment. Detailed emergency plans will be produced for the Proposed Development in accordance with the Environmental Permit and all applicable Regulations.	
O-6	Domino Effects Domino effects from incidents at neighbouring facilities	Fire and / or explosion, toxic release, discharges to air and water from neighbouring facilities such that these impact on the Proposed Development triggering further fire, explosion, or release of toxic or asphyxiant materials from the Proposed Development.	The Cleveland Emergency Planning Unit (CEPU) provides an emergency planning service to ensure that local authorities are prepared to respond to emergencies and to support the emergency services and the community. This organisation provides information to businesses and has many years' experience working with COMAH sites and operators of major pipelines in Hartlepool, Middlesbrough, Stockton on Tees and Redcar and Cleveland. It is a requirement of the COMAH Regulations that neighbouring upper tier sites should review and update their off-site emergency plans and Safety Reports to take into consideration potential impact of domino sites, which could potentially include this Proposed	Tolerable (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
			<p>Development. This ensures that domino effects are assessed in detail by major accident installations. It is expected that existing safety precautions at neighbouring industrial sites will mitigate the risk of domino effects occurring.</p> <p>Should new developments take place near to the Proposed Development in the future these will need to be sited to prevent domino effects from occurring by following the HSE standard land use planning methodology (Planning Advice for Developments near Hazardous Installations (PADHI) assessment (HSE, 2023)).</p>	
<p>O-7</p>	<p>Flooding A tidal or river flood event causes the Proposed Development to flood</p>	<p>The consequences of flooding the Main Site could include contamination with polluting substances, destabilising assets and compromising the integrity of plant and equipment.</p> <p>Floodwater reaching electrical equipment could trigger knock-on impacts to the electrical systems and present a risk to health due to electrocution.</p>	<p>A Preliminary Flood Risk Assessment (FRA) is included with the PEI Report (Appendix 9A: Flood Risk Assessment (PEI Report, Volume III)). This will be used to inform the detailed design of the Proposed Development in terms of surface water management and selection of finished floor levels.</p> <p>Mitigation measures are described in the FRA include identifying a suitable level of the development platform for the Main Site, building the Proposed Development using Flood Resistant and Resilient Design standards, a system for monitoring flood warnings, and the development of a Flood Emergency Response Plan.</p>	<p>Tolerable (Not Significant)</p>



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
			<p>Electrical equipment such as transformers and switchgear are to be located above predicted flood levels.</p> <p>Flooding guidance is provided by the EA for sites regulated under the EPR (2016).</p>	



Decommissioning

Assessment of Substances

- 20.6.24 During decommissioning there is the potential for process fluids to remain in-situ in the event of a failure to fully de-inventory process systems and pipework. An accidental release of these substances could result in a fire and / or explosion in the event of contact with an ignition source, with the potential for significant harm to persons on-site.
- 20.6.25 Waste materials would be generated during the decommissioning and demolition process. However, these would be recycled wherever possible and managed in accordance with the legislation applicable at the time. For further information regarding waste management, refer to Chapter 21: Materials and Waste (PEI Report, Volume I).

Review of Activities

- 20.6.26 Activities carried out during decommissioning would be similar to those carried out during construction, with the significant potential hazards including ground stability and vehicle impacts on-site. Decommissioning would involve a significant process of dismantling above and below-ground structures and the removal or capping off of pipelines. This activity has the potential for an accidental loss of containment of process fluids as described in Section 20.5.

Assessment of Shortlisted MA&D Scenarios

- 20.6.27 Considering the baseline, the hazardous substances likely to be present, and the identified decommissioning and demolition activities, a review of credible MA&D Risk Events contained in Appendix 20A: Long List of MA&Ds Risk Events (PEI Report, Volume III), concluded that the only MA&D Risk Event shortlisted for further assessment is fire / explosion.
- 20.6.28 Credible Scenarios for decommissioning Risk Events are summarised in Table 20-5. The level of risk presented by all Credible Scenarios has been assessed as 'tolerable', taking into consideration the proposed mitigation measures.



