HyNet North West

ENVIRONMENTAL STATEMENT (VOLUME II)

Chapter 11 – Land and Soils (Tracked)

HyNet Carbon Dioxide Pipeline DCO

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulations 5(2)(a)

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11. LAND AND SOILS

11.1. INTRODUCTION

11.1.1. This Chapter reports the assessment of the likely significant effects of the DCO Proposed Development on Land and Soils and includes an assessment of how the DCO Proposed Development could be impacted by or could impact Land and Soils which includes Contaminated Land, Mineral Resources, Coal Mining and Agricultural Land. It describes:

- Relevant, legislation, policy and guidance;
- Consultation undertaken;
- Scope of the assessment;
- Assessment methodology;
- Baseline conditions;
- Sensitive receptors;
- Design development and embedded mitigation;
- Assessment of likely impacts and effects;
- Mitigation and enhancement measures;
- Residual effects;
- Monitoring; and
- Next steps.

11.1.2. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider Environmental Statement (ES), with particular reference to **Chapter 14 - Materials and Waste** and **Chapter 18 - Water Resource and Flood Risk (Volume II).**

11.1.3. This Chapter has been prepared by competent experts with relevant and appropriate experience, as outlined in **Appendix 5.1 - Relevant Expertise and Competency (Volume III).**

11.2. LEGISLATIVE AND POLICY FRAMEWORK

11.2.1. A summary of the international, national, and local legislation, planning policy and guidance relevant to the Land and Soil assessment for the DCO Proposed Development is set out below.

LEGISLATIVE FRAMEWORK

International

11.2.2. The Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment, 2006 (2006/11/EC) (**Ref. 11.1**) offers protection of watercourses and the marine environment from pollution.

National

11.2.3. Contaminated Land Regulations (England), 2006 (amended 2012) (these regulations apply to England only) (**Ref. 11.2**) is guidance on the how land should be investigated and remediated in relation to contamination.

11.2.4. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (**Ref. 11.3**) is legislation that seeks to establish an integrated approach to the protection and sustainable use of the water environment.

11.2.5. Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (**Ref. 11.4**) is guidance to provide information to those carrying out activities that may cause threats to environmental damage.

11.2.6. The Environmental Permitting (England and Wales) Regulations 2016 (**Ref. 11.5**) is to streamline the legislative system for industrial and waste installations into a single permitting structure for those activities which have the potential to cause harm to human health or the environment.

11.2.7. Control Of Substance Hazardous to Health Regulations (COSHH) 2002 (**Ref .11.6**). COSHH is the law that requires employers to control substances that hazardous to health.

11.2.8. Control Of Asbestos Regulations (CAR) 2012 (**Ref. 11.7**) is legislation to set out the duties to manage risks from asbestos.

11.2.9. Construction (Design & Management) Regulations (CDM), 2015 (**Ref. 11.8**) is legislation to ensure health and safety issues are properly considered during a project's development so that the risk of harm to those who have to build, use and maintain the development is reduced.

POLICY

National – England

11.2.10. The National Planning Policy Framework (2021) (NPPF) (**Ref. 11.9**) states that the purpose of the planning system is to contribute to the achievement of sustainable development. The NPPF requires the planning system to contribute to and enhance the natural and local environment by protecting and enhancing geological and soils conservation interests. It also seeks to prevent new and existing development from contributing to or being put at unacceptable risk from soil or water pollution or land instability. It seeks to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location.

11.2.11. The National Policy Statement (NPS) guidelines including the 'Overarching National Policy Statement for Energy' (EN-1) (**Ref. 11.46**) and the 'Gas Supply Infrastructure and Gas and Oil Pipelines' (EN-4) (**Ref. 11.47**) (current and draft) have been reviewed. Together they provide the primary basis for decision by the Infrastructure Planning Commission (IPC) on applications it receives for gas supply infrastructure and gas/oil pipelines.

11.2.12. With regard to Land (Geology) and Soils Draft EN-4 (**Ref. 11.47**) states:

- Applicants should assess the stability of the ground conditions associated with the pipeline route and incorporate the findings of that assessment in the ES (see Section 4.2 of EN-1 (**Ref. 11.46**)) as appropriate. Desktop studies, which include known geology and previous borehole data, can form the basis of the applicant's assessment. The applicant may find it necessary to sink new boreholes along the preferred route to better understand the ground conditions present. The assessment should cover the options considered for installing the pipeline and weigh up the impacts of the means of installation. Where the applicant proposes to use HDD as the means of installing a pipeline under a National or International Site (i.e., RAMSAR, SSSIs etc) and mitigating the impacts, the assessment should cover whether the geological conditions are suitable for HDD.

11.2.13. With regards to mitigation for Land (Geology) and Soils Draft EN-4 (**Ref. 11.47**) states:

- Mitigation measures to minimise any adverse effects on soil and geology should include measures to ensure that residual impacts on the surface are minor, for example some differential vegetation growth. Mitigation measures should include appropriate treatment of soil (and in particular topsoil) during site construction and other infrastructure activity (and appropriate soil storage and reinstatement) in line with the principles and practices outlined in the Code of Practice for the Sustainable Management of Soils on Construction Sites17 and the Agricultural Land Classification18 which provides guidelines on soil handling and restoration criteria and land quality. The Secretary of State must consider what appropriate conditions should be attached to any consent. Where HDD is proposed, the applicant should provide an alternative plan for installing the pipeline in the event that HDD fails. Such alternative means could include open cut, micro-tunnelling and tunnelling.

National - Wales

11.2.14. The Planning Policy Wales (PPW) (**Ref. 11.48**) guidance sets out the land use planning policies of the Welsh Government. The primary objective of the PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental, and cultural well-being of Wales.

11.2.15. The PPW (**Ref. 11.48**) is supplemented by a series of Technical Advice Notes (TANS), Government Wales Circulars, and policy clarification letters, which together with the PPW provide the national planning policy framework for Wales. Examples of TANS relevant to land and soils assessment include:

- TAN5: Provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation;
- TAN12: Provides design solutions which maximise the natural landscape and assets and minimise environmental impact on the landscape through the sustainable management of resources such as water and soil on a catchment scale; and
- TAN15: Advises caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions.

Local

11.2.16. Relevant adopted policies within:

- Cheshire West and Chester Council (CWCC) Local Plan (**Ref. 11.10**);
- Flintshire County Council (FCC) Development Plans and Policy (**Ref. 11.11**);
- Flintshire Local Development Plan (2015 – 2030) (**Ref. 11.12**); and
- The Council Plan (2017 – 2023) – Flintshire County Council (**Ref. 11.13**) The Deeside Plan (2017) (**Ref. 11.14).**

GUIDANCE

National

11.2.17. The following guidance has been used to inform the assessment approach, and the mitigation applied.

- Health and Safety Executive (HSE) (1991) Guidance Note HS(G)66, Protection of Workers, and the General Public during the Development of Contaminated Land (**Ref. 11.15**);
- Environment Agency (EA) (2020) Land Contamination Risk Management (LCRM) (**Ref. 11.16**). Natural Resources Wales (NRW) have adopted the EA guidance on assessing and managing risks from land contamination. In reference to Regulatory Position Statement (RPS) 182 (regulating trials of waste management operations) and 215 (land contamination pilot trials and small-scale remediation schemes), NRW has equivalent regulatory decisions in place for Wales;
- CIRIA C552 (2001), Contaminated Land Risk Assessment: A guide to good practice (**Ref. 11.17**);

- CIRIA C532 (2001) Control of Pollution from Construction Sites (**Ref. 11.18**);
- Environment Agency and National House Building Council (NHBC) (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66 (**Ref. 11.19**);
- BS 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice (**Ref. 11.20**);
- Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012 (**Ref. 11.21**);
- Environment Agency (2017) Groundwater Protection (**Ref. 11.22**).
- British Standards Institute (BSI) BS 5930 (2020) The Code of Practice for Site Investigations (**Ref. 11.23**);
- Design Manuals for Roads and Bridges (DMRB) 104 (Environmental Assessment and Monitoring) (**Ref. 11.24**), 109 (Geology and Soils) (**Ref. 11.25**), 110 (material assets and waste) (**Ref. 11.26**) and 113 (Road drainage and the water environment) (**Ref. 11.27**);
- NRW Guide to the discretionary advice service for development planning and marine advice regarding land contamination, groundwater protection and nationally significant infrastructure projects (NSIPs) (**Ref. 11.28**); and
- Natural England Environmental Planning Guide to developers on NSIPs and applications for planning, permission in principle and technical details consent (**Ref. 11.29**).

Local

11.2.18. CWCC have a team identified as the 'Total Environment Team' who carry out project, planning and advisory work, with the aim of creating a better environment for the residents of Cheshire West and Chester (**Ref. 11.10**). The team work closely with external organisations such as Mersey Forest, Historic England, Cheshire Wildlife Trust and Natural England. The team specialise in the following areas relevant to land and soils; biodiversity, conservation, green infrastructure and landscape.

11.2.19. FCC has prepared a set of 18 summary Topic Papers (**Ref. 11.11**) to support the preparation of the Flintshire Local Development Plan (FLDP) (2015 – 2030), the Deposit version of which is currently at Examination Stage (**Ref. 11.12**). Each Topic Paper sets out the relevant guidance and identifies issues that the FLDP will need to address as well as possible policy approaches to be incorporated. The Topic Papers are intended to provide an early opportunity for stakeholders and the public to have an input in the FLDP.

