

Connah's Quay Low Carbon Power

Environmental Statement Volume II Chapter 22: Major Accidents and Disasters

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22. Major Accidents and Disasters

22.1 Introduction

Overview

- 22.1.1 This chapter of the Environmental Statement (ES) presents an assessment of the likely significant environmental effects of the Connah's Quay Combined Cycle Gas Turbine (CCGT) fitted with Carbon Capture Plant (CCP) (hereafter referred to as the Proposed Development) with respect to Major Accidents and Disasters (MA&Ds) during the construction, operation (including maintenance), and decommissioning phases of the Proposed Development. A description of the Proposed Development, including details of maximum parameters, is set out in **Chapter 4: The Proposed Development (EN010166/APP/6.2.4)**. The assessment has been developed in accordance with best practice as set out within guidance prepared by the Institute of Environmental Management and Assessment (IEMA)¹ (Ref 22-1).
- 22.1.2 This chapter includes an assessment of reasonably foreseeable worst-case MA&Ds scenarios that could credibly arise during the construction, commissioning, operation (including maintenance) 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&Ds hazards. The main objective of this assessment is to identify appropriate precautionary actions to prevent and mitigate potentially significant risks associated with MA&Ds.
- 22.1.3 The assessment of MA&Ds has incorporated the findings of several other key studies carried out in support of the ES, including the identification of environmental and human health receptors in the vicinity of the Proposed Development and the assessment of the vulnerability of resources and receptors such as ground, groundwater and surface water, amongst others. The receptors identified in this Chapter are based on those identified in the following chapters in **ES Volume II**:
- **Chapter 4: The Proposed Development (EN010166/APP/6.2.4);**
 - **Chapter 8: Air Quality (EN010166/APP/6.2.8);**
 - **Chapter 10: Traffic and Transport (EN010166/APP/6.2.10);**
 - **Chapter 11: Terrestrial and Aquatic Ecology (EN010166/APP/6.2.11);**
 - **Chapter 13: Water Environment and Flood Risk (EN010166/APP/6.2.13);**

¹ The Institute of Environmental Management Assessment (IEMA) has changed its name to the Institute of Sustainability and Environmental Professionals (ISEP). Where general reference is made to the institute in this document, the following distinction has been made: ISEP (formerly IEMA). When referencing legacy IEMA documents, this distinction is not made.

- **Chapter 17: Terrestrial Heritage (EN010166/APP/6.2.17);**
- **Chapter 18: Marine Heritage (EN010166/APP/6.2.18); and**
- **Chapter 20: Climate Change (EN010166/APP/6.2.20).**

22.1.4 This chapter is supported by the following figures in **ES Volume III (EN010166/APP/6.3)**:

- **Figure 3-3: Areas Described in the ES;** and
- **Figure 22-1: Listed COMAH Sites within 5km of the Construction and Operation Area.**

22.1.5 **Figure 3-3: Areas Described in the ES (EN010166/APP/6.3)** identifies the different components of the Order limits which are referenced throughout this chapter.

22.1.6 This chapter is supported by the following appendices in **ES Volume IV (EN010166/APP/6.4)**:

- **Appendix 1-A: Scoping Report;**
- **Appendix 1-B: Scoping Opinion;**
- **Appendix 2-B: Scoping Opinion Responses;**
- **Appendix 7-A: Legislative, Policy and Guidance Framework for Technical Topics;** and
- **Appendix 22-A: Long List of MA&Ds Risk Events.**

Legislation, Policy and Guidance

22.1.7 Legislation, planning policy, and guidance relating to MA&Ds and pertinent to the Proposed Development are listed in **Table 22-1**. Further detail regarding these can be found in **Appendix 7-A: Legislative, Policy and Guidance Framework for Technical Topics (EN010166/APP/6.4)**.

Table 22-1: Legislation, Planning Policy, and Guidance relating to Major Accidents and Disasters

Type	Legislation, Policy and Guidance
Legislation	<ul style="list-style-type: none"> • Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017 (Ref 22-2); • The EIA Directive 2014/52/EU393 (Paragraph 15) (Ref 22-3); • The Control of Major Accident Hazards (COMAH) Regulations 2015 (Ref 22-4); • The Health and Safety (Amendment) (EU Exit) Regulations 2018 (Ref 22-5); • The Pipelines Safety Regulations 1996 (PSR) (Ref 22-6); • The Planning (Hazardous Substances) (Wales) Regulations 2015 (Ref 22-7); • Planning (Hazardous Substances) Act 1990 (Ref 22-8);

Type	Legislation, Policy and Guidance
	<ul style="list-style-type: none"> • The Environmental Permitting Regulations 2016 (EPR) (Ref 22-9); • Health and Safety at Work etc. Act 1974 (Ref 22-10); • The Workplace (Health, Safety and Welfare) Regulations 1992 (Ref 22-11); • The Gas Safety (Management) Regulations 1996 (Ref 22-12); • The Lifting Operations and Lifting Equipment Regulations 1998 (Ref 22-13); • The Management of Health and Safety at Work Regulations 1999 (Ref 22-14); • The Dangerous Substances and Explosive Atmospheres Regulations 2002 (Ref 22-15); • The Control of Substances Hazardous to Health Regulations 2002 (COSHH) (Ref 22-16); • Civil Contingencies Act 2004 (Ref 22-17); • The Regulatory Reform (Fire Safety) Order 2005 (Ref 22-18); • The Building Regulations 2010 (Ref 22-19); • Construction Design Management (CDM) Regulations 2015 (Ref 22-20); • The Supply of Machinery (Safety) Regulations 2008 (Ref 22-21); • The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 (Ref 22-22). • Pressure Equipment (Safety) Regulations 2016 (Ref 22-23); and • Classification, Labelling and Packaging (CLP) Regulations 2015 (Ref 22-24).
National Planning Policy	<ul style="list-style-type: none"> • The Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 22-25); • The NPS for Natural Gas Electricity Generating Infrastructure (EN-2) (Ref 22-26); • The NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 22-27); • The NPS for Electricity Networks Infrastructure (EN-5) (Ref 22-28); and • Planning Policy Wales (PPW) (Ref 22-29).
Local Planning Policy	<ul style="list-style-type: none"> • Flintshire County Council (FCC) Local Development Plan (LDP) (2015-2030) (Ref 22-30).
National Guidance	<ul style="list-style-type: none"> • IEMA, Major Accidents and Disasters in EIA: A Primer 2020 (Ref 22-1);

Type	Legislation, Policy and Guidance
	<ul style="list-style-type: none"> • Health and Safety Executive (HSE), Emergency Planning for Major Accidents (HSG 191): COMAH Regulations 2015 (Ref 22-31); • HSE, Further Guidance on Emergency Plans for Major Accident Hazard Pipelines (1996) (Ref 22-32); • HSE, Reducing Risks, Protecting People: HSE's Decision Making Process (2001) (Ref 22-33); • HSE Major Hazard Regulatory Model: Safety Management in Major Hazard Sectors (Ref 22-34); • Chemicals and Downstream Oil Industries Forum (CDOIF) Guidelines, Environmental Risk Tolerability for COMAH Establishments (Ref 22-35); • Chapter 4 of the Cabinet Office's Emergency Preparedness Guidance on Part 1 of the Civil Contingencies Act 2004 (Ref 22-36); • DEFRA, The Green Leaves III Guidelines for Environmental Risk Assessment (Ref 22-37); • BSI, 2018; BS ISO 31000:2018 Risk Management-Guidelines (Ref 22-38); and • Department for the Environment, Guidance on the Interpretation of Major Accidents to the Environment (MATTE for the purposes of COMAH Regulations 2023 (Ref 22-39).

22.2 Consultation and Scope of Assessment

Consultation

EIA Scoping Opinion

- 22.2.1 A request for an EIA Scoping Opinion was sought from the Secretary of State (SoS) through the Planning Inspectorate (PINS) in February 2024 as part of the EIA Scoping process. The EIA Scoping Opinion was adopted on 20 March 2024 (**Appendix 1-B: Scoping Opinion (EN010166/APP/6.4)**).
- 22.2.2 Key issues raised in the EIA Scoping Opinion are summarised and responded to in **Appendix 2-B: Scoping Opinion Responses (EN010166/APP/6.4)**. All issues have been considered during the EIA process. EIA Scoping Opinion responses are provided in **Table 22-2** and statutory consultee responses are provided in **Table 22-3**.

Statutory Consultation

- 22.2.3 No responses relevant to Major Accidents and Disasters were received in response to Statutory consultation.

Targeted Consultation

- 22.2.4 Following Statutory Consultation changes were made to the heights of the proposed absorber and HRSG stacks and the Applicant undertook further

targeted consultation. This consultation included a Supporting Information Report which detailed the environmental considerations associated with these changes. This Targeted Consultation was held between Thursday 8 May to Friday 6 June 2025. Responses to this targeted consultation are presented in the **Consultation Report (EN010166/APP/5.1)** and **Table 22-4** below outlines how and where these comments have been addressed within this chapter.

Additional Relevant Engagement

22.2.5 No further engagement has been deemed necessary.

Table 22-2: Scoping Opinion Responses

Comment ID	Consultee	Comment	Response
3.14.1	PINS	<i>'The Scoping Report proposes to scope out an assessment of the following hazards for the construction phase: Other industrial hazards; Meteorological hazards; Hydrological hazards; Geophysical hazards; Other natural hazards; and, Societal hazards. These matters are proposed to be scoped out on the basis that the likelihood of a major accident or disaster is low given the relatively short duration of the construction phase and small chemical inventory. Based on the information in the Scoping Report, [PINS] 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>	This position on the scope of the construction phase assessment is acknowledged and has been applied to this chapter.
3.14.2	PINS	<i>'The Scoping Report proposes to scope out an assessment of the following hazards for the commissioning phase: Other industrial hazards; Meteorological hazards; Hydrological hazards; Geophysical hazards; Other natural hazards; and, Societal hazards. These matters are proposed to be scoped out on the basis that the likelihood of a major accident or disaster is low given the relatively short duration of the commissioning phase. Based on the evidence presented in the Scoping Report, the Inspectorate is content that risks to or from the Proposed Development from these matters are not likely to result in significant effects. These matters can be scoped out of the assessment.'</i>	This position on the scope of the operational phase assessment is acknowledged and has been applied to this chapter.
3.14.3	PINS	<i>'The Inspectorate directs the Applicant to comments in ID 2.1.11, which should be addressed in the ES in relation to decommissioning and therefore does not agree to scope out this matter on the information provided.'</i>	An assessment of the decommissioning of the Proposed Development is provided in Section 22.6.