Table 20-5: Credible Scenarios Related to the Decommissioning of the Proposed Development

SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
D-1	Fire and / or Explosion Demolition activity results in a loss of containment of gas as a result of failure to de-inventory process systems.	Process pipework and equipment containing extremely flammable gases (H ₂ , natural gas) and/or O ₂ , which is not fully removed prior to demolition activities has the potential to result in a fire and / or explosion causing significant harm to persons carrying out this work.	There are legislative requirements to control this work to ensure it is carried out safely. The demolition phase will be a notifiable project under CDM Regulations. Risk assessments will be produced prior to demolition activities, which are only to be carried out by suitably trained and experienced personnel. Activities with a high level of risk such as hot work (activities such as welding or using tools where there is a risk of ignition in a hazardous area) will be strictly controlled. Job method statements will include gas testing systems to ensure they have been fully vented and are clean prior to demolition. Compliance with safety legislation by the implementation of controls is considered to be sufficient to reduce risks to a level which is tolerable.	Tolerable (Not Significant)
D-2	Exposure to toxic catalyst material as a result of failure to de-inventory process systems	Catalyst material which is not fully removed from the catalyst beds prior to demolition activities has the potential to result in the	There are legislative requirements to control this work to ensure it is carried out safely. Risk assessments will be produced prior to demolition activities, which are only to be carried	Tolerable (Not Significant)



SCENARIO REFERENCE	CREDIBLE SCENARIO	POTENTIAL IMPACTS	EMBEDDED MITIGATION	TOLERABILITY
		dispersion of this material as dust causing significant harm to persons carrying out this work.	<p>out by suitably trained and experienced personnel.</p> <p>Job method statements will include checks to ensure process equipment has been fully de-inventoried and are clean prior to demolition.</p> <p>Compliance with safety legislation by the implementation of controls is considered to be sufficient to reduce risks to a level which is tolerable.</p>	



20.7 Mitigation and Enhancement Measures

Construction

- 20.7.1 All assessed Credible Scenarios during the construction phase of the Proposed Development have been assessed as having a Tolerable level of risk (which is Not Significant). The embedded mitigation measures proposed during construction are considered to be sufficient and secondary mitigation is not proposed at this point. This will be reviewed as the EIA progresses and confirmed in the ES.

Operation

- 20.7.2 The assessed Credible Scenarios identified during the operational phase of the Proposed Development have been assessed as having a level of risk which is Tolerable or Tolerable if ALARP (Not Significant). The embedded mitigation measures are considered to be sufficient and secondary mitigation is not proposed at this point.
- 20.7.3 However, further measures will be defined as the design of the Proposed Development design progresses and will be detailed in the ES. Further analysis may be carried out which includes detailed QRA and / or modelling assessments to determine whether the level of residual risk to people, both on-site and off-site, and to the environment, is ALARP.

Decommissioning

- 20.7.4 The Credible Scenario identified during the decommissioning phase of the Proposed Development has been assessed as having a Tolerable level of risk (Not Significant). The embedded mitigation measures are considered to be sufficient and secondary mitigation is not proposed at this point. This will be reviewed as the EIA progresses and confirmed in the ES.

20.8 Limitations and Difficulties

- 20.8.1 This assessment is based on construction, preliminary design, process and decommissioning information that is currently available and early appraisal of potential hazards. These will be refined and reappraised as the Proposed Development's design progresses and reported in the ES.

20.9 Residual Effects and Conclusions

- 20.9.1 It is considered that all MA&D Risk Events identified during the construction, operation and decommissioning of the Proposed Development would be Tolerable or Tolerable if ALARP (Not Significant). No additional mitigation is considered necessary at this stage. Therefore, the residual effects are Not Significant.

Cumulative Effects

- 20.9.2 The MA&Ds assessment has implicitly considered cumulative effects that may arise due to other major accident hazard installations and pipelines in the area (domino effects) which are knock-on impacts (e.g., fire at one installation which causes an explosion at another installation).

20.10 References

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