11.2.20. Topics relevant to land and soils include; landscape, minerals, waste, biodiversity and nature conservation, flooding and environmental protection. In terms of the ES assessment, the Topic Papers have been used to identify existing policies relevant to land and soils and as a guide to address objectives and requirements in line with the FLDP.

11.3. SCOPING OPINION AND CONSULTATION

RESPONSE TO THE SCOPING OPINION

11.3.1. An **EIA Scoping Opinion** (**Appendix 1.2, Volume III)**) was received by the Applicant from the Planning Inspectorate (The Inspectorate) on 14 July 2021, including formal responses from Statutory Consultees. The responses from The Inspectorate in relation to Land and Soils and how these have been addressed by the Applicant in the undertaking of this assessment are set out in **Appendix 1.3 - Scoping Opinion Responses (Volume III).**

CONSULTATION UNDERTAKEN TO DATE

11.3.2. **Table 11.1~~Table 11.1~~** provides a summary of the consultation undertaken to inform the Land and Soil assessment.

Table 11.1 - Summary of Consultation Undertaken

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
Welsh Government Natural England	Arwel Williams (Welsh Government) Eleanor Reed (Natural England)	Email correspondence (02 August 2021)	Email requesting a meeting regarding the extent and density requirements for the Agricultural Land Classification (ALC) Survey to establish a classification for the agricultural land that the Newbuild Infrastructure Boundary could intercept.
Welsh Government Natural England	Arwel Williams (Welsh Government) Eleanor Reed (Natural England)	Teleconference (25 October 2021)	Meeting to agree density and method of ALC Survey. The agreed proposals were as follows: • 1 location per hectare in any areas that will be permanently sealed; • 1 location per 2 hectares in any areas that will be temporarily sealed; • Contingency for soil variability, if soils are highly variable in areas that will be temporarily sealed then higher density 1 location per hectare should be undertaken. The survey density is to increase where soil variability increases and BMV land is present. A clear justification is required to explain the survey density across the Newbuild Infrastructure Boundary; and • Welsh Government may request access to Site to undertake targeted survey work to support the validation process – The Applicant to facilitate access if this is requested. The works should be undertaken in accordance with guidance set out in Code of Practice for the Sustainable Use of Soils on Construction Sites

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
			(**Ref. 11.30**) and the Institute of Quarrying: Good Practice for Handling Soils (**Ref. 11.31**).
Natural England	Eleanor Reed (Natural England)	Email correspondence (10 August 2022)	Communication from Natural England confirming they are satisfied with the ALC survey assessment extent and the assigned agricultural grading classification assigned to soils within the English extent of the DCO Application.
Welsh Government	Arwel Williams (Welsh Government)	Email correspondence (12 August 2022)	Communication from the Welsh Government stating the report was 'thorough and clearly surveyed' according to guidelines. They requested some clarifications prior to their final validation. These responses were submitted on 19 August 2022. A final validation report is awaited.
FCC	Email to Pollution.Control@flintshire.gov.uk Reply from Rachael Davies	Email correspondence (01 October 2021) Reply (01 October 2021)	Requesting pertinent information regarding Contaminated Land, landfills, and local water supplies Information provided included in Baseline. Information provided is included with the **Phase I Land and Soil (Contaminated Land) Baseline Report (Appendix 11.1, Volume III)**.
	Rachael Davies	Email correspondence (01 December 2021) Baseline and Proposed outline	Email requesting meeting (01 December 21). Documents submitted on 23 December 2021. Followed by meeting (25 January 2022) to discuss **Phase I Land and Soil (Contaminated Land) Baseline Report (Appendix 11.1, Volume III)** and the scope of **Phase II Ground Investigation Appendix 11.5 (Volume III).** FCC confirmed they were satisfied with the contents of the Phase I Preliminary Risk Assessment (Baseline Report) and agreed with

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
		Ground Investigation Scope submitted (23 December 2021) Teleconference (25 January 2022)	the outline scope of the Phase II Ground Investigation. FCC highlighted former lead mining on Halkyn that should be included in the investigation scope.
	Hannah Parish and Gary Nancarrow	Email correspondence (29 November 2021)	Email to confirm the requirement for a Mineral Resource Assessment (MRA) for portion of the DCO Proposed Development within the FCC jurisdiction. Email confirmed an MRA was required and provided guidance on the contents. The email is included within the annexes of the **MRA (Appendix 11.3 , Volume III).**
		MRA Submitted (11 July 2022)	Submission of the MRA version 1 for comment to the Local Authority.
		Email correspondence (08 August 2022)	Email to confirm receipt of version 1 of the MRA and informing WSP that given workloads it could not be reviewed until September 2022.
CWCC	Ben Greenwood and Laura Roberts	Email correspondence (01 December 2021)	Meeting to discuss **Phase I Preliminary Risk Assessment (Baseline Report)** and scope of **Proposed Phase II Geoenvironmental Investigation.** CWCC were satisfied with the Phase I Report and the scope of the **Proposed Phase II Geoenvironmental Investigation.**

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
		Baseline and Proposed outline Ground Investigation Scope submitted (23 December 2021) Teleconference (26 January 2022)	
	Laura Furlong	Email correspondence (27 June 2022)	The Senior Environmental Protection Officer at CWCC confirmed that the indicative alignment of the Newbuild Carbon Dioxide Pipeline and associated infrastructure do not fall on or within 250m of any sites determined by the Council as contaminated land, as defined under Part IIA of the Environmental Protection Act 1990 (**Ref. 11.41**).
	Ben Greenwood and Catherine Morgetroyd	Email correspondence (29 November 2021) Reply (29 November 2021)	Email to confirm the requirement for a MRA for portion of the proposed DCO Development within the CWCC jurisdiction. Email confirmed an MRA was required and provided guidance on the contents. The email is included within the appendices of the **MRA (Appendix 11.3, Volume III)**.
		MRA v1 Submitted (11 July 2022)	Teams Meeting to discuss Version 1 of the MRA.

Body / Organisation	Individual / Statutory Body / Organisation	Meeting Dates and Other Forms of Consultation	Summary of Outcome of Discussions
		Teleconference (03 August 2022) MRA v2 submitted (12 August 2022)	A version 2 of the MRA will be produced and submitted including clarification of points that were raised following the CWCC review of version 1.

11.4. SCOPE OF THE ASSESSMENT

11.4.1. This section provides information on the scope of the assessment and re-iterates the evidence base for scoping out elements following further iterative assessment. Further information can be found in **Chapter 5 - EIA Methodology (Volume III)** of the ES.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

11.4.2. The elements shown in **Table 11.2~~Table 11.2~~** are not considered likely to give rise to significant effects as a result of the DCO Proposed Development and have therefore not been considered within this assessment. The existing Flint Connection to PoA Terminal Pipeline has been scoped out of all elements.

Table 11.2 - Elements Scoped Out of the Assessment

Element Scoped Out	Stage	Justification
Contaminated soil and detriment to Human Health	Operation	Contaminated land pathways to human health to be addressed via a Remediation Strategy (if required) and incorporated as part of the Construction Stage, thereby leaving the site 'suitable for use' from a contaminated land perspective as part of the Operational Stage.
Controlled Water Body Contamination	Operation	No contaminated land source-pathway-receptors scenarios identified as part of the Operational Stage.
Built Environment – detriment of pipes and cables from aggressive ground contaminants over time	Construction	Insufficient time for contaminants to impact pipe / ducting materials during the Construction Stage of the DCO Proposed Development.

ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Stage

11.4.3. The potential for likely significant effects to occur during the Construction Stage relate to:

- Disturbance, permanent and/or temporary loss of agricultural land and soils including Best and Most Versatile (BMV) soils;
- Exposing construction staff to contaminated dust and soil particulates during construction related earthworks activities;
- Mobilising existing contamination in groundwater as a result of ground disturbance and de-watering and creating or optimising migration pathways for contaminants to reach sensitive receptors (e.g. along Newbuild Carbon Dioxide Pipeline or new service trenches);
- Potential ground instability and ground contamination associated with former mining at Halkyn and Alltami Brook which could cause subsidence of the Newbuild Carbon Dioxide Pipeline or exposure of construction workers or operational maintenance workers to lead contamination;
- Introduction of new sources of contamination to the ground, such as fuels and oils used in construction plant, associated with any spillages and leaks; and
- Release of hazardous mine gas/ground gas and subsequent accumulation within confined spaces associated with disturbing and potentially grouting coal mining related voids.

Operation Stage

11.4.4. The likely significant effects associated with the Operation Stage relate to:

- Loss of agricultural land including BMV land;
- Changes in site levels may result in existing contaminants that were previously present at depth and therefore unlikely to interact with the identified receptors, now being present at the surface where they could pose unacceptable risks to future site users; and
- Damage to the Newbuild Carbon Dioxide Pipeline and cables from ground contaminants.

Decommissioning Stage

11.4.5. The likely significant effects associated with the Decommissioning Stage relate to:

- Potential mobilisation of contaminants during decommissioning works;
- Exposing construction staff to contaminated dust and soil particulates during demolition activities;
- Mobilising existing contamination in groundwater as a result of ground disturbance during decommissioning; and
- Introduction of new sources of contamination to the ground, such as fuels and oils used by demolition plant.

11.5. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

11.5.1. A qualitative assessment of potential effects during construction, operation and decommissioning stages has been carried out that considered risks to land and soil with reference to the activities for each stage.

11.5.2. A **Phase I Land and Soil (Contaminated Land) Baseline Report** (**Appendix 11.1, Volume III)** has been produced to establish the current baseline condition of the Study Area (defined in **Paragraph 11.5.8**) and assess potential constraints relating to land and soil relevant to the phases of the DCO Proposed Development.