Comment ID	Consultee	Comment	Response
N/A	HSE	<p><i>'With reference to the red lined Indicative Site Boundary shown on Plate 1-1 Indicative DCO Site Layout contained in document [Connah's Quay Low Carbon Power (Uniper), Scoping Report, Document Reference 60717119-AECOM] areas of the Proposed Development fall within HSE public safety zones associated with Major Accident Hazard Pipeline(s) and Major Hazard Installation(s): Pipeline(s)</i></p> <ul style="list-style-type: none"> <i>• 21 Feeder Mickle Trafford / Deeside [HSE ref 7630, Transco ref: 1881]-Pipeline Operator: National Grid Gas PLC</i> <i>• NTS (Burton Point) to Connah's Quay PS Pipeline [HSE ref 11891]-Pipeline Operator: Uniper</i> <i>• Point of Ayr to Connah's Quay Pipeline [HSE ref 11888]-Pipeline Operator: ENI Liverpool Bay Operating Company</i> <p><i>Major Hazard Installation(s)</i></p> <ul style="list-style-type: none"> <i>• H4216 Tata Steel UK Ltd, Flintshire</i> <p><i>There is currently insufficient information available for HSE to provide its' public safety Land Use Planning Advice. However, by way of general guidance HSE would not advise against the Proposed Development providing no population(s), either temporary or permanent, is introduced within any of HSE's public safety zones nor would HSE advise against Workplaces (DT1.1-Workplaces)*, providing for less than 100 occupants in each building and less than 3 occupied storeys.'</i></p>	<p>As described in Section 22.3, potential domino effects would be considered as part of the COMAH process for the Proposed Development which would ensure risks are mitigated to be As Low As Reasonably Practicable (ALARP).</p>
N/A	HSE	<p><i>'The presence of hazardous substances on, over or under land at or above set threshold quantities (Controlled Quantities) may require Hazardous Substances Consent (HSC) under the Planning (Hazardous Substances) Act 1990 as amended. The substances, alone or when aggregated with others, for which HSC is required,</i></p>	<p>Section 22.5 identifies that the Proposed Development would require Hazardous Substances Consent. Section 22.6 provides a summary of the hazardous substances to be used on site within each of the relevant</p>

Comment ID	Consultee	Comment	Response
		<p><i>and the associated controlled quantities, are set out in The Planning (Hazardous Substances) (Wales) Regulations 2015.</i></p> <p><i>Hazardous Substances Consent would be required if the site is intending to store or use any of the named hazardous substances or categories of substances and preparations at or above the controlled quantities set out in schedule 1 of these Regulations.</i></p> <p><i>Further information on HSC should be sought from the relevant Hazardous Substances Authority.'</i></p>	<p>phases of the Proposed Development.</p>

Table 22-3: Statutory Consultee Responses

Consultee	Comment	Response
HSE	<i>'HSE's land use planning advice: CEMHD5 has nothing further to add to the previous consultation response. CEMHD7 response remains the same as previous response of no comment to make as there are no HSE Licensed explosives sites in the vicinity of the Proposed Development.'</i>	This position is acknowledged and the substance of previous consultation responses is shown in Table 22-2 .
Natural Resources Wales (NRW)	<i>'Chapter 22 (Major Accidents and Disasters) of the PEIR includes Table 22-5: Hazardous Substances Likely to be Present during the Operation of the Proposed Development, which lists these as:</i> <ul style="list-style-type: none"> <i>• Natural gas (comprising a mixture of hydrocarbons; primarily methane (CH₄))</i> <i>• CO₂ gaseous</i> <i>• Amine solvent</i> <i>• Ammonia Solution</i> <i>• Diesel</i> <i>• SCR catalyst'</i> 	This position is acknowledged. The substances likely to be present onsite are detailed in Table 22-6 of this chapter. The PEIR also referenced the presence of BESS chemicals, but the client has since confirmed that no BESS is proposed as part of the development.
NRW	<i>'During the operational phase, the development has the potential to cause pollution incidents as a consequence of fire and explosion. We therefore advise that an outline Battery Safety Management Plan (oBSMP) should be provided that secures pollution prevention measures during operation. This should set out the key fire safety provision for the BESS and include measures for fire reduction and protection. We recommend that you seek the advice of the North Wales Fire and Rescue Service in relation to the oBSMP.'</i>	The Applicant considers that the backup electrical battery does not constitute a BESS. Therefore, there is no need for an oBSMP.

Consultee	Comment	Response
NRW	<i>'The oBSMP will be an important document for the purpose of describing water management measures to control surface water runoff and to drain hardstanding and other structures. We advise this includes runoff from any incidents including fire suppression water. The management of water run-off would be particularly important in the event of a fire (e.g. at the BESS) and the need to use substantial amounts of water. The ES and oBSMP should set out the precautions that will be in place to contain any firewater produced and how firewater will be disposed of without causing pollution. We advise the use of penstocks as a means of preventing firewater contaminating watercourses.'</i>	The Applicant considers that the backup electrical battery does not constitute a BESS. Therefore, there is no need for an oBSMP.
NRW	<i>'Where CO₂ capture plants use dangerous substances in quantities above a certain threshold the COMAH Regulations 2015 will apply to the whole site. If this is the case, Uniper will be required to apply for a Hazardous Substances consent from the Local Authority and notify the Competent Authority.'</i>	This comment is acknowledged. The Applicant will engage the Local Authority (FCC) and Competent Authority with regards to the COMAH Regulations 2015 and Hazardous Substances consent. Further information is provided in the Consents and Agreement Position Statement (EN010166/APP/3.3) document.
Office for Nuclear Regulation (ONR)	<i>'The Proposed Development lies within a nuclear site consultation zone. When consulted on formal planning applications around nuclear sites, ONR will provide advice to Local Planning Authorities (LPAs), where those planning applications meet with ONR's consultation criteria. ONR may also make representations to LPAs when consulted regarding Local Development Plans and Strategies.'</i>	The Proposed Development is located approximately 9 km from the Urenco facilities at Capenhurst and lies within the 12 km ONR consultation zone for major hazard facilities. It is highly unlikely that the Proposed Development would represent an external hazard to the existing nuclear installation. We note that the existing refinery at Stanlow lies much closer to the Urenco site. Appropriate consequence modelling would be undertaken as part of the detailed design phase.

Consultee	Comment	Response
	<p><i>The advice that ONR provides is dependent on the specific details of the planning application. Therefore, ONR does not comment on pre-planning applications.</i></p> <p><i>After receiving a request for consultation on a formal planning application ONR would consider the following questions:</i></p> <ul style="list-style-type: none"> <i>Does the Proposed Development represent an external hazard to a nuclear installation; and</i> <i>Could the Proposed Development be accommodated within the Local Authority off-site emergency planning arrangements.</i> <p><i>If ONR had significant health and safety concerns on either count then it would advise against the development. If ONR was satisfied that the Proposed Development could be accommodated within the Local Authority off-site emergency planning arrangements and that it posed no external hazard to the installation, then ONR would have no grounds to advise against.'</i></p>	<p>Due to the anticipated inventory at the Main Development Area², it is anticipated that the Main Development Area would be a COMAH establishment, and as such a Major Accident Prevention Policy (MAPP) would be developed. On and off site emergency plans would be put in place, which would be agreed with the HSE and FCC. The HSE would advise on potential domino effects from and to the side with neighbouring, existing COMAH establishments.</p> <p>On this basis it is anticipated that there would be no grounds for the ONR to advise against the development.</p>
FCC	<p><i>'The submitted environmental statement will need to have regard for PPW (edition 12, 2024) and any relevant legislation and guidance such as relevant Technical Advice Notes that is in force / adopted in Wales.</i></p> <p><i>Also the application should have regard to the respective and relevant policies within the Flintshire LDP adopted by the Council on 24 January 2023.'</i></p>	<p>The assessment has been completed with regard to the latest edition of the PPW and the FCC LDP.</p>

² As shown in **Figure 3-3: Areas described in the ES (EN010166/APP/6.3)**.

Table 22-4: Targeted Consultation

Consultee	Summary of Comment	Response
Flint Town Council	<p>The Council expects:</p> <ul style="list-style-type: none"> - Transparent, accountable mitigation strategies for all identified environmental risks—including noise and vibration (e.g., from pile driving) in relation to nearby Listed Buildings; - Clear summaries of these assessments for public understanding; <p>Full details of compensation mechanisms available to adversely affected residents and businesses, including:</p> <ul style="list-style-type: none"> - How compensation will be calculated, - Who will administer the scheme, - How the public will be made aware of it. <p>Additionally, the Council requests:</p> <ul style="list-style-type: none"> - Clarification on how often the project's environmental performance will be reviewed and how local residents will be kept informed of those findings. 	<p>Details of all mitigation and monitoring proposed is included within the Commitments Register (EN010166/APP/6.10).</p>

Scope of the Assessment

22.2.6 Following the conclusions of the EIA Scoping process, this assessment considers:

- hazards from materials and activities undertaken during construction, commissioning, operation (including maintenance) and decommissioning associated with the Proposed Development; and
- MA&Ds at other industrial sites that may affect the Proposed Development and vice versa, henceforth referred to as 'Domino effects' during construction, commissioning, operation (including maintenance) and decommissioning; and
- The following hazards which may arise during the operational phase:
 - meteorological hazards;
 - hydrological hazards;
 - geophysical hazards;
 - other natural hazards; and
 - societal hazards.

22.2.7 The focus of this assessment is on the Construction and Operational Area, as shown on **Figure 3-3: Areas Described within the ES (EN010166/APP/6.3)**. However, abnormal Indivisible Loads (AILs) and other vehicle movements in the routes and ports used to transport AILs to the Main Development Area (referred to as the Accommodation Work Areas) have also been considered but the potential MA&Ds events and mitigation measures would be the same as those for vehicle usage in general (i.e. vehicle collisions). For the purposes of this chapter, AILs are assumed to not contain any hazardous materials, as such, no additional MA&Ds scenarios would result from use of AILs or other vehicle movement in the Accommodation Work Areas beyond a vehicle collision. Further assessment of the AIL movements is provided within **Chapter 10: Traffic and Transport (EN010166/APP/6.2.10)**.

22.3 Assessment Methodology

Definitions

22.3.1 The IEMA Guidance 'Major Accidents and Disasters in EIA: A Primer' (Ref 22-1) 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., contractor) 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."

22.3.2 Events that have the potential to cause a Major Accident / Disaster are termed risk events which are also defined in the IEMA guidance as follows:

“An identified, unplanned event, which is considered relevant to the development and has the potential to result in a major accident and / or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor.”

22.3.3 The criteria used in this assessment to define an accident or disaster as major, was adopted from the criteria listed within Schedule 5 of the COMAH Regulations 2015 (Ref 22-4). Whilst these criteria were developed for reporting requirements to the European Commission and were omitted from the COMAH Regulations as part of the Health and Safety (Amendment) (EU Exit) Regulations 2018 (Ref 22-5), they are relevant to the identification of MA&Ds. For the purposes of this assessment a MA&D, is an accident or disaster that causes:

- an injury to a person which is fatal;
- up to six persons are injured within the establishment and hospitalised for at least 24 hours;
- one person outside the establishment is hospitalised for at least 24 hours;
- 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 hours, where the value (persons × hours) is at least 500;
- the interruption of drinking water, electricity, gas or telephone services for more than two hours, where the value (persons × hours) is at least 1000;
- damage to property in the establishment, to the value of at least 2,000,000 Euro (approximately £1,700,000 as 08/04/2025);
- damage to property outside the establishment, to the value of at least 500,000 Euro (approximately £430,000 as 08/04/2025);
- 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; or
 - 1 ha or more of a lake or pond; or
 - 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.

Study Area

- 22.3.4 The study area for assessment of MA&Ds is not defined within regulatory guidance or a standardised methodology, as such a study area of 5 km from the Construction and Operation Area has been considered based on professional experience and judgement, ensuring that sensitive resources and receptors are included. This is shown in **Figure 22-1: Listed COMAH Sites within 5km of the Construction and Operation Area (EN010166/APP/6.3)**.
- 22.3.5 The 5 km study area accounts for the likely maximum Zone of Influence (Zol) over which risk events from the Proposed Development have potential to result in significant MA&Ds effects on relevant environmental receptors.
- 22.3.6 The Zol are specific to each risk event and considers the principle of the Rochdale Envelope in relation to worst-case needs for assessment purposes.
- 22.3.7 Due to the volumes of hazardous materials proposed to be stored on site, i.e. amines, the Proposed Development would be subject to the COMAH Regulations 2015 (Ref 22-4) and professional judgement has been applied in defining the Zol, recognizing the current design stage of the plant and equipment and consideration of potential Major Accident Hazards (MAH). As the detailed design of the Proposed Development progresses, safety information would be prepared for submission to the Health and Safety Executive (HSE), as required by COMAH, specifying the MAH and the residual impacts; demonstrating the application of ALARP in overall plant design.
- 22.3.8 The study area includes several installations regulated by the COMAH Regulations 2015 (Ref 22-4) and MAH pipelines regulated by the PSR (Ref 22-6), and that the COMAH Regulations 2015 require the consideration of "domino" effects with neighbouring assets. The 5 km has been selected on the basis that MAH sites greater than 5 km from the Main Development Area are unlikely to be directly affected, unless there is a domino linkage with another site within the study area, and this would be managed through the COMAH Regulations, as required.

Impact Assessment Methodology

- 22.3.9 MA&Ds scenarios have been considered for each phase of the Proposed Development, namely construction, commissioning, operation (including maintenance) and decommissioning.
- 22.3.10 Commissioning has been defined as a specific phase for the purposes of the assessment in this chapter because there is potential for a MAH event during this specific phase, despite lasting for a short time. It is the first time that equipment is being brought into operation, with the addition of process fluids / chemicals for the first time. In addition, atypical operations may be undertaken, which are not the normal operation of the plant and equipment, e.g. guarantor testing of equipment at higher rates than normal operation.
- 22.3.11 In accordance with the principles of the IEMA guidance "*Major Accidents and Disasters in EIA: A Primer*" (Ref 22-1), unlike other chapters, the MA&Ds assessment criteria are based upon a risk assessment process, which

considers the consequences and likelihood of a risk event occurring. In terms of consequence (severity and duration), the primary criteria specified in paragraph 22.3.3 have been considered together with the guidance provided as part of the Civil Contingencies Act 2004 (Ref 22-17), as well as guidance on environmental risk tolerability from the Chemicals and Downstream Oils Industry Forum (CDOIF) (Ref 22-35) to develop project-specific assessment criteria. These have been revised from those set out within the EIA Scoping Report (**Appendix 1-A: Scoping Report (EN010166/APP/6.4)**) as the CDOIF guidance requires design information not currently available at this stage of development (for example, Quantitative Risk Assessment (QRA) and preliminary consequence modelling) to determine levels of consequence for a risk event. The CDOIF guidance was considered to further subdivide and provide more details regarding categories of receptors.

22.3.12 The following steps were followed to identify credible MA&Ds scenarios for detailed assessment:

- baseline information relevant to MA&Ds has been collated, such as 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 2015 (Ref 22-4);
- an assessment of the substances which could be present within the Main Development Area was carried out to identify those classified as hazardous, in accordance with the CLP Regulations 2015 (Ref 22-24). The storage requirements and process uses of hazardous substances were identified to determine the potential for risk events which could constitute MA&Ds related to these substances. Substances, which are not classified as hazardous, or are present in relatively minor quantities, were discounted. As AILs are assumed not to contain any hazardous substances, the Accommodation Work Areas were also discounted;
- a review of the operations and activities carried out throughout the lifecycle of the Proposed Development was undertaken to determine the potential for risk events which could constitute a MA&Ds related to these activities;
- a long list of unscreened risk events for MA&Ds was collated for all lifecycle stages, considering the substances, the activities and the baseline conditions that have been identified;
- the resulting long list were subject to a screening assessment, utilising the consequence criteria (paragraph 22.3.3) and potential likelihood as coarse filters. 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-receptor linkage, have not been taken forward for further assessment. This is found in **Appendix 22-A: Long List of MA&Ds Risk Events (EN010166/APP/6.4)**; and
- all remaining MA&Ds Risk events were shortlisted for further assessment.

22.3.13 For those MA&Ds risk events which were scoped in for detailed assessment, the following assessment process has been followed:

- credible scenarios related to the risk event were identified-these constitute a reasonably foreseeable worst-case incident of the identified risk event;
- the potential impact of credible scenarios on environmental resources / receptors were estimated using the source-pathway-receptor linkage model;
- the magnitude of potential impacts of credible scenarios were assessed, considering the severity of harm, its duration, and its consequences, as well as its probability of occurrence;
- mitigation measures to eliminate the risk were identified where possible; and if not possible, to reduce the risk to a level demonstrated to be ALARP; and
- the tolerability of any residual risk was qualitatively considered.

22.3.14 The tolerability of the risk of a MA&Ds credible scenario is categorised via the application of professional judgement on the reasonably foreseeable worst-case consequence and the likelihood of occurrence. Risks were categorised as:

- tolerable (broadly acceptable): the levels of risk are generally regarded as adequately controlled and comparable to those that people regard as trivial in their daily lives. Further action to reduce risks is not normally required, as such they are generally considered to be broadly acceptable;
- tolerable (if ALARP): people are prepared to tolerate this level of risk in order to secure benefits, such as employment or infrastructure. The expectation is that risks are properly assessed and kept ALARP through the application of appropriate mitigation, and risks are kept under review; and
- unacceptable (intolerable): A risk falling into this region is regarded as unacceptable, whatever the level of benefits associated with the activity.

22.3.15 The definitions of the above terms are contained in Reducing Risks, Protecting People (Ref 22-33), prepared by the HSE.

22.3.16 As a general rule, tolerable and tolerable-if ALARP risks are considered as being Not Significant and broadly acceptable in the context of MA&Ds. Intolerable risks are considered Significant and unacceptable.

22.3.17 Risks categorised as tolerable-if ALARP require further assessment to determine what control measures are required as "reasonably practicable" for the detailed design of the plant and equipment to be used on the Proposed Development. As the site is expected to be regulated under COMAH, a pre-construction safety report would be submitted to the COMAH Competent Authority to be assessed before construction commences. This pre-construction safety report would include the preventative and mitigating control measures to be included, which would have been determined through quantitative and qualitative risk assessment methods, such as Quantitative Risk Assessment (QRA), preliminary consequence modelling,

Hazard Identification (HAZID) studies, Hazard and Operability (HAZOP) studies, Fire Hazard Analysis (FHA) and Explosion Hazard Analysis (EHA). Regardless of the COMAH status of the Main Development Area, the undertaker would undertake any necessary studies, where required by UK legislation and industry good practice, to support the safe design, construction, commissioning, operation (including maintenance) and decommissioning of the Proposed Development.

- 22.3.18 The scope of the future studies would meet the requirements of the Health and Safety at Work Act 1974 (Ref 22-10), good engineering design practice and the HSE requirements for a COMAH Safety Report submission (or Safety Management System); to demonstrate that suitable and sufficient risk control measures have been applied to mitigate risks to an acceptable level without significant impacts, thereby demonstrating "ALARP". Where appropriate, the HSE and Natural Resources Wales (NRW) would be consulted on the content of the COMAH Safety Report (or Safety Management System) and supporting studies as they develop.

Rochdale Envelope

- 22.3.19 The setting of design parameters using the Rochdale Envelope approach is described in **Chapter 2: Assessment Methodology (EN010166/APP/6.2.2)**. The maximum parameters for the principal components of the Proposed Development are set out in the **Design Principles Document (EN010166/APP/7.8)** and are illustrated on the **Works Plans (EN010166/APP/2.4)** and the **Parameter Plans (EN010166/APP/2.5)**. These parameters, together with assumptions regarding the future plans for the existing Connah's Quay Power Station set out in **Chapter 2: Assessment Methodology (EN010166/APP/6.2.2)** have been used to inform the representative worst-case scenario that has been assessed in this chapter, in order to provide a robust assessment of the impacts and likely significance of environmental effects of the Proposed Development at its current stage of design.

Assessment Assumptions and Limitations

- 22.3.20 This assessment is based on the construction, design, process and decommissioning information that is currently available and early appraisal of potential hazards. These would be refined and reappraised as the design progresses to identify and adopt additional embedded mitigation measures as required to ensure continuing compliance with the Health and Safety at Work Act 1974 (Ref 22-10), the COMAH Regulations 2015 (Ref 22-4), the EPR 2016 (Ref 22-9), and other relevant legislation.
- 22.3.21 For the purposes of the assessment the construction phase includes enabling and demolition works required to facilitate the Proposed Development.
- 22.3.22 At this stage, specific safety and control systems have not yet been designed for the Proposed Development, however, standard industry approaches to managing risk would 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 would be installed as required by the relevant legislation as listed above.

22.4 Baseline Conditions

Existing Baseline

Data Sources

22.4.1 The following data sources have been used to inform the baseline:

- Overview of natural and man-made disaster risks the European Union may face (Ref 22-40);
- UK National Risk Register 2023 (Ref 22-41);
- British Geological Survey (BGS) GeoIndex (onshore) (Ref 22-42);
- COMAH 2015 Public Information Search (Ref 22-43); and
- Google aerial and street view maps covering the study area (Ref 22-44).

Environmental Baseline of Relevance to MA&Ds

22.4.2 Connah's Quay has a temperate oceanic climate typical of the UK. Historic climate data for the area is presented in **Chapter 20: Climate Change (EN010166/APP/6.2.20)**.

22.4.3 The region has relatively frequent small earthquakes totalling 218 quakes since 2015, the maximum magnitude of which was 3.9. None of these were classified by the BGS as significant.

22.4.4 As described in **Chapter 13: Water Environment and Flood Risk (EN010166/APP/6.2.13)**, the Main Development Area is predominantly within flood zone 3 due to tidal flooding (areas with more than 0.5% (1 in 200) chance of flooding in a given year) and flood zone 2 of sea flooding (areas having between a 0.5% and 0.1% chance of flooding in a given year).

Infrastructure and Industrial Sites Receptors

22.4.5 The Main Development Area incorporates the existing Connah's Quay Power Station and pipelines operated by the Applicant and the Liverpool Bay CCS Limited operating company.

22.4.6 The local Connah's Quay / Deeside area has multiple industrial facilities close to the Main Development Area, the closest of which being the Deeside Industrial Park, located approximately 3 km from the Main Development Area. The industrial park comprises solar parks and materials manufacturing and storage facilities and has multiple COMAH sites as listed in **Table 22-5**.

22.4.7 Transport infrastructure within the study area includes ports, roads and railways. Connah's Quay North is located approximately 0.75 km southeast of the Main Development Area and 0.2 km north-east of the Construction and Indicative Enhancement Area (C&IEA). Primary roads within the area include the A548, A550 and A494, and the Crewe North and Holyhead line (railway) associated with the Hawarden Bridge train stations run adjacent to the Proposed Development. Hawarden airport is the closest airport to the

Proposed Development and is located approximately 8 km south-east, outside of the study area. Further detail regarding transport infrastructure is provided in **Chapter 10: Traffic and Transport (EN010166/APP/6.2.10)**.