11.5.3. The assessment is undertaken in accordance with DMRB document LA 109 Geology and Soils (with inclusion of Wales Annex where appropriate) (2019) (**Ref. 11.25**). Although not a Highway Project, the LA 109 framework provides recognised contemporary guidance on how to assess the impact of a development on land and soils. LA 109 assesses the effects of a development on the following aspects:

1. Effects on bedrock geology and superficial deposits; including geological designations (i.e., mineral resources) and sensitive / valuable non-designated features;
2. Effects on soil resources (i.e., agricultural land); and
3. Effects from contamination on human health, surface water and groundwater.

11.5.4. When assessing the effects from contamination, the guidance Land Contamination Risk Management (LCRM) (**Ref. 11.16**) recommends the use of a Conceptual Site Model (CSM). The basis of this approach comprises three elements: a source, a pathway, and a receptor. Without each of these, there can be no contamination risk. Therefore, the presence of measurable concentrations of contamination within the ground and subsurface does not automatically imply that a contamination risk exists, since the contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors that are relevant to a particular Site will vary according to the intended use of the Site, its characteristics, and its surroundings.

11.5.5. LCRM will be used as a technical framework in the understanding of how contamination issues that may arise could be managed. The CSM will be used to identify and assess the potential effects on the identified sensitive receptors (including human health, controlled waters, agricultural soils, ecological receptors, buildings and services) and outline mitigation measures to manage the risks identified in the assessment. The assessment will be prepared in accordance with the legislation and guidance referenced above.

11.5.6. The level of risk has been evaluated in accordance with the methodology set out in CIRIA C552: Contaminated Land Risk Assessment: A guide to good practice (CIRIA, 2001) (**Ref. 11.17**). This involves classification of the consequence and probability associated with each potential contaminant linkage and thereby the corresponding level of risk (risk category).

11.5.7. The Applicant produced a **Coal Mining Risk Assessment** (presented in **Appendix 11.2, Volume III**).

STUDY AREA

11.5.8. The Newbuild Infrastructure Boundary has been divided into seven sections (Section 1 to Section 6) from Ince in the east to Flint in the west and three Block Valves Stations (BVSs) (Section 7). A Site Location Plan is presented on **Figure 3.2 - DCO Proposed Development (Volume IV).**

11.5.9. Although the Newbuild Carbon Dioxide Pipeline route may move within the Newbuild Infrastructure Boundary (within the Permanent Acquisition of Sub-Surface Area), any changes that may occur within these limits are not considered to significantly alter the outcome of this Chapter.

11.5.10. The assessment includes the Newbuild Infrastructure Boundary with the following buffer zones:

- A 50m buffer from the Newbuild Infrastructure Boundary has been used in identifying sources of contamination posing a risk to human health receptors. This is considered to be the area that could be impacted in terms of land and soil based on the route and surrounding sensitive environmental receptors and contamination migration potential; and
- A 250m buffer from the Newbuild Infrastructure Boundary route has been used to identify sources of contamination posing a risk to sensitive controlled waters receptors. This is consistent with safe development on contaminated land guidance document R&D66 (**Ref. 11.19**) when considering the impacts of contamination on sensitive environmental receptors.

11.5.11. It is assumed that the information provided and reviewed in the baseline is representative of existing ground conditions. A degree of professional judgement has been used in the interpretation of information and in determining the sensitivity and magnitude.

METHOD OF BASELINE DATA COLLATION

Desk Study

11.5.12. As specified within Draft EN-4 (**Ref. 11.47**) the Desktop Study should form the basis of an applications assessment. The Desktop Study is included within the **Phase I Land and Soil (Contaminated Land) Baseline Report** (**Appendix 11.1, Volume III**) which comprises a review of the following publicly available data and data purchased from third parties:

- Groundsure Enviro Insight and Geo Insight, Refs and Groundsure Insight Historical Ordnance Survey mapping;
- Zetica UXO Desk Study and Risk Assessment (October 2021);
- British Geological Survey (BGS) Onshore GeoIndex online viewer (**Ref. 11.32**);
- Coal Authority Interactive Map viewer (**Ref. 11.33**);
- Geological Survey Mapping of England and Wales (**Ref. 11.34**);
- EA Catchment Data Explorer (**Ref. 11.35**);
- DEFRA Magic Map website (**Ref. 11.36**);
- Natural Resource Wales (NRW) Mapping (**Ref. 11.37**);
- Cranfield Soil and Agrifood Institute Soilscapes map (**Ref. 11.38**); and
- Flintshire County Council Contaminated Land Register (**Ref. 11.39**).

Site Visit and Surveys

11.5.13. A preliminary Site reconnaissance visit was undertaken on 29 November 2021 to four parcels of land identified by the **Phase I Preliminary Risk Assessment (Baseline Report)** to present potential sources of contamination; Industrial Sources (Fertiliser Manufacturer), former Thornton Green Landfill, former Spring Farm Landfill and active Gowy Landfill. The walkover notes are contained within Annex I of the **Phase I Land and Soil (Contaminated Land) Baseline Report**, presented within **Appendix 11.1 (Volume III)**. The remaining extents of the Newbuild Infrastructure Boundary have been reviewed using publicly available data and aerial photography.

11.5.14. A **Coal Mining Risk Assessment** has been produced for the Newbuild Infrastructure Boundary, presented in **Appendix 11.2 (Volume III)**.

11.5.15. A **Mineral Resource Assessment (MRA)** has been produced for the Newbuild Infrastructure Boundary, presented in **Appendix 11.3 (Volume III)**.

11.5.16. An intrusive **ALC Survey** has been undertaken for the Newbuild Infrastructure Boundary. The survey report, laboratory results and associated drawings for Sections 1-6 are presented within **Appendix 11.4 (Volume III)** and a separate report for Section 7 is presented in **Appendix 11.5 (Volume III)**.

11.5.17. Intrusive ground investigation has been undertaken for the Newbuild Infrastructure Boundary, as specified within Draft EN-4 (**Ref. 11.47**) the requirement to assess the ground conditions to inform the Applicant's understanding of the ground conditions might be necessary. It was determined necessary to provide a better understanding of the ground conditions within the Newbuild Infrastructure Boundary. The **Ground Investigation Report** is presented within **Appendix 11.6 (Volume III)**.

11.5.18. Finally, in conjunction with the aforementioned ALC Survey, an **Outline Soil Management Plan (OSMP)** and **Outline Peat Management Plan (OPMP)** have been produced based on the ALC results. These form appendices to the **Outline Construction Environmental Management Plan (OCEMP) (Document reference: D.6.5.4)**

IMPACT ASSESSMENT METHODOLOGY

11.5.19. A detailed assessment of land and soil has been undertaken in accordance with DMRB document LA 109 Geology and Soils (with inclusion of Wales Annex where appropriate) (2019) (**Ref. 11.25**) which presents guidance on the methodology for assessing the value / sensitivity of the receptor and magnitude of the impact and covering the elements set out in in the earlier **Table 11.2~~Table 11.2~~.**

11.5.20. The detailed elements included:

- Review of baseline soil, geological and environmental information for the Newbuild Infrastructure Boundary, including historical mapping, to enable an assessment of potential impacts associated with land contamination;
- Detailed Site survey / walkover;
- Review of ALC survey data;
- Review of data from GI surveys (where available) to confirm / attribute importance and facilitate Assessment of potential contaminant linkages, as required;
- Assessment of potential impacts;
- Assessment of the sensitivity of the attributes; and
- Evaluation of the likely significance of effects.

11.5.21. Assessment procedures contained within BS10175:2011 (**Ref. 11.20**) and Environment Agency guidance Land Contamination: Risk Management LCRM (**Ref. 11.16**), including an assessment of risk classification for the source-pathway-receptor protocol based on CIRIA C552 (**Ref. 11.17**), were used in a phased approach to inform the sensitivity of the receptor and the magnitude of the impact.

SIGNIFICANCE CRITERIA

11.5.22. The criteria for determining the magnitude of identified impacts, the sensitivity of receptors and the significance of the resulting effects are presented in **Table 11.3**~~**Table 11.3**~~ to **Table 11.5**~~**Table 11.5**~~.

Table 11.3 - Magnitude of Impact

Magnitude*	Criteria
Major	**Geology**: loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features, or elements. **Soil**: physical removal or permanent sealing of soil resource or agricultural land (soil resource of >20ha of agricultural land). Contamination: • Human health: significant contamination identified; • Contamination levels significantly exceed background levels and relevant screening criteria; and • Surface water and groundwater: use relative sensitivity in water environment in LA113 (**Ref. 11.27**).