Sensitive Resources and Receptors

- 22.4.8 This assessment accounts for the sensitive resources and receptors within the MA&Ds study area, summarised in **Table 22-5**, as well as the interactions between them.

Future Baseline

- 22.4.9 The future baseline scenarios are set out in **Chapter 2: Assessment Methodology (EN010166/APP/6.2.2)**.
- 22.4.10 In a future baseline scenario without the Proposed Development, the existing Connah's Quay Power Station (which is not a COMAH site) would continue to operate as usual. The hazardous substances and operations associated with the future baseline would be similar to those currently present at the existing Connah's Quay Power Station, consequently, only MA&Ds scenarios applicable to the existing Connah's Quay Power Station would be relevant. The likelihood of these MA&Ds scenarios occurring is considered to be low as the power generation industry and natural gas fuelled facilities, both at the existing Connah's Quay Power Station and at facilities operated worldwide, have a very good safety record and MA&Ds are very rare.
- 22.4.11 Therefore, in the absence of the Proposed Development, there would be a low risk of a MA&D occurring within the Order limits.

Table 22-5: Sensitive Receptors within the Existing Baseline

Receptor Type	Sensitive Receptor	Location
Infrastructure / Industrial-COMAH establishment	Great Bear Distribution Warehouse, an Upper Tier COMAH establishment which stores large amounts of pressurized flammable gases.	Located within Deeside Industrial Park, approximately 3.2 km east of the Main Development Area and 2.7 km northeast of the C&IEA.
Infrastructure / Industrial-COMAH establishment	Valspar Paint Shop, a Lower Tier COMAH establishment operated by Sherwin-Williams. This was designated as a storage and distribution centre for basic organic chemicals.	Located within Deeside Industrial Park, approximately 4.8 km east of the Main Development Area and 4.1 km east of the C&IEA.
Infrastructure / Industrial-COMAH establishment	Shotton Steelworks operated by Tata Steel Limited. This site is a Lower Tier COMAH establishment due to its metal processing operations and associated materials.	Located just outside the Deeside Industrial Park approximately 1.5 km east of the Main Development Area and 0.7 km east of the C&IEA.
Infrastructure / Industrial-COMAH establishment	Cambrian Gas Limited offices (CamGas Head Office). A Lower Tier COMAH establishment designated due to its inventory of pressurized flammable gas.	Located approximately 4.7 km southeast of the C&IEA.
Infrastructure / Industrial-COMAH establishment	FMC Agro Limited. This site is an Upper Tier COMAH establishment due to the production and storage of pesticides, biocides, fungicides, herbicides as well as other inorganic chemicals.	Located approximately 4.8 km southeast of the C&IEA.
Human Health	Private residences (and their inhabitants).	Adjacent to the Main Development Area.
Human Health	Local economic receptors including businesses and employees.	Adjacent to the Main Development Area.
Human Health	Community receptors, including public rights of way, community land, and community buildings.	Adjacent to the Main Development Area.
Historical / Cultural	21 identified receptors including various scheduled monuments as well as designated/non-designated	Various within the study area.

Receptor Type	Sensitive Receptor	Location
	buildings and Grade I / Grade II listed buildings. Refer to Chapter 17: Terrestrial Heritage (EN010166/APP/6.2.17) for named receptors within a 3 km area of the Order Limits.	
Environmental-Designated Ecological Site	The Dee Estuary Ramsar site, Special Protection Area (SPA), and Site of Special Scientific Interest (SSSI).	Overlaps with the Order limits, specifically the Water Connection Corridor.
Environmental-Designated Ecological Site	The Dee Estuary / Aber Dyfrdwy Special Area of Conservation (SAC)	Overlaps with the Order limits, specifically the Water Connection Corridor.
Environmental-Designated Ecological Site	The River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid SAC / Afon Dyfrdwy / River Dee SSSI.	Adjacent to the Order limits.
Environmental-Designated Ecological Site	Deeside and Buckley Newt Sites SAC / Connah's Quay Ponds and Woodland SSSI, Maes y Grug SSSI and Buckley Claypits and Commons SSSI.	2.1 km south of the Main Development Area and 1.5 km south of the Order limits.
Environmental-Designated Ecological Site	Shotton Lagoons and Reedbeds SSSI.	1.3 km east of the Main Development Area and 0.5 km east of the C&IEA.
Environmental-Designated Ecological Site	Halkyn Mountain/Mynydd Helygain SAC	5.3 km west of the Main Development Area and 0.5 km west of the Order limits.
Environmental-Designated Ecological Site	Mynydd Y Fflint / Flint Mountain SSSI.	1.7 km west of the Main Development Area and 2.2 km west of the Proposed CO ₂ Connection Corridor.
Environmental-Designated Ecological Site	Connah's Quay Ponds and Woodland SSSI	1.5 km north-east of the Main Development Area and 2.1 km north-east of the Order limits.
Environmental-Designated Ecological Site	Inner Marsh Farm SSSI.	3.2 km north-east of the Main Development Area and 2.8 km north-east of the Order limits.
Environmental-Designated Ecological Site	Comin Helygain a Glaswelltiroedd Treffynnon/Halkyn Common and Holywell Grasslands SSSI	5.3 km west of the Main Development Area and 3.6 km west of the Order limits.

Receptor Type	Sensitive Receptor	Location
Environmental-Designated Ecological Site	Buckley Claypits and Commons SSSI	4.4 km south of the Main Development Area and 4.0 km south of the Order limits.
Environmental-Designated Ecological Site	Maes y Grug SSSI	4.4 km south of the Main Development Area and 4.0 km south of the Order limits.
Environmental-Non-Designated Ecological Sites	Other non-statutory sites and priority habitats as listed in Chapter 11: Terrestrial and Aquatic Ecology (EN010166/APP/6.2.11) and shown on Figure 11-2: Locally Designated Sites within 2 km (EN010166/APP/6.3) .	Various within the study area.
Environmental-Non-Designated Ecological Sites	The water environment, including groundwater, the River Dee, and surrounding ponds / lagoons.	Within and adjacent to the Main Development Area and the Proposed CO ₂ Connection Corridor.

22.5 Development Design and Embedded Mitigation

- 22.5.1 The EIA process aims to avoid, prevent, reduce or offset potential environmental effects through design and / or management measures. These are measures that are inherent in the design, construction, commissioning, operation (including maintenance) and decommissioning of the Proposed Development (also known as embedded mitigation).
- 22.5.2 The following impact avoidance measures have either been incorporated into the design or are standard construction or operational practices and were considered during the impact assessment. Specific mitigation measures for each phase are also included in **Table 22-6** to **Table 22-10**.

Construction Phase

- 22.5.3 The **Framework Construction Environmental Management Plan (CEMP)** (**EN010166/APP/6.5**) sets out how construction activities would be managed and controlled in compliance with accredited health and safety and environmental management systems, relevant legislation and environmental permits, consents and licenses. A final CEMP would be prepared by the construction contractor in accordance with the **Framework CEMP** (**EN010166/APP/6.5**) prior to construction.
- 22.5.4 The **Framework Construction Traffic Management Plan (CTMP)** (**EN010166/APP/6.6**) sets out how traffic would be controlled onsite to eliminate incidents between workers and / or plant and equipment. A final CTMP would be prepared by the construction contractor in accordance with the **Framework CTMP** (**EN010166/APP/6.6**).
- 22.5.5 Ground Investigations (GIs) are required under Environmental Permitting to assess the underlying stratigraphy and characterise underlying soil and groundwater conditions which will inform the structural and civil design of the Proposed Development.
- 22.5.6 In compliance with the CDM Regulations 2015 (Ref 22-20) the undertaker would develop and provide pre-construction information to the Engineering, Procurement, and Construction (EPC) Contractor(s), as soon as is practicable with the formal appointment of the principal designer and principal contractor (normally the roles are undertaken by the appointed Principal Contractor).
- 22.5.7 In compliance with Regulation 6 of the CDM Regulations 2015 (Ref 22-20), a notification of construction works would be submitted to the HSE prior to the commencement of construction. The Proposed Development's Principal Contractor(s) (principal designer and principal contractor) would comply with relevant health and safety legislation, i.e., Health and Safety at Work Act 1974 (Ref 22-10).
- 22.5.8 The principal designer, or where there is no principal designer, the Principal Contractor(s), would ensure that a final health and safety file is prepared and handed to the undertaker. This would identify any environmental, health and safety information about the Proposed Development likely to be needed during any subsequent work activities.

- 22.5.9 The use of suitably experienced contractors, risk assessments, working method statements, operating procedures and personnel training would minimise the risk of accidental scenarios occurring during the Proposed Development construction. Atypical activities, which would be undertaken during construction, but not in normal operation, would be assessed as part of the risk assessment and mitigation processes. For example, the refuelling of construction vehicles from temporary diesel storage areas would be subject to both procedural and infrastructure measures to prevent spillages of fuel.

Commissioning Phase

- 22.5.10 Commissioning of the facility would be undertaken in accordance with a commissioning plan. It is expected that the commissioning plan would be a pre-operational condition of the Environmental Permit, for NRW, and it would also be supplied to the HSE for approval as part of the COMAH pre-construction notification process. Aspects of the commissioning would also form part of construction phase plan required under the CDM Regulations 2015 (Ref 22-20).
- 22.5.11 The standard practices during commissioning would be similar to those of typical operation, not including emergency and maintenance procedures, as outlined in the operation Phase.

Operation Phase

- 22.5.12 The Proposed Development design includes a number of principles / philosophies and procedures with regard to process safety and safeguarding. The layout of the Proposed Development would give due consideration to inherently safer design principles with respect to both on-site and off-site receptors.
- 22.5.13 During the detailed design stage, the future operational risks would be managed via a number of studies such as Site QRA, preliminary Consequence Modelling, HAZID studies, failure mode effect analysis, layer of protection analysis and HAZOP studies. These studies would be carried out for the Proposed Development during the ongoing design process. This is a standard approach for the systematic identification of hazards and the development of barriers and other risk mitigation measures for preventing, or otherwise minimizing, hazardous scenarios to ALARP through appropriate design during the design stages.
- 22.5.14 **Appendix 13-D: Outline Surface Water Drainage Strategy (EN010166/APP/6.4)** details the drainage arrangements for the Proposed Development such that surface water and chemical spills would be appropriately retained onsite to prevent release to environmental receptors. A final Drainage Strategy would be prepared as part of the detailed design in accordance with **Appendix 13-D: Outline Surface Water Drainage Strategy (EN010166/APP/6.4)** before construction commences.
- 22.5.15 The Proposed Development would be operated in line with appropriate standards, whilst the undertaker would implement and maintain an Environment Management System (EMS) which would be certified to British Standard (BS) International Standards Organization (ISO)

14001:2015+A1:2024. The EMS would outline the requirements and procedures needed to ensure that the Proposed Development is operating to the appropriate standard.

22.5.16 The facility would require an Environmental Permit, for the operation of the combustion plant and the CCP, under the EPR 2016 (Ref 22-8). The Environmental Permitting regime, enforced by NRW, places several stipulations and requirements to be fulfilled to the satisfaction of the regulators, including the 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). The undertaker would identify and implement BAT requirements and conditions, to ensure that the design of the Proposed Development would be suitable for the Environmental Permit application.