Magnitude*	Criteria
Moderate	**Geology**: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of / damage to key characteristics, features, or elements. **Soils:** permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (for example, through degradation, compaction, erosion of soil resource) or physical removal or permanent sealing of 1ha-20ha of agricultural land. **Contamination**: • Human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria. Significant contamination can be present. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use; and • Surface water and groundwater: use relative sensitivity in water environment in LA113 (**Ref. 11.27**).
Minor	**Geology**: minor measurable change in geological feature / designation attributes, quality, or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features, or elements. **Soils**: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (for example, through degradation, compaction, erosion of soil resource.) **Contamination**: • Human health: contaminant concentrations are below relevant screening criteria. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health; and • Surface water and groundwater: use relative sensitivity in water environment in LA113 (**Ref. 11.27**).
Negligible	**Geology**: very minor loss or detrimental alteration to one or more characteristics, features, or elements of geological feature / designation. Overall integrity of resource not affected. **Soils**: no discernible loss / reduction of soil function(s) that restrict current or approved future use, physical removal, or

Magnitude*	Criteria
	permanent sealing of <1ha of agricultural land should be reported as not discernible. **Contamination**: • Human health: contaminant concentrations substantially below levels outlined in relevant screening criteria. No requirement for control measures to reduce risks to human health / make land suitable for intended use; and • Surface water and groundwater: use relative sensitivity in water environment in LA113 (**Ref. 11.27**).
No Change	**Geology**: no temporary or permanent loss / disturbance of characteristics features or elements. **Soils**: no loss / reduction of soil function(s) that restrict current or approved future use. **Contamination**: • Human health: reported contaminant concentrations below background levels; and • Surface water and groundwater: use relative sensitivity in water environment in LA113 (**Ref. 11.27**).

* Physical removal or permanent sealing of <1ha of agricultural land should be reported as not discernible (**Ref. 11.24**).

Table 11.4 - Sensitivity Criteria

Sensitivity	Description
Very High	**Geology**: very rare and of international importance with no potential for replacement (for example, UNESCO World Heritage Sites, UNESCO Global Geoparks, Sites of Special Scientific Interest (SSSI) and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such. **Soils**: • Soils directly supporting an EU designated Site (for example, Special Areas of Conservation, Special Protections Areas, Ramsar); and / or

Sensitivity	Description
	• ALC grade 1, 2 & 3a or LCA grade 1, 2 and 3.1 (N.B. Grade 3a to be defined as Very High BMV agricultural land at the request of Welsh Government consultation). **Contamination**: • Human health - very high sensitivity land (for example, residential or allotments); • Surface water: watercourse having Good WFD classification or designation under EC or UK legislation; and • Groundwater: Principal Aquifer located within source protection zone (SPZ)1.
High	**Geology**: rare and of national importance with little potential for replacement (for example, geological SSSI and National Nature Reserves). Geology meeting national designation citation criteria which is not designated as such. **Soils**: Soils directly supporting a UK designated Site (for example, SSSI). **Contamination**: • High sensitivity land use such as public open space; • Surface water: Watercourse having Moderate WFD classification; and • Groundwater: Principal Aquifer located within SPZ2.
Medium	**Geology**: of regional importance with limited potential for replacement for example, Regionally Important Geological (and Geomorphological) Sites (RIGS). Geology meeting regional designation citation criteria which is not designated as such. **Soils**: • Soils supporting non-statutory designated Sites (for example, Local Nature Reserves, Sites of Nature Conservation Importance (SNCIs)); and / or • ALC grade 3b or LCA grade 3.2. **Contamination**: • Medium sensitivity land use such as commercial or industrial; • Surface waters: watercourse not having WFD classification linking to a WFD watercourse within 100m; and • Principal Aquifer located within SPZ3.

Sensitivity	Description
Low	**Geology**: of local importance / interest with potential for replacement (for example, non-designated geological exposures, former quarries / mining Sites). **Soils**: • ALC grade 4 & 5 or LCA grade 4.1 to 7; and / or • Soils supporting non-designated notable or priority habitats. **Contamination**: • Low sensitivity land use such as highways and rail; • Surface waters - watercourse not having WFD classification linking to a WFD watercourse within 250m; and • Unproductive stratum.
Negligible	**Geology**: no geological exposures, little / no local interest. **Soils**: previously developed land formerly in 'hard uses' with little potential to return to agriculture. **Contamination**: • Undeveloped surplus land / no sensitive land use proposed; • Surface water: no surface watercourses located within 250m; and • Groundwater: no pathway to underlying aquifer.

Table 11.5 - Significance Matrix

		Magnitude of Impact				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity	**Very High**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large

	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

11.5.23. DMRB LA 104 (**Ref. 11.24**) provides the following typical descriptions of the significance criteria:

- **Very Large**: Effects at this level are material in the decision-making process (considered Significant);
- **Large**: Effects at this level are likely to be material in the decision-making process (considered Significant);
- **Moderate**: Effects at this level can be considered to be material decision-making factors (considered Significant);
- **Slight**: Effects at this level are not material in the decision-making process (not considered Significant); and
- **Neutral**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error (not considered Significant).

11.6. BASELINE CONDITIONS

EXISTING BASELINE

11.6.1. The following reports should be read in conjunction with the baseline conditions section:

- **Appendix 11.1**: **Phase I Land and Soil (Contaminated Land) Baseline Report (Volume III)**;
- **Appendix 11.2: Coal Mining Risk Assessment (Volume III);**
- **Appendix 11.3: Mineral Resource Assessment (Volume III)**;
- **Appendix 11.4: Agricultural Land Classification and Soil Resources Sections 1-6 (Volume III);**
- **Appendix 11.5: Agricultural Land Classification and Soil Resources Section 7 (Volume III);**
- **Appendix 11.6: Phase II Geoenvironmental Ground Investigation Report (Volume III)**; and
- **Outline Soil Management Plan (Document reference: D.6.5.4.1)** and **Outline Peat Management Plan (Document reference: D.6.5.4.2).**

11.6.2. A summary of the baseline conditions (existing and future) for each section are summarised below.

Current Site Description

11.6.3. A detailed description of the DCO Proposed Development is presented in **Chapter 3 – Description of the DCO Proposed Development (Volume III)**. Detailed site descriptions are also provided within the **Phase I Land and Soil (Contaminated Land) Baseline Report (Appendix 11.1, Volume III)** with pertinent points summarised below:

Section 1

11.6.4. This 3.8 km section passes through predominantly agricultural land with the following land uses considered most pertinent to Land and Soils within the Newbuild Infrastructure Boundary, or 250 m from it:

- Former CF Fertilisers Manufacturing complex;
- Stanlow Manufacturing Complex;
- M56 motorway; and
- Ince Bio Power Station.

Section 2

11.6.5. This 7.8km section passes through predominantly agricultural land with the following land uses considered most pertinent to Land and Soils within the Newbuild Infrastructure Boundary or 250m from it:

- Stanlow Manufacturing Complex;
- Former Thornton Green Landfill and Spring Bank Farm Landfill;
- The Gowy Landfill (active landfill); and
- Ministry of Defence (MOD) fuelling depot (Backford South).

Section 3

11.6.6. This 6.2km section passes through predominantly agricultural land with the following land uses considered most pertinent to Land and Soils within the Newbuild Infrastructure Boundary, or 250m from it:

- Active Birkenhead to Chester Railway Line; and
- Dismantled Great Central Railway / London and North Eastern Railway.

Section 4

11.6.7. This 6.6km section passes through predominantly agricultural in the east with undeveloped land in the west, bound by mixed residential, commercial and industrial land, intersected by the active North Wales Coast Railway Line and River Dee.

Section 5

11.6.8. This 8.3km section comprises predominantly agricultural land on the outskirts of Aston and Ewloe Green to the east and Northop Hall to the west. The western

extent of the section runs approximately parallel to the A55 North Wales Expressway.

Section 6

11.6.9. This 2.15km section and the immediate surrounding comprises predominantly agricultural land on the outskirts of Aston and Ewloe Green to the east and Northop Hall to the west.

Section 7

11.6.10. Three BVSs will be constructed at three locations along the existing Flint Connection to PoA Terminal Pipeline, between Babell in the northwest and Flint in the southeast. At present the BVSs are located at sites occupied by open agricultural grassland:

- Babell BVS: Agricultural land accessible via Racecourse Lane to the northwest and an unnamed footway / single track lane that runs parallel to the northern boundary;
- Pentre Halkyn BVS: Agricultural land accessible via an unnamed track off the B5121 Allt-y- Chwiler to the west; and
- Cornist Lane BVS: Agricultural land accessible via an unnamed track off Cornist Lane which runs parallel with the northern boundary.

Historical Land Use

11.6.11. Detailed site histories and historical mapping records are provided within the **Phase I Land and Soil (Contaminated Land) Baseline Report (Appendix 11.1, Volume III)** with pertinent points summarised below:

Section 1

11.6.12. Historical mapping showed this section had limited notable features (a railway, quarry, roads, footpaths etc) and was predominantly agricultural land until the 1960s when the Stanlow Oil Refinery was constructed.

11.6.13. From 1990 to present day the Stanlow Oil Refinery infrastructure expanded and adjacent industrial sites have been constructed with tanks and chimneys shown at the start of the section on the CF Fertiliser Site.

Section 2

11.6.14. Historical mapping showed this section was predominantly agricultural land with the exception of the development of Stanlow Manufacturing Complex, the M56 and MOD Backford South site the section predominantly remains agricultural land.

Section 3

11.6.15. Historical mapping showed this section was predominantly agricultural land with several small residential villages and a culverted Beck. A sand pit was within 100m of the Newbuild Infrastructure Boundary limit with associated rail

infrastructure. The sand pit was infilled in the late 1960s and the railway infrastructure dismantled and redeveloped as a cycling / walking route in 2001.

Section 4

11.6.16. Historical mapping shows this section was predominantly agricultural land in the east from earliest mapping to present day. The west of the section is more developed, occupied by the towns of Pentre, Mancot and Sandycroft and the following industrial features; Queensferry wireworks and later corn mill, surface workings (clay pits and brickworks), coal mines and associated shafts and Aston Hill Colliery railway line.

Section 5

11.6.17. Historical mapping shows the section is largely agricultural land intersected by some residential properties, woodland, surface water features, roadways and rail infrastructure. Surface and underground mining features are also shown (sand / clay / gravel pits, shafts, collieries, spoil heaps) and mining is understood to have been undertaken in the Alltami Brook area. A brickworks is shown within the Newbuild Infrastructure Boundary in 1898. In addition, two wells are identified (90 m north) and a brewery (190 m northwest).

11.6.18. By the 1900s-1950s mapping many of the ground workings are identified as disused. Two reservoirs (one 180m northeast, the other 60m north) and a sewage works (200m southeast) are identified.

11.6.19. From the 1980s to present day mapping, two disused shafts in the centre of the Newbuild Infrastructure Boundary to the south of Northop Hall associated with historic collieries.

Section 6

11.6.20. Historical mapping shows the section consists of agricultural land with some residential properties, surface water features and highway infrastructure. An unidentified feature, likely a sand pit and lime kiln are located approximately 220m west (until 1960s).

Section 7

11.6.21. Historical mapping showed that the Section 7 were largely occupied by undeveloped agricultural land, with the exception of a former quarry identified at the Babell BVS site, a trackway at Pentre Halkyn BVS and a roadway and structure at Cornist Lane BVS.

Landfills and Waste Management

11.6.22. Review of historical mapping provided within the Groundsure Report (included within **Phase I Preliminary Risk Assessment (Baseline Report)**) indicates that a number of landfills, both historic and currently active, are located within the Newbuild Infrastructure Boundary. Moving east to west, from Section 1 to 7, the following landfills have been identified;

- Thornton Green Landfill (historical) – Section 2;
- Spring Farm Landfill (historical) – Section 2;

- Gowy Landfill (active) – Section 2;
- Unidentified landfill, east of Station Road (historical) – Section 3;
- Unidentified landfill, west of A550 (historic – previous brickfield) – Section 5;
- Old Aston Hill Landfill (recently active) – Section 5; and
- New Bridge Farm Landfill to the east of Wepre Brook (historical) – Section 5.

11.6.23. In addition, there are two licensed waste sites located within 50m of the Newbuild Infrastructure Boundary. The entries relate to the same site a surrendered waste licence location (surrendered in 2005), situated 50m north, to the west of the north-bound carriageway of the A41 Liverpool Road in Backford. During operation the site accepted household, commercial and industrial waste, accepting an annual tonnage of 15,024 tonnes.

Unexploded Ordnance (UXO)

11.6.24. Preliminary Risk Assessments completed by Zetica and commissioned for the DCO Proposed Development and Newbuild Infrastructure Boundary identified military land uses / activities from World War I (WWI) and World War II (WWII) within all sections. Please refer to **Annex C of the Phase I Land and Soil (Contaminated Land) Baseline Report**, presented in **Appendix 11.1 (Volume III)** for detailed information.

11.6.25. Despite the historical military activity, Zetica concluded that the Newbuild Infrastructure Boundary containing the DCO Proposed Development has a low UXO hazard level, with no significant sources of UXO hazard identified.

11.6.26. As such, Zetica recommended that a formal UXO awareness briefing is provided to all personnel involved in excavations so that they can take the appropriate action in the event of a suspect find.

11.6.27. The Newbuild Infrastructure Boundary has been modified since the detailed desk studies were prepared by Zetica. An updated UXO assessment will be produced prior to the commencement of the construction stage (**see Section Embedded Mitigation Section 11.8**).

Control of Major Accident Hazards (COMAH)

11.6.28. The existing Stanlow Manufacturing Complex, located within Section 1 in Ince, is an Upper Tier COMAH (Control of Major Accidents Hazards) site which is managed under COMAH Regulations 2015 (**Ref. 11.40**).

Contaminated Land Register

11.6.29. A review of the contaminated land registers available on the FCC website (**Ref. 11.39**) and correspondence with CWCC confirm that the Newbuild Infrastructure Boundary does not fall within 250m of any sites determined by the councils as contaminated land, as defined under Part IIA of the Environmental Protection Act 1990 (**Ref. 11.41**).

Geology

11.6.30. An assessment of the underlying geology has been undertaken to allow the formulation of an understanding of the ground model within the Newbuild Infrastructure Boundary. The underlying geology will allow differing migration pathways and are also receptors.

11.6.31. Made Ground associated with existing and historical development is expected in all sections and their surrounding areas. BGS Mapping indicates the underlying superficial and bedrock geology varies in lithology between the different sections of the DCO Proposed Development as summarised below.

Section 1

11.6.32. The superficial deposits comprise Tidal Flat Deposits (clay, silt and sand) in the east and Glacial Till in the centre and west. These are underlain by bedrock comprising the Kinnerton Sandstone Formation in the east and Chester Formation in the centre and west.

Section 2

11.6.33. The following superficial deposits are found along Section 2; Glacial Till, Blown Sand, Tidal Flat Deposits, Glaciofluvial Deposits, Alluvium and Peat (see Paragraphs **11.6.92 – 11.6.93** for additional information on Peat). These are underlain by bedrock comprising the Chester Formation with a small section of Wilmslow Sandstone Formation to the north.

Section 3

11.6.34. The superficial deposits along Section 3 are Glaciofluvial Deposits, Glacial Till and Tidal Flat Deposits. These are further underlain by bedrock comprising the Chester Formation and the Kinnerton Sandstone Formation.

Section 4

11.6.35. Tidal Flat and Glacial Till superficial deposits are identified along Section 4. These are underlain by bedrock comprising the Kinnerton Sandstone Formation, Etruria Formation and Pennine Coal Measures Formations (Lower and Middle).

Section 5

11.6.36. The superficial deposits comprise Glacial Till, intermittent with Glaciofluvial and Head deposits. These are further underlain by bedrock comprising the Pennine Coal Measures Formations (Lower and Middle including Hollin Rock Member), Gwespyr Sandstone, Bowland Shale Formation and Etruria Formation.

Section 6

11.6.37. The superficial deposits along section 6 comprise Glacial Till, with Glaciofluvial deposits encroaching on the eastern boundary. These are further underlain by bedrock comprising the Pennine Coal Measures Formations (Lower and Middle) and Gwespyr Sandstone.

Section 7

11.6.38. The superficial deposits comprise clay, silt and sand (Tidal Flats) with localised gravel layers likely. The Cornist Lane BVS exclusively comprises Glacial Till. Limestone bedrock is anticipated at Babell and Pentre Halkyn BVSs; Cefn Mawr Limestone Formation (Babell BVS) and Loggerheads Limestone Formation (Pentre Halkyn BVS). Sandstone and mudstone bedrock underlie Cornist Lane BVS; Bowland Shale Formation and Gwespyr Sandstone Formation. Bedrock at Babell BVS is anticipated to be present from 3.5m bgl, according to BGS borehole location SJ17SE124. Depth to bedrock at Pentre Halkyn BVS and Cornist Lane BVS unconfirmed due to unavailable BGS borehole data.

Coal Mining

11.6.39. Coal mining features (shafts, adits or mine workings) have the potential to cause ground subsidence i.e., sudden collapse or subsidence over a period time, which can generate mine water which in turn can contaminate watercourse and have the potential to release mine gas into structures or below ground excavations. Understanding where potential mine features are positioned within, or within 250m of, the Newbuild Infrastructure Boundary is presented below.

Sections 1, 2, 3, 6 and 7

11.6.40. The Coal Authority (CA) Interactive mapping (**Ref. 11.33**) indicates that sections 1, 2, 3, 6 and 7 of the Newbuild Infrastructure Boundary are not within Coal Mining Reporting Areas and as such, coal mining related stability risks are not considered further within this sub-section.

Sections 4 & 5

11.6.41. The CA Interactive mapping (**Ref. 11.33**) indicates that development high risk areas, requiring coal mining reports, are present along the western extent of Section 4 and along the majority of Section 5.

11.6.42. The Applicant commissioned the CA to prepare two Coal Mining Consultant Reports, covering Sections 4 and 5, for inclusion within their **Coal Mining Risk Assessment (Appendix 11.2 Volume III).**

11.6.43. The Coal Mining Consultants Reports confirmed the following:

- Past underground mining beneath the Newbuild Infrastructure Boundary and in the surrounding area;

- Probable unrecorded shallow workings mining beneath the Newbuild Infrastructure Boundary (increasing probability to the east, towards Section 4 and in vicinity of the A550);
- 32 mine entries mining within, or within 50 m of, the Newbuild Infrastructure Boundary very few of which have been treated under correct permitting and supervision. Several of these are clustered in adjacent to the Alltami Brook proposed crossing area;
- Several abandoned mines beneath the Newbuild Infrastructure Boundary;
- 'Workable' coal outcrops beneath the Newbuild Infrastructure Boundary; and
- A number of faults, adits and disused mine shafts intersecting the central area of Section 5 (concentrated southeast of Northop Hall in Section 5).

11.6.44. Both Coal Mining Consultant Reports (contained in **Appendix 11.2, Volume III**) conclude further investigation is required prior to the Detailed Design. In addition, the report for Section 5 (Report reference. 51002524473001) states the eastern extents of the section are close to areas the CA has previously investigated and remediated due to specific hazard reports. The CA recommended that further investigation regarding these hazards is undertaken, these works should be undertaken during any additional ground investigation.

11.6.45. As detailed above, the **Coal Mining Risk Assessment (Appendix 11.2 Volume III)** made several recommendations with regard to potential risk from Coal Mining and how it should be considered in the Detailed Design and construction of the DCO Proposed Development. Actions to address these recommendations are included within the **Embedded Mitigation Section 11.8.**

Quarrying and Mineral Extraction

Section 1

11.6.46. Numerous surface ground working features have been identified within the immediate surroundings of Section 1:

- Within 50 m - many ponds and a few unspecified heaps; and
- Within 250 m - many ponds, a few unspecified pits, a quarry and cuttings along carriageways (Junction 14 of M56).