22.5.17 Due to the inventory of dangerous substances, the Proposed Development would require a Hazardous Substances Consent and cause the existing power plant to become a COMAH regulated facility. A calculation is to be carried out as part of the Hazardous Substances Consent process, to confirm the COMAH status of the facility and determine whether the Proposed Development would be at the Lower or Upper Tier requirements. The appropriate COMAH notifications would be submitted to the Competent Authority (CA) which comprises the HSE and NRW. The pre-operational requirements are different for Lower and Upper Tier establishments:

- Lower Tier establishments require the implementation of a Safety Management System (SMS) and a Major Accident Prevention Policy (MAPP). The SMS would identify potential major accidents onsite, include an environmental risk assessment, have procedural controls to manage / control / mitigate the risks and have an emergency response plan. The MAPP describes how the site would control the risks of a MA&D; and
- Upper Tier establishments require the implementation of an SMS and MAPP, like a Lower Tier establishment, and the development and upkeep of a detailed safety case report. The safety case report would include appropriate risk assessments in line with the HSE Safety Report Assessment Manual (SRAM) criteria, which is used to demonstrate that the application is duly made to the regulator. The safety case report would also include appropriate risk assessments in relation to Major Accidents to the Environment (MATTE). The safety case report is to be updated every five years which would include changes in site procedures and processes in the intervening period, including those to address the findings of site inspections undertaken by the HSE / NRW. These establishments also need to provide information to external bodies for the development of external emergency plans.

Decommissioning Phase

22.5.18 The following embedded mitigation measures have been incorporated into the Proposed Development design:

- a Decommissioning Environmental Management Plan (DEMP) would be produced and agreed with NRW and the HSE as part of the Environmental Permit 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 licenses. It should be recognised that there is a DEMP required under the **Draft DCO (EN010166/APP/3.1)**, which is a separate requirement;
- 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 land re-use. It is standard practice to leave underground infrastructure in-situ, for example, drainage systems, with connection and access points being sealed / disconnected;
- all decommissioning and demolition activities would be controlled under relevant legislation at the time, current examples include; The Dangerous Substances and Explosive Atmospheres Regulations 2002 (Ref 22-15), The Control of Substances Hazardous to Health Regulations 2002 (Ref 22-16) and The CDM Regulations 2015 (Ref 22-20); and
- the use of suitably experienced contractors, risk assessments, working method statements, operating procedures and personnel training would minimise the risk of accidental scenarios occurring during Proposed Development decommissioning. The decommissioning and / or demolition activities would be notified as required under the appropriate regulations at the time.

22.6 Assessment of Likely Impacts and Effects

22.6.1 Taking into account the embedded mitigation measures as detailed in Section 22.5 above, the potential impacts and effects of the Proposed Development have been assessed using the methodology as detailed in Section 22.3 of this chapter and **Chapter 2: Assessment Methodology (EN010166/APP/6.2.2)**.

22.6.2 Considering the baseline conditions, the hazardous substances present and the identified likely activities during each phase of the Proposed Development, a long list of MA&D risk events has been prepared. This long list can be found in **Appendix 22-A: Long List of MA&Ds Risk Events (EN010166/APP/6.4)**, along with justification for the shortlisting of the risk events presented in the following sections.

22.6.3 This section introduces the hazardous substances that are present at each stage of the Proposed Development, the potential risks that they pose and sets out the shortlisted MA&D scenarios.

Construction Phase

Hazardous Substances to be used on Site

- 22.6.4 Diesel would be used during construction for fuel for vehicles, plant and, if required, mobile power generators. Diesel is classified as hazardous and harmful to the aquatic environment under The Planning (Hazardous Substances) Regulations 2015 (Ref 22-7). A release, which if 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 Dee, could result in harm to flora and fauna. The quantities of diesel present would be kept to an operational minimum to reduce the inherent severity of any risk of loss of containment. Procedurally, vehicles would be stationary with engines switched off and keys taken out of ignition (to prevent drive away) during filling. Any temporary bulk diesel storage tank would be located away from potential vehicular collisions and in an area where spills can be contained and recovered, and away from open drainage and open ground. Storage would have tank bunding (whether external or integral double skinned tanks), drip trays and tank level indication, with alarms where appropriate. Refuelling operations would take place over an impermeable surface, with the capability of capturing any spillages. Spill kits would be available for minor spill cleanup. Surface water drainage systems would be protected by spill covers or the use of suitable interceptor systems e.g., oil / water separator (subject to site design). Details of these matters are set out in the **Framework CEMP (EN010166/APP/6.5)**.
- 22.6.5 Liquid concrete could be present in significant quantities during construction of the Proposed Development. It may be produced in-situ 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. The requirement for temporary protective drain covers to be available for use at drains at risk in the locality of cement civil works is detailed in the **Framework CEMP (EN010166/APP/6.5)**. The surface water drainage system (subject to detailed design) is likely to have silt traps, which could capture small spillages. Consideration would be given to monitoring rainwater pH during construction, and this would be confirmed in the Water Management Plan as part of the final CEMP, to be developed by the Principal Contractor following appointment.
- 22.6.6 Compressed gases stored in small cylinders, such as Acetylene, may be present on site to carry out welding or cutting, e.g., trimming rebar, during construction. Acetylene is a flammable gas and a release could lead to fires / explosions if ignited, the thermal radiation from which could cause harm to people. A release in enclosed areas can cause harm to people via asphyxiation. These materials would however be stored in relatively small quantities and would be stored in appropriate locations which will be captured in the final CEMP, typically near their end use, e.g. lubricants and oils (near mechanical equipment), water treatment chemicals (near cooling water circuits) etc.

Review of Construction Activities

- 22.6.7 A preliminary GI has been carried out to assess the underlying stratigraphy and characterise underlying soil and groundwater baseline conditions as required for Environmental Permitting. Additional GIs will be undertaken as the detailed design of the Proposed Development is developed, including ground gas and mine gas monitoring and geotechnical testing to inform foundation design. The GIs will inform the structural and civil design of the Proposed Development. The results of the preliminary GI are detailed in **Chapter 14: Geology and Ground Conditions (EN010166/APP/6.2.14)**.
- 22.6.8 The following construction activities have been identified to the potential to lead to a MA&D:
- construction works: construction works have the potential to cause instability and vibrations resulting in ground instability / collapse which can cause harm to workers. The works may also cause structural collapse of new and existing buildings / structures via mechanical failure or accidental impact with vehicles potentially leading to injury / harm to workers; and
 - earthworks: earthworks may lead to a utility / pipeline or Unexploded Ordnance (UXO) strike, impact with a HV transmission cable or high-pressure gas pipelines could lead to injury / harm to persons within the vicinity.
- 22.6.9 The impact of construction activities on human health, can be severe with permanent or very long-lasting effects. As identified in the **Framework CEMP (EN010166/APP/6.5)**, the Final CEMP would detail standard practice to be applied. Additionally, mitigation specific to certain activities would be implemented, including but not limited to: ground testing to ensure that it is stable; as well as consultation with National Gas Transmission plc and National Grid Electricity Transmission plc and other statutory undertakers to ensure appropriate control measures are applied when working near pipelines and cables. As such, the risks resulting from such activities is considered tolerable or tolerable-if ALARP (**Not Significant**).

Assessment of Shortlisted Major Accidents and Disasters Scenarios

- 22.6.10 The following MA&D risk events have been identified for the construction phase, considering the likely hazardous substances and identified construction activities, for further consideration herein:
- ground instability;
 - structural collapse / accidental impact;
 - utility (pipeline or electrical cable) strike / UXO impact;
 - domino effects with neighbouring COMAH establishments;
 - accidental vehicle impact;
 - aircraft / Drone impact; and
 - vandalism.
- 22.6.11 Credible Scenarios for the construction risk events are presented in **Table 22-6** as well as an overview of associated potential environmental impacts

and the relevant embedded mitigation. In summary, the level of risk presented by all foreseeable credible scenarios has been assessed as tolerable, taking into consideration the identified embedded mitigation measures, with the exception of domino effects, which is assessed as tolerable-if ALARP.

- 22.6.12 The statement of tolerable-if ALARP recognises that, at this stage of the Proposed Development design process, the available embedded mitigation measures considered are primarily the standard engineering design controls typically included within industrial facilities such as the Proposed Development. Specific embedded mitigation measures would be confirmed as the detailed design of the Proposed Development progresses and project-specific process safety studies are produced to assess the level of residual risk. The detailed design would need to reduce the risks to ALARP to satisfy COMAH. If any further measures are required to satisfy the relevant legislation, as identified through consequence modelling / QRA or similar detailed safety study(s), they will be included during the detailed design to demonstrate that the embedded mitigation measures reduce all risks to ALARP.

Table 22-6: Credible Scenarios Related to the Construction of the Proposed Development

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
C-1	<p>Ground Instability Construction activity results in disturbance of manmade or naturally occurring ground related hazards.</p> <p>Vibration causes ground instability / collapse / settlement.</p>	<p>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 harm to persons on-site and / or lead to secondary impacts e.g., damage to utilities leading to explosion.</p>	<p>Application of standard practices detailed within the Framework CEMP (EN010166/APP/6.5) would minimise the risk such that it is tolerable.</p> <p>A preliminary GI has been undertaken to understand the potential risks and inform the construction methods to be used.</p> <p>To reduce risks associated with ground instability, there contractor(s) would use industry standard construction methods / design features appropriate to the context of the Proposed Development.</p>	Tolerable (Not Significant)
C-2	<p>Structural Collapse / Accidental Impact Construction activity results in damage to structures or impact with workers.</p>	<p>Collapse of new and existing buildings, structures and excavations via accidental impact with vehicles or via other failure mechanisms. Could cause harm / injury to persons on-site.</p>	<p>Structural engineering design for new structures, assessments of existing structures and temporary structures, such as excavations, would be in accordance with industry codes and standards.</p> <p>The Framework CEMP (EN010166/APP/6.5) identifies the relevant measures to control potential impacts from construction works. The Framework CTMP (EN010166/APP/6.6) identifies measures to improve the safety and</p>	Tolerable (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
			reliability of deliveries to a site and reduce congestion.	
C-3	<p>Utility (Pipeline or Electrical Cable) Strike / UXO Impact</p> <p>Construction activity, such as excavation, accidentally impacts underground gas pipeline or UXO.</p>	<p>Impact on high-pressure gas pipelines could cause flammable gas to be released which, if ignited, can lead to injury / harm to persons within the vicinity.</p> <p>Potential damage to the environment via fire water run-off.</p> <p>Impact with utilities, i.e. a HV transmission cable would cause immediate harm to workers.</p>	<p>Preventative control measures could include, for example, ground penetrating radar (GPR) surveys and magnetometer surveys of the site and positive identification (ID) of all pipelines prior to construction, in accordance with PAS 120, and would be determined by the principal contractor. The Framework CEMP (EN010166/APP/6.5) identifies the relevant measures to control potential environmental impacts of construction works, which would define control measures and procedures associated with excavations and avoidance of underground strikes.</p> <p>A desk top study on the risk of a UXO strike has been conducted which determined there was a low potential to encounter UXO during ground investigation and earthworks, however, this is subject to detailed assessment.</p> <p>Appropriate anti-strike protection (anti-collision guards) would be implemented, where identified, to protect existing and new aboveground pipework.</p>	Tolerable (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
C-4	<p>Domino Effects with neighbouring COMAH establishments</p> <p>An event on the construction site impacts and escalates to a neighbouring hazardous (COMAH) site. Alternatively, an event at a neighbouring hazardous (COMAH) site impacts the Proposed Development.</p>	<p>Risk of escalation of fire / explosion / loss of chemical to nearby COMAH sites, due to an explosion or fire or loss of containment event on the construction site. The site could be affected by fire / explosion / loss of chemical containment from neighbouring COMAH sites. Potential harm / injury to onsite workers.</p>	<p>The COMAH status of the Proposed Development is to be determined. There are several Lower and Upper Tier COMAH establishments within the MA&Ds study area (5 km distance). It is a requirement under COMAH legislation to consider potential domino effects and to demonstrate that the risks are ALARP and ensure that appropriate mitigation measures are incorporated into the design, construction, commissioning and operation to demonstrate ALARP.</p> <p>The Proposed Development would be required to consider potential domino effects as part of the construction phase plan (to be prepared in accordance with the CDM regulations 2015).</p>	<p>Tolerable-if ALARP (Not Significant)</p>
C-5	<p>Accidental Vehicle Impact</p> <p>Construction equipment and construction / delivery / AIL vehicles could collide with each other or workers on-site.</p>	<p>A collision between vehicles and workers / equipment could cause harm to site personnel.</p>	<p>The Framework CEMP (EN010166/APP/6.5) identifies the relevant measures to control potential impacts from construction works.</p> <p>The Framework CTMP (EN010166/APP/6.6) identifies measures to improve the safety and reliability of deliveries to a site and reduce congestion.</p>	<p>Tolerable (Not Significant)</p>