11.6.47. There are no historical mineral planning areas within 250m of Section 1.

Section 2

11.6.48. Within the immediate surroundings of Section 2 numerous surface ground workings have been identified:

- Within 50m – many features largely relating to ponds but also the Shropshire Union Canal and cuttings along carriageways (M53 and M56); and

- Within 250m - cuttings along the Birkenhead to Chester railway line, refuse and unspecified heaps at GPSS Backford South and Chorlton Quarry and Church Farm Sand Pit.

11.6.49. Some historical mineral planning areas exist within proximity to Section 2; the aforementioned Church Farm Sand Pit is identified as a surface planning permission area (now expired). Two additional historical mineral extraction areas are identified within 50m of the Newbuild Infrastructure Boundary; for sandstone extraction at Thornton Green Farm (now expired) and a surface mineral working for sand at Collinge Farm (withdrawn).

Section 3

11.6.50. The surface ground workings identified within the immediate vicinity of Section 3 include:

- Within 50m – largely ponds, the Shropshire Union Canal, cuttings along the Birkenhead to Chester Railway and the Church Farm sand pit (within 50m of the Newbuild Infrastructure Boundary); and
- Within 250m – largely ponds, unspecified pits and ground workings along the England-Wales Border and the Great Central Railway / North Eastern Railway Line, a historic brickfield and ceased Backford sand and gravel pit.

11.6.51. Historic mineral planning areas in Section 3 include the aforementioned Church Farm Sand pit (surface planning permission area, now expired).

Section 4

11.6.52. The ground workings identified within the immediate vicinity of Section 4 include:

- Within 50 m – to the west of the section, numerous ceased surface and under-ground working features are identified: Clay Hill Colliery, Queensferry Road Colliery, brickworks in Pentre and Mancot Colliery). To the east of the section, surface workings identified exclusively relate to ponds; and
- Within 250 m – pond and surface ground workings related to historic clay / sand pits and ceased collieries in Pentre and Mancot. In addition to ceased underground workings related to lead mining (Mechanic's Arms Mine) and natural gas extraction (Yew Tree Farm).

Section 5

11.6.53. Numerous ground workings have been identified within the immediate surroundings of Section 5. These include:

- Within 50 m – numerous ceased collieries and surface workings (sand and gravel pit, collieries and quarry), disused shafts, heaps (unspecified and refuse) and less frequent reports of ponds and railway / roadway cuttings; and

- Within 250 m – unspecified shafts / heaps and three reservoirs to the east in Ewloe and Pentre.

11.6.54. No historical mineral planning areas are located within 50 m of Section 5. Within 250 m of the Newbuild Infrastructure Boundary, two historical mineral planning areas are identified, both located at a site name 'New Works', possibly within the Alltami Clay Quarry.

11.6.55. There are many entries for localised, small-scale and sporadic underground mining of iron ore and vein mineral deposits within 250 m of the Newbuild Infrastructure Boundary.

11.6.56. One natural cavity (a swallow hole) is identified within 70 m of the Newbuild Infrastructure Boundary (adjacent to Aston Hill Farm).

Section 6

11.6.57. Limited surface ground workings have been identified within the immediate surroundings of Section 6. These include three historic sand pits and a few ponds which have been identified within 250 m of the Newbuild Infrastructure Boundary.

11.6.58. The northern most historic sand pit located 250 m east of the indicative alignment of the Newbuild Carbon Dioxide Pipeline, south of Little Leadbrook Farm is also an historical mineral planning area.

11.6.59. There are many cases of localised, small-scale, sporadic underground mining of iron ore and vein mineral deposits within 250 m of the Newbuild Infrastructure Boundary.

Section 7

11.6.60. The majority of Babell BVS falls within an area designated as localised small scale underground mining possible, with the north-western region designated as underground mining known or likely within close proximity relating to vein mineral deposits.

11.6.61. Pentre Halkyn BVS is located in an area where underground mining may have occurred, and underground mining is known or likely within or in close proximity relating to vein mineral deposits.

11.6.62. Cornist Lane BVS is located within an area where sporadic underground mining of restricted extent is possible, relating to vein mineral and iron ore (bedded) deposits.

Lead Mining on Halkyn Mountain

11.6.63. Lead has been mined on Halkyn mountain for hundreds of years and according to the Halkyn mountain website (**Ref. 11.42**) over 100 km of tunnels and a vast network of shafts still exist on the mountain.

11.6.64. Babell BVS and Pentre Halkyn BVS are located within 6 km of Pentre Halkyn and therefore consideration should be given to the potential that lead mining may have occurred in the vicinity of or underlying the BVS sites. It is understood there is potential for lead contamination within this area.

Mineral Resources

11.6.65. The BGS (**Ref. 11.32**) and local authorities (CWCC and FCC) have identified potential mineral resources within the Newbuild Infrastructure Boundary.

11.6.66. A summary of the identified mineral resources underlying Sections 1-6 of the DCO Proposed Development is provided below in **Table 11.6~~Table 11.6~~.**

Table 11.6 - Identified Mineral Resources

Identified Mineral Resource	Associated Newbuild Infrastructure Boundary Section
Alluvium	1, 2
Blown Sand	2
Peat	2
Glaciofluvial Deposits	2, 3, 5, 6
Primary & Secondary Shallow Coal	4, 5, 6
Brick Clay	4, 5

11.6.67. The **Mineral Resource Assessment (MRA) (Appendix 11.3, Volume III)** concluded the following pertinent points regarding prior extraction for Sections 1-6:

- The Newbuild Infrastructure Boundary intersects multiple Mineral Safeguarding Areas (MSAs), defined as '*areas designated by a Mineral Planning Authority which cover known deposits of minerals, desired to be kept safeguarded from unnecessary sterilisation by non-mineral development'*. MSAs have been identified along each section of the DCO Proposed Development and comprise Sand & Gravel, and brick clay mineral resources;
- The MRA concluded that the mineral resources located within the MSA do not present workable or viable mineral prospects, due to poor quality resources and / or numerous constraints adversely impacting workability, resulting in partial or complete sterilisation of the existing resource (e.g. existing infrastructure / development, protected areas etc); and

- Despite this, limited incidental extraction of mineral resource will undoubtedly occur and will be managed by the Construction Contractor using a Materials Management Plan (MMP) (see **Section 11.8 Embedded Mitigation**), which is a Requirement in the **Draft DCO (Document reference: D.3.1)**. The MMP will enable the reuse of excavated material without it being classified as a waste and outline a cut / fill balance to reduce the amount of material permanently removed during the construction of the DCO Proposed Development. Where possible, mineral resources should be reused within the DCO Proposed Development (e.g. backfilling of the pipeline trench where viable).

11.6.68. The **Mineral Resource Assessment (MRA) (Appendix 11.3, Volume III)** concluded the following pertinent points regarding prior extraction for Section 7.

- Babell BVS: This area is underlain by sand and gravels (superficial deposits) and Limestone bedrock. Due to the limited size of the area, limited distribution of sand and gravels, and existing sterilisation, prior extraction of Sand and Gravel is not considered feasible. Incidental extraction of sand and gravel in the northwest is feasible for the construction of the access road. Limestone is not considered during incidental extraction as it is unlikely to be encountered; and
- Pentre Halkyn BVS: This area is underlain by sand and gravels (aggregates) and High Purity Limestone bedrock. Due to the limited size of the area, and existing sterilisation, prior extraction is not considered feasible. Incidental extraction of sand and gravel in the north of the site is feasible for the construction of the access road and BVS. Limestone is not considered during incidental extraction as it is unlikely to be encountered; and
- Cornist Lane BVS: No mineral deposits have been identified within the BVS area.

Soil Character

11.6.69. The Cranfield Soil and Agri-food Institute Soilscapes website (**Ref. 11.38**) defines the following expected soil quality types / classifications to the Sections:

Section 1

11.6.70. Loamy and sandy soils in the east, with naturally high groundwater and a peaty surface, with low to high fertility and medium to high carbon.

11.6.71. Loamy and clayey (slightly acid but base-rich) soils in the centre and west, which are slowly permeable (impeded drainage to stream network) and seasonally wet, with moderate fertility and low carbon.

Section 2

11.6.72. Loamy and clayey (slightly acid but base-rich) soils across the majority of the Section, which are slowly permeable (impeded drainage to stream network) and seasonally wet, with moderate to high fertility and low carbon.

11.6.73. Fen peat soils in the centre at the Gowy Landfill, with naturally high groundwater, mixed fertility and medium to high carbon.

11.6.74. Sandy (slightly acid) soils in the west exclusively (relating to the glaciofluvial deposits), which are freely draining with low fertility and carbon.

Section 3

11.6.75. Loamy and clayey (slightly acid but base-rich) soils across the majority of the Section, which are slowly permeable (impeded drainage to stream network) and seasonally wet, with moderate to high fertility and low carbon.

11.6.76. Loamy and clayey soils in the west exclusively (relating to the Tidal Flat Deposits), which have naturally high groundwater, with lime-rich to moderate fertility and medium carbon.

Section 4

11.6.77. Loamy and clayey soils across much of the Section (relating to the tidal flat deposits), which have naturally high groundwater, with lime-rich to moderate fertility and medium carbon.

11.6.78. Loamy and clayey (slightly acid but base-rich) soils exclusively to the west of the Section (related to glacial till deposits), which are slowly permeable (impeded drainage to stream network) and seasonally wet, with moderate fertility and low carbon.

Section 5

11.6.79. Loamy and clayey (slightly acid but base-rich) soils across the majority of the section (related to glacial till deposits), which are slowly permeable (impeded drainage to stream network) and seasonally wet, with low to moderate fertility and low to medium carbon.

11.6.80. Loamy (slightly acid) soils to the north of Ewloe (related to glaciofluvial and head deposits), which are freely draining, with low fertility and low carbon.

Section 6

11.6.81. Loamy and clayey (slightly acid but base-rich) soils across the majority of the Section (related to glacial till deposits), which are slowly permeable (impeded drainage to stream network) and seasonally wet, with moderate fertility and low carbon.

11.6.82. Loamy (slightly acid) soils encroaching on the eastern boundary (related to glaciofluvial deposits), which are freely draining, with low fertility and low carbon.

Section 7

11.6.83. Babell and Pentre Halkyn BVSs: Slightly acid but base-rich soils with a loamy texture. Soils are freely draining to the underlying groundwater. Habitats comprise base-rich pastures and deciduous woodland with arable and grassland landcover. Soils have low carbon and high fertility.

11.6.84. Cornist Lane BVS: Slightly acid but base-rich loamy and clay soils with loamy and clayey texture. Soils are slowly permeable and seasonally wet, with impeded drainage to the stream network. Habitats comprise seasonally wet pastures and woodlands with grassland and arable (some woodland) landcover. Soils have low carbon and moderate fertility.

Agricultural Soils and Agricultural Land

11.6.85. The Newbuild Infrastructure Boundary is predominantly agricultural land. Following the installation of the Newbuild Carbon Dioxide Pipeline there is a requirement to return the agricultural land to its previous quality as per section 2.23.7 of Draft EN-4 (**Ref. 11.47**). It is assumed that the land can be re-used for agricultural purposes following the DCO Proposed Development (with the exception of Mitigation Areas identified in **Table 11.7~~Table 11.7~~** below).

11.6.86. In order to assess the potential impact to soil quality, prior to undertaking the intrusive survey the post-1988 agricultural land classification (ALC) grades (where available) have been reviewed. The ALC grading is classified as follows:

- Grade 1: Excellent Quality with no limitations to agricultural use;
- Grade 2: Very good quality with minor limitations to agricultural use;
- Grade 3a: Good quality that can produce moderate to high yields of limited crops;
- Grade 3b: Moderate quality that can produce moderate yields of limited crops;
- Grade 4: Poor quality that significantly restricts the range or yield of crops; and
- Grade 5: Very poor quality with severe restrictions, generally used for pasture or rough grazing.

11.6.87. The National Planning Policy Framework (NPPF) and LA 109 (**Ref. 11.25**) (with inclusion of Wales Annex were appropriate) define Grades 1, 2 and 3a as Best and Most Versatile (BMV) land. LA 109 (**Ref. 11.25)** defines the sensitivity as follows:

- Very High: Grades 1 and 2;
- High: Grade 3a (to be defined as Very High at the request of Government Wales consultation);
- Medium: Grade 3b; and
- Low: Grade 4 and 5.

11.6.88. An **ALC Survey (Appendix 11.4 and 11.5, Volume III)** has been conducted by Reading Agricultural Consultants Ltd in 2022. The results have been reported separately with Sections 1-6 in **Appendix 11.4 (Volume III)** and Section 7 in **Appendix 11.5 (Volume III).**

11.6.89. Permanent sealing of agricultural land will occur at the newly constructed Above Ground Installation (AGI), Block Valve Station (BVS) sites and Mitigation Areas (where land will be used for new planting etc). **Table 11.7~~Table 11.7~~** below demonstrates the hectarage of each of these features. Stanlow Manufacturing Complex AGI has been excluded as this is non-agricultural land. The calculations of size of each of the proposed AGIs and BVSs is taken from the **OSMP (Document reference: D.6.5.4.1)**. The Mitigation Areas are taken from **Chapter 9 - Biodiversity (Volume II).**

Table 11.7 - Hectarage of Permanently Sealed Agricultural Land

Name	Hectare (ha)	BMV Grade
Ince AGI	0.180	Grade 3a*
Northop Hall AGI****	0.1155	Not surveyed (prior to design change 1 Grade 3b)
Flint AGI	0.560	Grade 3a
Rock Bank BVS	0.1050	Grade 2
Mollington BVS	0.1050	Grade 2
Aston Hill BVS	0.1050	Grade 3a
Cornist Lane BVS****	0.1050	Not Surveyed (prior to design change 1 Grade 3a)
Pentre Halkyn BVS	0.105	Grade 3a
Babell BVS	0.105	Grade 2**
Mitigation Area 1***	1.699	Grade 3b
Mitigation Area 2	0.364	Grade 3a
Mitigation Area 3	0.445	Grade 3a
Mitigation Area 4	1.375	Grade 3a
Mitigation Area 5	1.335	Grade 2
Mitigation Area 6	1.173	Grade 3a

Mitigation Area 7	1.133	Grade 3a
Mitigation Area 8	0.768	Grade 2
Mitigation Area 9	2.347	Grade 2 / 3a / Not surveyed
Mitigation Area 10	4.127	Grade 3a / Not surveyed
Altami Brook****	3.439	Not surveyed
Mitigation Area 11	0.323	Grade 3a
Mitigation Area 12	0.930	Grade 3a
Mitigation Area 13***	1.294	Grade 3b
Total BMV assuming BMV grades for Northop Hall and Cornist Lane	19.245	excludes MA1 and MA13

~~**Name**~~	~~**Hectare (ha)**~~	~~**BMV Grade**~~
~~Ince AGI~~	~~0.180~~	~~Grade 3a*~~
~~*Northop Hall AGI****~~	~~*0.1155*~~	~~*Grade 3b*~~
~~Flint AGI~~	~~0.560~~	~~Grade 3a~~
~~Rock Bank BVS~~	~~0.1050~~	~~Grade 2~~
~~Mollington BVS~~	~~0.1050~~	~~Grade 2~~
~~Aston Hill BVS~~	~~0.1050~~	~~Grade 3a~~
~~Cornist Lane BVS~~	~~0.1050~~	~~Grade 3a~~
~~Pentre Halkyn BVS~~	~~0.1050~~	~~Grade 3a~~
~~Babell BVS~~	~~0.1050~~	~~Grade 2**~~
~~***Mitigation Area 1***~~	~~*1.699*~~	~~*Grade 3b*~~
~~Mitigation Area 2~~	~~0.364~~	~~Grade 3a~~
~~Mitigation Area 3~~	~~0.445~~	~~Grade 3a~~
~~Mitigation Area 4~~	~~1.375~~	~~Grade 3a~~
~~Mitigation Area 5~~	~~1.335~~	~~Grade 2~~

~~Name~~	~~Hectare (ha)~~	~~BMV Grade~~
~~Mitigation Area 6~~	~~1.173~~	~~Grade 3a~~
~~Mitigation Area 7~~	~~1.133~~	~~Grade 3a~~
~~Mitigation Area 8~~	~~0.768~~	~~Grade 2~~
~~Mitigation Area 9~~	~~2.347~~	~~Grade 2 / 3a / Not surveyed~~
~~Mitigation Area 10~~	~~4.127~~	~~Grade 3a / Not surveyed~~
~~Altami Brook****~~	~~3.439~~	~~Not surveyed~~
~~Mitigation Area 11~~	~~0.323~~	~~Grade 3a~~
~~Mitigation Area 12~~	~~0.930~~	~~Grade 3a~~
~~***Mitigation Area 13***~~	~~*1.294*~~	~~*Grade 3b*~~
~~**TOTAL BMV**~~	~~20.423~~	~~-~~

*Provisional Grade 3 within report so upgraded to 3a for conservatism

**Grade 2 and 3a so upgraded to Grade 2 only for conservatism

***Excluded from calculation as not BMV

****Not surveyed included as BMV for conservatism

~~Provisional Grade 3 within report so upgraded to 3a for conservatism~~

~~**Grade 2 and 3a so upgraded to Grade 2 only for conservatism~~

~~***not BMV and excluded from calculation~~

~~****Not surveyed included as BMV for conservatism~~

11.6.90. ~~The~~ The AGIs, BVSs and Mitigation Areas in **Table 11.1** will sterilise a current total of 19.245ha BMV agricultural land assuming a worst-case scenario of Northop Hall and Cornist Lane being located on BMV land, for the duration of the development~~AGIs (listed above) will sterilise 19.129 hectares of BMV agricultural land for the duration of the development~~.

11.6.91. An **OSMP (Document reference: D.6.5.4.1)** sets out the best practice for extraction, handling and re-use of the differing agricultural soils. This should be used by the Construction Contractor to produce a Soil Management Plan (SMP) (**see Embedded Mitigation Section 11.8**).

Peat

11.6.92. The BGS (**Ref. 11.32**) and Cranfield Soil and Agri-food Institute Soilscapes website (**Ref. 11.38**) identifies peat deposits to the south / southwest of CF Fertilisers (Section 1) and to the north of the Gowy Landfill (Section 2). This was confirmed by the ground investigation undertaken by Fugro, between October 2021 and April 2022.