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
C-6	Aircraft / Drone Impact Impact on site infrastructure and / or site personnel from above aircraft / drones.	Aircraft / drone incident results in harm to site personnel and / or member of public and / or irreversible damage to environmental receptor (ecological site, watercourse etc.).	The Proposed Development is located in an area close to Hawarden airport (aerodrome). Consultation with Airbus has confirmed the absorber and HRSG stacks would infringe the outer horizontal surface. The requirement for aviation warning lighting to be fitted to chimney stacks and any construction equipment 150 m or more in height (above ground level) is defined in Air Navigation Order Article 222 (Ref 22-45). CAP 1096 (Ref 22-46) provides guidance for lighting of crainage above 45 m above ground level. An aviation lighting scheme will also be submitted for approval from the Planning Authority in conjunction with the CAA. Ongoing consultation with the relevant Airbus/ CAA will occur as required by the final CEMP to manage interfaces and define further appropriate control measures to minimise risk of collision, such as cranage lighting (Ref 22-46).	Tolerable (Not Significant)
C-7	Vandalism A malicious destructive act onsite whereby material loss of containment could occur,	Harm to onsite personnel and / or members of the public off site from fire / explosion / loss of containment. Damage to	Appropriate security measures would be installed at the construction site, including CCTV, site security and fencing to prevent trespassers and mitigate this risk to ALARP in accordance with the Framework CEMP	Tolerable (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
	resulting in Fire / Explosion / Pollution	environmental receptors from loss of containment.	(EN010166/APP/6.5). During construction, the on-site chemicals inventory is limited (diesel etc.) and thus the severity of a potential incident would be limited.	

Commissioning Phase

Hazardous Substances to be Used on Site

22.6.13 As detailed in **Chapter 5: Construction Management and Programme (EN010166/APP/6.2.5)**, commissioning of the Proposed Development would be undertaken in accordance with a commissioning plan. It is expected that the commissioning plan may be a pre-operational condition of the Environmental Permit, for NRW, and it would also form part of the construction phase plan required as part of the CDM Regulations 2015 process.

22.6.14 The commissioning plan would cover the hazardous substances to be used onsite, most of which would be those to be used in operation of the development and which are presented later in the operational phase preliminary assessment (**Table 22-9**). In addition, there may be some chemicals introduced as a one-off application, e.g., degreasing / cleaning chemicals for plant and equipment. The commissioning plan, required through the environmental permitting process, would address the hazards and risks of the hazardous substances during the commissioning phase.

Review of Commissioning Activities

22.6.15 Plant and equipment would be commissioned in accordance with a commissioning plan. The plant and equipment would be brought on incrementally, using minimum process fluids where possible, until the operations are established. Once established, the operating capacity would be increased under controlled conditions specified in the commissioning plan.

22.6.16 The commissioning plan would be underpinned by:

- appropriate task risk assessments;
- clearly defined criteria, beyond which the commissioning operations would be stopped; and
- industry recognised standard commissioning practices.

Assessment of Shortlisted Major Accidents and Disasters Scenarios

22.6.17 The following MA&D risk events have been identified for the commissioning phase, considering the likely hazardous substances and identified commissioning activities for further consideration herein:

- wet testing of equipment and charging storage vessels with gases and chemicals for the first time; and
- testing of critical instrument and control systems.

22.6.18 Credible Scenarios for the commissioning risk events are presented in **Table 22-7** as well as an overview of associated potential environmental impacts and the relevant embedded mitigation. In summary, the level of risk presented by foreseeable credible scenarios has been assessed as tolerable-if ALARP, taking into consideration the identified embedded mitigation measures.

Table 22-7: Credible Scenarios Related to the Commissioning of the Proposed Development

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
COM-1	<p>Wet Testing of Equipment and Charging Storage Vessels</p> <p>On first use of equipment, loss of containment possible if equipment is not clean or if equipment fails / has open route (i.e. untested open valve).</p>	<p>Equipment needs to be clean when brought online and charged / used for the first time. If equipment has not been sufficiently purged of construction materials, i.e. cleaning agents or flushing oils, there may be unwanted reactions or loss of containment from failure or open ends (e.g. valving error).</p>	<p>A commissioning plan would be required for sharing with the HSE and NRW as part of both the COMAH and Environmental Permitting regimes, and from part of the construction phase plan. The commissioning plan would be underpinned with appropriate risk assessments and control measures which reflect standard commissioning practices. The plant and equipment would be brought on incrementally, using minimum process fluids where possible, until the operations are established.</p>	<p>Tolerable-if ALARP (Not Significant)</p>
COM-2	<p>Testing of Critical Instrument and Control Systems</p> <p>On first use of equipment, loss of containment possible if testing of equipment controls fail.</p>	<p>Failure of critical instrument and control systems during testing may lead to loss of containment of materials.</p>	<p>A commissioning plan would be required for sharing with the HSE and NRW as part of both the COMAH and Environmental Permitting regimes. The commissioning plan would be underpinned by control loop / system testing plans, involving testing remotely (i.e., when not in service / duty). Piping and vessels would be subject to appropriate cleaning (e.g. chemical / steam cleaning) prior to use. The plant and equipment would be brought on incrementally, using minimum process fluids where possible, until the operations are established.</p>	<p>Tolerable-if ALARP (Not Significant)</p>

22.6.19 The ranking of tolerable-if ALARP recognises that, at this stage of the Proposed Development design process, the mitigation measures considered are primarily the standard engineering design controls typically included within industrial facilities such as the Proposed Development. Specific embedded mitigation measures would be confirmed as the detailed design of the Proposed Development progresses and consequence modelling / QRA or similar detailed safety study(s) are produced to assess the level of residual risk. If any further measures are required to satisfy the relevant legislation, as identified through consequence modelling / QRA or similar detailed safety study(s), they would be included during the detailed design to demonstrate that the embedded mitigation measures reduce all risks to ALARP.

Operational Phase

22.6.20 The earliest year of operation for the Proposed Development is anticipated to be Q4 2026. If construction was to be undertaken in a simultaneous construction approach, the earliest operation is anticipated to be Q4 2031.

Hazardous Substances to be Used on Site

22.6.21 The key hazardous substances, which would be present within the Proposed Development during operation are summarised in **Table 22-8**, along with their properties and arrangements for storage and use.

22.6.22 Through the detailed design process, smaller quantities of other potentially dangerous and / or hazardous materials may also be present on-site. These substances would 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. These smaller quantities would be managed under embedded practices such as bespoke risk assessments and management of change to ensure their use would not initiate or contribute to a MA&Ds.

Review of Operational Activities

22.6.23 The Proposed Development would include up to two new integrated power generation and carbon capture "Trains". Each train would consist of a CCGT plant, which in total, would generate up to a likely maximum of 1,380 MW electrical output, and a CCP for the recovery of the CO₂ from the exhaust gases of the CCGT plant. The recovered CO₂ would be sent offsite, outside the boundaries of the Proposed Development, by pipeline for permanent geological storage.

22.6.24 Natural gas would be supplied to the proposed CCGT units from the National Transmission System (NatTS) through the existing Connah's Quay Power Station Above Ground Installation (AGI) where it would be conditioned to the required temperature and pressure for combustion in the CCGT.

22.6.25 Following combustion, the hot product gases enter the gas turbine where they would expand across the blades of the turbine causing it to rotate and drive an electrical generator. As an amount of usable heat remains in the gas turbine exhaust gases, these would be passed into a Heat Recovery Steam

Turbine (HRSG) (a type of boiler) to recover the useful heat to produce steam (at various pressures) to generate further electricity via a separate steam turbine, and for heating of process streams within the CCP.

- 22.6.26 Flue gases would be treated by selective catalytic reduction (SCR) to ensure that oxides of nitrogen (NO_x) concentrations remain within the required emissions limits and to prevent the degradation of solvent within the CCP to optimise the CO₂ capture efficiency. SCR is a secondary abatement technique typically involving either the injection of aqueous ammonia or urea into the flue gas to react with any NO_x present in the presence of a catalyst to create nitrogen and water vapour.
- 22.6.27 The flue gas post-SCR would be directed into the CCP for the removal of CO₂ from the gas stream during normal (abated) operation. During certain circumstances including outages of the CCP, it would be possible to discharge exhaust gases through a dedicated stack above the HRSG building. The HRSG stack would be fitted with continuous emissions monitoring system (CEMS) instrumentation and would serve as the bypass stack to run independently of the CCP.
- 22.6.28 The exhaust steam from the steam turbine would be condensed (cooled) back into water which would then be returned to the HRSG to continue the process. Water used within this steam / water cycle would be treated with water treatment chemicals (anti-scaling / fouling chemicals) to minimise the build-up of residual dissolved solids in pipework and treated with corrosion inhibitor chemicals to minimise corrosion. The volume of these chemicals used onsite is small and would not cause a MA&D.
- 22.6.29 The Proposed Development would also include a 'system restoration' capability using a small, 2 Megawatts electrical (Mwe), diesel generator or a small battery energy storage system (BESS). The diesel generator would require use and storage of diesel in above ground tank(s). Subject to further design, this is expected to be approximately 50 m³ capacity and would include an associated loading area within the Main Development Area. The diesel would only be used to support black-start operations or to provide emergency supplies if connection to the grid system was lost.
- 22.6.30 Post combustion carbon capture first involves capturing and cooling the exhaust gases from the CCGT units (potentially via a flue gas blower) to the optimal CCP design temperature at which the CO₂ gas can be absorbed by solvent. Therefore, prior to their introduction into the absorber column(s), flue gases from the CCGT would be cooled to the required design temperature using a direct contact cooler (DCC), that quenches the hot flue gases with a fine water spray in a column using indirect cooling by the hybrid cooling towers. The heated water would then be subject to indirect cooling by the hybrid cooling towers, prior to recirculation to the DCC in a closed loop cycle.
- 22.6.31 Once cooled, the flue gases from the generating station would be introduced to one or more absorber column(s), which contain a liquid amine-based chemical solvent, to absorb the CO₂ and remove it from the exhaust gases. The solvent to be used is the subject of ongoing technical studies but is assumed to be an aqueous solution of amines. The alkaline nature of the solvent would mean that it would selectively absorb acidic gases such as CO₂.

- 22.6.32 A flue gas washing unit would be located within the absorber column(s) to remove entrained solvent and potentially ammonia from the flue gases. The CO₂ 'lean' flue gases following treatment may then pass through a mist eliminator where they are treated to remove entrained mist droplets. A flue gas heater may be included in the absorber column (requirement to be confirmed by dispersion modelling at detailed design). If the heater is required, waste heat from the steam condensate stream, or from elsewhere in the process, would be used to increase the thermal buoyancy of the treated, washed flue gas, before release from the top of the absorber column(s) via dedicated absorber stack(s) for dispersion to the atmosphere.
- 22.6.33 The CO₂ 'rich' solvent from the absorber(s) would pass from the bottom of the absorber column(s) to a stripper column for regeneration, where heat (steam) would be used to liberate the CO₂ gas from the solvent. The hot CO₂ 'lean' solvent would be returned from the stripper column, potentially via a heat exchanger, to the top of the absorber column(s) to repeat the cycle. The CO₂ gas exiting the top of the stripper column would be passed through a condenser to remove water and solvent vapours before being passed to the CO₂ conditioning and compression stages.
- 22.6.34 Within the CCP absorber(s), this solvent regeneration process concentrates residual impurities and would typically be operated without continuous make-up water or effluent production, although in the event of impurity accumulations, an occasional purge would be required.
- 22.6.35 The gaseous CO₂ stream from the CCP would be saturated with water and contain traces of oxygen, which would need to be reduced in a gas conditioning facility, prior to export to the T&S pipeline and gathering network. It is envisaged that the captured CO₂ stream would be cooled and partly compressed before the trace oxygen and water are removed. Following treatment, the CO₂ stream would be compressed to pipeline pressure (to be agreed with the pipeline operator) for export, measured in a metering station and transferred from the Main Development Area for onward transfer and connection.
- 22.6.36 Following compression, metering and composition monitoring by the Applicant, the CO₂ would be transferred into the Proposed CO₂ AGI (to be operated by Liverpool Bay CCS Limited) which would control the entry of CO₂ into the T&S network. From the Proposed CO₂ AGI, CO₂ is proposed to be transferred via the Repurposed CO₂ Connection, then the Proposed CO₂ Connection, to exit the Proposed Development at the Liverpool Bay CCS Ltd's Flint AGI (to be constructed as part of the HyNet CO₂ Pipeline Project). From Liverpool Bay CCS Limited's Flint AGI, CO₂ is proposed to be transported and stored within the wider T&S network to be constructed as part of the HyNet CO₂ Pipeline Project.

Table 22-8: Hazardous Substances Likely to be Present during the Operation of the Proposed Development

Substance	Use	Transportation / Storage	Hazards	Potential Effects
Natural gas (comprising a mixture of hydrocarbons; primarily methane (CH ₄))	Primary fuel for CCGT power plant.	Natural gas would be imported from the National Grid via a dedicated pipeline. No onsite gas storage.	Extremely flammable. A qualifying substance under COMAH (a named dangerous substance in the regulations).	Fire and / or explosion. Potential for onsite harm to workforce.
CO ₂ -gaseous	Recovered from the CCGT exhaust gas by the CCP.	Recovered, compressed, dewatered, and metered into a pipeline for export offsite and storage underground. No onsite storage of CO ₂ .	Asphyxiant. Not a qualifying substance under COMAH.	Harm to people via inhalation if exposed to gas (where oxygen in air is displaced / reduced).
Amine solvent	Used within the CCP for scrubbing CO ₂ from the CCGT exhaust gases and recovery as a CO ₂ gas stream.	Amine solvent would be imported by road tanker and stored in a dedicated storage tank within the CCP. After the initial fill, road tanker deliveries would be infrequent as the material is recycled. Some material would be purged occasionally to ensure efficient scrubbing. The exact storage inventory is to be defined, but sufficient quantities would be required to facilitate start-	Causes serious eye irritation. Toxic to aquatic life with long lasting effects.	Minor harm to people if released. Potential harm to the environment if released to ground / water / groundwater, dependent on type of Amine solvent used.

Substance	Use	Transportation / Storage	Hazards	Potential Effects
		up and shut-down equating to > 5,000 m ³ .		
Ammonia solution / Urea	Used within SCR abatement system (if required) to reduce NOx emissions from combustion equipment.	Ammonia solution / urea would be imported by road tanker and stored in a tank as part of the CCGT facility. Exact storage quantities are subject to detailed design, however it is anticipated that less than 100 m ³ of ammonia solution / urea would be required per week when both trains are in operation.	Very toxic to aquatic life. Harmful if swallowed. Causes skin burns and eye damage.	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.
Diesel	Fuel for backup generators, firewater pumps etc.	Diesel would be imported by road tanker and stored on-site at various locations, near point of use. Inventory is likely to be small for emergency systems.	Flammable. Toxic to the aquatic environment with long lasting effects (chronic). A qualifying substance under COMAH (a named dangerous substance in the regulations).	Harm to people on-site in the event of release and / or fire. Harm to environment if released.
SCR Catalyst	Catalyst used for abating combustion plant emissions, i.e., NOx reduction, in the CCGT	SCR catalyst would be imported by road. Catalyst would be loaded to the CCGT.	Toxicity to be confirmed pending selection of catalyst. SCR catalysts are complex mixtures of transition metal	This would be confirmed when catalyst confirmed but could be harmful to workforce if inhaled, or in contact with skin.

Substance	Use	Transportation / Storage	Hazards	Potential Effects
	using ammonia solution (or urea) if required.	Inventory to be confirmed when catalyst chosen.	and base metal oxides, e.g. Titanium (Ti), Tungsten (W), Vanadium (V), Molybdenum (Mo), Aluminium (Al), Silicon (Si), Magnesium (Mg) etc.	
Hydrogen (gaseous)	Reagent used in removing oxygen from the CO ₂ product (over a catalyst, converting it to water). The water is then removed by an adsorbent system. Water and oxygen are tightly controlled so as to minimize pipe corrosion. Hydrogen is also used as a generator coolant.	Dependent on volumes to be stored, this could be transported in pressurised gas cylinders (for smaller volumes) or brought to site in a Multiple Element Gas Container trailer or similar for offload and storage in dedicated on-site cylinders (for larger volumes).	Extremely flammable. A qualifying substance under COMAH (a named dangerous substance in the regulations).	Fire and / or explosion. Potential for onsite harm to workforce.

Assessment of Shortlisted Major Accidents and Disasters Scenarios

22.6.37 The following MA&D risk events have been identified for the operational phase, considering the likely hazardous substances and identified operational activities for further consideration herein:

- fire and / or explosion of natural gas or hydrogen;
- major asphyxiant gas release carbon dioxide;
- major release of amine solution;
- domino event - industrial;
- coastal / fluvial flooding;
- aircraft / drone impact; and
- vandalism.

22.6.38 Credible scenarios for the operation risk events are outlined in **Table 22-9** as well as an overview of associated potential environmental impacts and the relevant embedded mitigation. In summary, the level of risk presented by most foreseeable credible scenarios has been assessed as tolerable-if ALARP, taking into consideration the identified embedded mitigation measures, with the exception of aircraft / drone impact and vandalism which are ranked as tolerable.

22.6.39 The ranking of tolerable-if ALARP recognises that, at this stage of the Proposed Development design process, the mitigation measures considered are primarily the standard engineering design controls typically included within industrial facilities such as the Proposed Development. Specific embedded mitigation measures would be confirmed as the detailed design of the Proposed Development progresses and consequence modelling / QRA or similar detailed safety study(s) are produced to assess the level of residual risk. The detailed design would need to reduce the risks to ALARP to satisfy COMAH. If any further measures are required to satisfy the relevant legislation, as identified through consequence modelling / QRA or similar detailed safety study(s), they would be included during the detailed design to demonstrate that the embedded mitigation measures reduce all risks to ALARP.

Table 22-9: 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 of Natural Gas</p> <p>Fire due to loss of containment of natural gas (e.g., by mechanical failure or impact damage) from supply pipeline or process / combustion equipment. Explosion from ignition of escaped natural gas.</p>	<p>Fire and / or explosion could result in significant harm to people on-site. There is also the potential for harm to people and businesses off-site, through radiant heat burns, smoke effects and impact injuries from explosions.</p> <p>The environmental impact of a major fire could affect the surrounding soil and groundwater, surface waters and the River Dee, through the migration of contaminated firewater.</p>	<p>Design of the natural gas systems would be to industry codes and standards and would include the 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 the equipment.</p> <p>Locating occupied buildings away from hazardous zones, where practicable, 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.</p> <p>Compliance with the Pressure Equipment (Safety) Regulations 2016 (Ref 22-23) and the PSR (Ref 22-5).</p> <p>Selection of buried pipeline routes away from sensitive receptors (where practicable), increased 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 collision barriers.</p> <p>Leak / natural gas detection systems would be used in the vicinity of high hazard areas at the Main Development Area.</p> <p>Fire detection and fire protection systems would be installed, including passive and active fire suppression systems.</p>	Tolerable-if ALARP (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
			<p>The Proposed Development would be designed to contain firewater runoff in a retention basin and prevent material reaching unmade ground or other environmental receptors.</p> <p>Detailed emergency plans would be produced for the Proposed Development in accordance with applicable regulations.</p>	
O-2	<p>Asphyxiant Gas Release Carbon Dioxide</p> <p>Release of CO₂ (e.g., by mechanical failure or impact damage) from export pipeline or CCP process equipment.</p>	<p>Release of CO₂ could result in harm / injury to people on-site.</p> <p>The impact of the release on people and the environment offsite depends on the pressure, temperature and mass of material that is lost, however, there is the potential for harm from asphyxiation as CO₂ is odourless and heavier than air.</p> <p>The likelihood of pipeline loss of containment failure and significant release of CO₂ is assessed to be very low.</p>	<p>Design of the process systems in the CCP (CO₂ desorption system and gas compression) and piping would be to industry codes and standards.</p> <p>Compliance with the Pressure Equipment (Safety) Regulations and the PSR.</p> <p>The pipeline will be designed, constructed, operated and maintained in compliance with applicable Regulations, Cods/Standards and Good Practices. Leak detection and emergency shut down systems will be installed and activated to minimise the release in the unlikely event of a pipeline failure.</p> <p>Oxygen depletion detection, CO₂ presence and process pressure monitoring would be installed at the Main Development Area in the vicinity of high hazard areas.</p> <p>Personnel would wear personal CO₂ detectors in high hazard areas.</p> <p>Detailed emergency plans would be produced for the Proposed Development in accordance with all applicable Regulations, such as evacuation of the facility, such as shutdown / isolation of the pipelines and notification of relevant authorities.</p>	Tolerable-if ALARP (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
O-3	<p>Release of Amine Solution</p> <p>Release of amine solution (e.g., by mechanical failure or impact damage) from carbon capture process equipment or storage.</p>	<p>Release of amine solution could result in harm to aquatic environments. Loss of this material into surface water drains could reach local watercourses including the Dee Estuary. This could be a major accident with the potential to harm the local environment due to the potential toxicity of amines, and / or through an increase in the pH of the environment as well as through the reduction in the dissolved oxygen concentration within the watercourses.</p>	<p>Amine solution bulk storage and storage within process equipment would be located within appropriately bunded areas. The process equipment and pipework would be designed and constructed to the relevant industry standards.</p> <p>As detailed in Chapter 4: The Proposed Development (EN010166/APP/6.2.4), process water would have isolated drainage areas, segregated from the surface water drains, which would be routed to be collected for transfer off-site together with process wastewater. The discharge would be regulated by NRW through the Environmental Permit which is required for the operation of the Proposed Development. Disposal by vacuum truck operated by a specialist waste disposal contractor may be used for new waste / effluent streams. This effects associated with these routine operations are considered in Chapter 13: Water Environment and Flood Risk (EN010166/APP/6.2.22).</p> <p>Containment facilities and drainage systems onsite would be designed and constructed to industry standards (so as to be compliant with CIRIA C736 requirements) and operated in accordance with the Environmental Permit.</p> <p>Process monitoring systems would be installed to monitor releases with alarms and trip systems in place to inform operatives of accidental emissions. Interlocks would also be installed to automatically isolate or shut down systems in the event of an abnormal release.</p>	Tolerable-if ALARP (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
O-4	<p>Domino Event - Industrial</p> <p>An event on the operational site impacts and escalates to a neighbouring hazardous (COMAH) site. Alternatively, an event at a neighbouring hazardous (COMAH) site impacts the Proposed Development.</p>	<p>Risk of escalation of fire / explosion / loss of chemical containment to nearby COMAH sites, due to an explosion or fire or loss of containment event on the operational site.</p> <p>The site could be affected by fire / explosion / loss of chemical containment from neighbouring COMAH sites.</p> <p>Potential harm / injury to onsite workers.</p>	<p>The COMAH status of the Proposed Development is to be determined. There are several Lower and Upper Tier COMAH establishments within the MA&Ds Study Area (5 km distance).</p> <p>It is a requirement under COMAH legislation to consider potential Domino effects and to demonstrate that the risks are ALARP. Putting in the appropriate mitigation measures in design and operation.</p> <p>The Proposed Development would have to assess the potential for Domino effects, either being the initiator or the receptor of an event, as part of the COMAH process. Appropriate mitigation measures would need to be implemented such that the Principles of ALARP are upheld to minimise risk.</p> <p>It should be noted that neighbouring COMAH sites would have to review and implement changes, where required, as part of their Domino effects assessment.</p> <p>The HSE would review the Domino assessments to ensure that the risks are tolerable and that ALARP has been applied.</p>	Tolerable-if ALARP (Not Significant)
O-5	<p>Coastal / Fluvial Flooding</p> <p>A tidal or river flood event or storm surge causes the Proposed Development to flood</p>	<p>The site is located adjacent to the River Dee, which is influenced by tidal movements. The site is located in a flood zone 3 and has a >0.5% chance of</p>	<p>A Flood Consequence Assessment (FCA) is provided in Appendix 13-C: Flood Consequence Assessment (EN010166/APP/6.4).</p> <p>The Site is located in a Flood Zone 3.</p>	Tolerable-if ALARP (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
		<p>flooding from tidal influence.</p> <p>The consequences of flooding the Site include contamination with polluting substances through destabilising assets and / or compromising the integrity of plant and equipment.</p> <p>Floodwater reaching electrical equipment could present a risk to health due to electrocution.</p>	<p>The FCA has informed the design of the Proposed Development in terms of surface water management and the selection of finished floor levels (7.7 m AoD).</p> <p>Mitigation measures include:</p> <ul style="list-style-type: none"> identifying a suitable level for the development platform for the Site (7.4 m AoD); building the Proposed Development using Flood Resistant and Resilience design standards; a system for monitoring flood warnings; and the development of a Flood Emergency Response Plan. <p>The Main Development Area would be on a suitably raised platform (7.4 m AoD) to accommodate the flood zone and hence critical electrical equipment, such as transformers and switchgear, would be located above the predicted flood levels.</p> <p>Flooding is considered by the HSE under COMAH as a potential "initiating event" to a Major Accident and consequently mitigation measures are required to be defined in the COMAH Safety Report, to demonstrate risks have been mitigated to ALARP.</p> <p>Flooding guidance is provided by NRW for sites regulated under the EPR, this has been embedded within design of the Proposed Development.</p>	
O-6	Aircraft / Drone Impact Impact on site infrastructure and / or	Aircraft / drone incident results in harm to site personnel and / or member	The Proposed Development is located in an area close to Hawarden airport (aerodrome). The final CEMP would require that consultation be undertaken with relevant airports / Civil Aviation Authority (CAA) to manage	Tolerable (Not Significant)

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
	site personnel from above aircraft / drones.	of public and / or irreversible damage to environmental receptor (ecological site, watercourse etc.).	interfaces and define appropriate control measures, including the need for aviation warning lighting to be fitted to tall construction machinery. The Applicant has engaged Airbus and it has been noted that the absorber and HRSG stacks would infringe the outer horizontal surface related to Hawarden Airport. Further discussion and assessment is required to demonstrate the infringement is acceptable.	
O-7	Vandalism A malicious destructive act onsite whereby material loss of containment could occur, resulting in Fire / Explosion / Pollution	Harm to onsite personnel and / or members of the public off site from fire / explosion / loss of containment. Damage to environmental receptors from loss of containment. During operation, the on-site chemicals inventory is hazardous (amine solvent etc.) and thus the severity of a potential incident would not be trivial.	Appropriate security measures would be installed at the operating site, including CCTV, site security and fencing to prevent trespassers and mitigate this risk as per the COMAH and EPR permit security requirements.	Tolerable (Not Significant)

Decommissioning Phase

22.6.40 In the context of MA&Ds, the decommissioning phase is distinctly different from demolition. Decommissioning refers to the removal of chemical inventory and waste, removing residual risk and making assets safe. Demolition refers to the removal of physical assets and infrastructure from the site.

Hazardous Substances to be Used on Site

22.6.41 Potential MA&Ds disasters scenarios during decommissioning of the Proposed Development would involve the same hazardous materials as encountered in the operational phase, however this phase would also generate waste chemicals when emptying vessels and pipework. These chemicals would be recycled wherever possible and managed in accordance with the legislation applicable at the time.

22.6.42 Assuming decommissioning successfully removes all chemicals used during operation from site, the hazardous substances present during demolition should be broadly similar to those present during construction and in small quantities.

Review of Decommissioning/Demolition Activities

22.6.43 Activities carried out during decommissioning may also have potential hazards associated with chemical release and vehicle impacts on-site. Decommissioning is likely to include the cleaning, removal or capping off of pipelines and isolation of process vessels prior to dismantling. This activity has the potential for an accidental loss of containment of process gases (natural gas) and liquids.

22.6.44 Activities typically carried out during demolition include lifting cranes, hot work (cutting), etc. The associated risks and control measures with these activities are broadly similar to those encountered during construction. As such, demolition activities are not subject to further assessment.

Assessment of Shortlisted Major Accidents and Disasters Scenarios

22.6.45 The following MA&D risk events have been identified for the decommissioning phase, considering the likely hazardous substances and identified decommissioning activities for further consideration herein:

- the release of residual inventory substances used during operational phase.

22.6.46 Credible scenarios for decommissioning risk events are provided in **Table 22-10** as well as an overview of associated potential environmental impacts and the relevant embedded mitigation. In summary, the level of risk presented by all foreseeable credible scenarios has been assessed as tolerable, taking into consideration the proposed mitigation measures. This recognises that the decommissioning plan would need to demonstrate BAT (under EPR 2016) and effective health and safety management under the CDM Regulations 2015 (or equivalent legislation in place at the time of decommissioning) to the satisfaction of NRW and the HSE (or other relevant regulators at the time of decommissioning).

Table 22-10: Credible Scenarios Related to the Decommissioning of the Proposed Development

Scenario Reference	Credible Scenario	Potential Impacts	Embedded Mitigation	Tolerability
D-1	<p>Release of Residual Inventory of Operational Phase Substances</p> <p>Decommissioning activity results in a loss of containment of gas, or liquid (diesel / amine) as a result of failure to empty, clean and purge process systems.</p>	<p>A release of natural gas could cause a fire / explosion that could cause harm / injury to site personnel.</p> <p>A release of liquid diesel / amine could impact upon the environmental receptors.</p>	<p>A decommissioning plan (DEMP) would be required for the Environmental Permit, subject to the approval of NRW.</p> <p>A separate DCO DEMP is required to discharge the requirements of the DCO, which is not subject to NRW approval.</p> <p>All decommissioning and demolition activities would be controlled as applicable in relation to The Dangerous Substances and Explosive Atmospheres Regulations 2002; The Control of Substances Hazardous to Health Regulations 2002 and The CDM Regulations 2015; or any equivalent legislation at the time of decommissioning.</p> <p>The demolition phase would be a notifiable project under CDM Regulations 2015 to the HSE.</p> <p>Risk assessments would be produced prior to demolition activities, which are only to be carried out by suitably trained and experienced personnel.</p> <p>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), would be strictly controlled in accordance with the decommissioning plan / DEMP.</p> <p>Job method statements, prepared under the CDM Regulations 2015, would include gas testing systems to ensure that plant and equipment have been fully vented 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>	Tolerable (Not Significant)

22.7 Additional Mitigation and Enhancement Measures

- 22.7.1 The credible scenarios identified for each phase of the Proposed Development have been assessed as having a level of risk which is tolerable or tolerable-if ALARP, based on the information available at this time. The embedded mitigation measures envisaged at this stage of the design process are considered to be sufficient at this point, however further measures may well be defined as the Proposed Development design is further progressed. Further analysis may be carried out as part of design development which includes detailed QRA and / or consequence modelling assessments to determine whether the level of residual risk to people, both on-site and off-site, and to the environment, is to acceptable industry standards or ALARP and compliant with relevant legislation.

22.8 Summary of Likely Residual Effects

- 22.8.1 It is considered that all MA&Ds risk events identified during each stage of the Proposed Development would be tolerable or tolerable-if ALARP and therefore the residual effects are **Not Significant**.
- 22.8.2 The MADS events, considered for each phase of the Proposed Development, are outlined in detail within the body of this section, with the necessary detail for the evaluation and judgement. Consequently, no Summary Table is included, contrary to the other technical chapters.
- 22.8.3 An assessment of potential cumulative and combined effects is detailed in **Chapter 24: Cumulative and Combined Effects (EN010166/APP/6.2.24)**. It should be recognised that domino effects would be considered within the COMAH considerations with the HSE.

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