11.6.93. An **OPMP** (**Document reference: D.6.5.4.2**) sets out the best practice for the extraction, handling and re-use of peat. This should be used by the Construction Contractor to produce a Peat Management Plan (PMP) (**see Embedded Mitigation Section 11.8**)**.**

Radon

~~11.6.94.~~ **Table 11.8**~~**Table 11.8**~~ summarises the available radon information for the Newbuild Infrastructure Boundary. If radon protection measures are required these should be incorporated at the Detailed Design stage (**see Embedded Mitigation Section 11.8**).

Table 11.8 - Summary of Radon Data

Newbuild Infrastructure Boundary Section	Radon Data	Radon Protection Measures Required in Buildings
Section 1	Less than 1% of properties at or above action level	No
Section 2	Less than 1% of properties at or above action level	No
Section 3	Generally less than 1% properties affected by radon, although to the immediate east of the England – Wales border, radon action level increases to between 1% -3%.	No
Section 4	Generally less than 1% of properties affected by radon, although to the north of Mancot and in Sandycroft, radon action level increases to between 1% - 10%.	No
Section 5	Generally between 5 – 30% of properties affected by radon, although there are areas along Section 5 where radon action level increases to greater than 30%.	**Yes***
Section 6	Generally less than 1% of properties affected by radon, although there are areas, particularly in the north, where the radon action level increases to over 30%	**Yes***
Section 7	Generally between 5 – 30% of properties affected by radon, although there are areas along Section 5 where radon action level increases to greater than 30%.	**Yes***

*Radon protection measures are only required in buildings where radon action levels exceed 10%.

Natural Ground Subsidence

~~11.6.96.~~11.6.95. **Table 11.9**~~**Table 11.9**~~ provides a summary of the subsidence risks for individual Newbuild Infrastructure Boundary sections.

Table 11.9 - Natural Ground Subsidence

Hazard	Risk Rating for Each Section of the Newbuild Infrastructure Boundary (Within 50m of Newbuild Infrastructure Boundary)						
	1	2	3	4	5	6	7
Shrink Swell Clays	Negligible - very low	Negligible - very low	Negligible - very low	Very low	Negligible - very low	Negligible - very low	Very Low - Low
Running Sands	Very low - moderate	Very low - moderate	Very low - Moderate	Very low - moderate	Negligible - moderate	Negligible - very low	Very Low – High
Compressible Deposits	Negligible - moderate	Negligible - high	Negligible - moderate	Negligible - moderate	Negligible - moderate	Negligible - very low	Negligible - moderate
Collapsible Deposits	Negligible - very low	Negligible - very low	Negligible - very low	Negligible - very low	Very low - negligible	Very low	Very low - negligible
Landslides	Very low	Very low - low	Very low – moderate	Very low	Very low - moderate	Very low - moderate	Very Low - Low
Ground Dissolution of Soluble Rocks	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible - Moderate

Hydrogeology

~~11.6.97.~~11.6.96. **Table 11.10**~~**Table 11.10**~~ below identifies the EA classification of the various superficial and bedrock aquifers underlying the individual Newbuild Infrastructure Boundary sections.

Table 11.10 - Aquifer Classifications

Aquifer Classification	Geological Deposit	Section
Principal	Kinnerton Sandstone Formation*	1, 3, 4
	Chester Formation*	1, 2, 3
	Wilmslow Formation*	2
	Cefn Mawr	7
	Loggerhead Limestone	7
Secondary A	Blown Sand*	2
	Alluvium*	2
	Glaciofluvial Deposit*	2, 3, 5, 6, 7
	Etruria Formation**	4, 5
	Pennine Coal Measures Formations (Lower and Middle)**	4, 5, 6
	Gwespyr Sandstone Formation**	5, 6, 7
Secondary Undifferentiated	Tidal Flat Deposits*	1, 2, 3, 4
	Glacial Till*	1, 2, 3, 4, 5, 6, 7
	Head Deposits*	5, 7
	Bowland Shale Formation**	5, 7
Unproductive	Peat*	2

*Superficial geology, **Bedrock geology

~~11.6.98.~~11.6.97. For all Newbuild Infrastructure Boundary sections and within a 250 m buffer there are no recorded source protection zones (SPZ). However, for Section 4 a small region of the New Build Infrastructure Boundary, determined for temporary possession of land, falls within a SPZ 3 (total catchment).

Hydrology

~~11.6.99.~~11.6.98. A detailed summary of the Hydrological features is presented within **Chapter 18 - Water Resources and Flood Risk (Volume II).**

Flooding

~~11.6.100.~~11.6.99. The potential for flooding is detailed within **Chapter 18 -Water Resources and Flood Risk (Volume II)**.

Environmental Designations

~~11.6.101.~~11.6.100. The Environmental Designations that are pertinent to the Land and Soils chapter are presented below. A full review of all Environmental Designations for the site is presented within the **Chapter 9 - Biodiversity (Volume II).**

Sections 1, 2 and 3

~~11.6.102.~~11.6.101. No sensitive land uses are identified within the 250 m buffer zones for Section 1 (closest entry is a designated conservation area 400 m away), 2 (no entries identified within 1 km) or 3 (no entries within 1 km).

Section 4

~~11.6.103.~~11.6.102. The River Dee which flows through the centre of the Section has been identified as a designated Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC). In addition, an area of designated woodland (semi-natural) is located immediately adjacent to the New Build Infrastructure Boundary (determined for temporary possession of land). No other sensitive land uses are identified within 250 m of Section 4.

Section 5

~~11.6.104.~~11.6.103. The following sensitive land uses are located within 250 m of Section 5:

- Connah's Quay Ponds and Woodland are designated SSSIs (40 m north);
- Deeside and Buckley Newt sites are SACs (closest site is 60 m north); and
- Designated ancient woodland along the watercourses. Two pockets are positioned along the northern tributary of Wepre Brook, south of Northop Hall and within 50 m of the Newbuild Infrastructure Boundary.

Section 6

~~11.6.105.~~11.6.104. There is designated ancient woodland within the immediate vicinity of this section, particularly concentrated along the watercourse of Lead Brook. One pocket of ancient woodland, associated with Leadbrook Wood, is located within the Newbuild Carbon Infrastructure Boundary.

Section 7

~~11.6.106.~~11.6.105. All BVSs are located within SSSI Impact Risk Zones, which reflect the particular sensitivities of the features and indicate the types of development proposal which could have potentially adverse impacts. Certain types of development proposals including airports, pipelines, farming units and incineration units require consultation however the proposals for the BVSs do not fall under this requirement.

CONTAMINANT LINKAGE ASSESSMENT

~~11.6.107.~~11.6.106. Using the understanding of the ground conditions as set out within the **Phase I Preliminary Risk Assessment (Baseline Report)**, the pollutant linkages that were considered to be viable were used to create a preliminary conceptual site model (CSM) and a risk grading in accordance with the risk assessment set out in CIRIA C552 **(Ref. 11.17**) was applied. This preliminary CSM is presented within the **Phase I Land and Soil (Contaminated Land) Baseline Report (Appendix 11.1 (Volume III).**

~~11.6.108.~~11.6.107. In line with LCRM guidance (**Ref. 11.16**) the potentially viable pollutant linkages identified within the **Phase I Land and Soil (Contaminated Land) Baseline Report** (**Appendix 11.1 (Volume III**) were used to inform the design of an intrusive investigation (included in **Ground Investigation Report (Appendix 11.6, Volume III).**

~~11.6.109.~~11.6.108. The information collected during the intrusive investigation has been used to produce a refined CSM as presented in the **Ground Investigation Report (Appendix 11.6, Volume III),** the conclusions of which are summarised here.

Conclusions

~~11.6.110.~~11.6.109. The Newbuild Infrastructure Boundary is considered to represent a low risk profile in relation to contaminated land.

~~11.6.111.~~11.6.110. Soil sample concentrations were not recorded above the generic assessment criteria (GAC) and asbestos was not recorded within any of the samples analysed, and soil contamination risk to end users is not thought to be significant.

~~11.6.112.~~11.6.111. Limited exceedances were recorded above water quality standards (WQS) which could pose a theoretical risk to controlled waters. Supplementary monitoring is recommended to refine this theoretical risk and inform any further works (if required) This supplementary monitoring can be undertaken during the additional ground investigation assessment (set out below).

~~11.6.113.~~11.6.112. Limited sources of ground gas were identified within the Newbuild Infrastructure Boundary. A high VOC result measured within the Stanlow Manufacturing Complex will require further assessment. High groundwater levels meant very little unsaturated zone is available to monitor. An area of potential landfill was recorded in the vicinity of Ewloe which will require further assessment. Additional ground investigation works will be undertaken prior to construction (**see Embedded Mitigation Section 11.8**).

FUTURE BASELINE

~~11.6.114.~~11.6.113. In the absence of the construction of the Newbuild Carbon Dioxide Pipeline, AGIs and BVSs, the current land use would remain the same.

~~11.6.115.~~11.6.114. Opportunities would be lost for soil quality improvements in the event that remediation at the construction stage is no longer undertaken. The remediation would mitigate against any identified unacceptable human health or controlled water related risks.

11.7. SENSITIVE RECEPTORS

11.7.1. The following potentially sensitive receptors have been assessed and their respective sensitivity values displayed in **Table 11.11**~~**Table 11.11**~~. Sensitive receptors scoped out of this assessment are presented in **Table 11.2**~~**Table 11.2**~~.

Table 11.11 - Sensitive Receptors

Sensitivity	Identified Potential Receptor	Comment on Sensitivity
Human Health	Construction workers during Construction / Decommissioning Stages and future maintenance workers during the Operational Stage.	**Medium** There is potential for direct contact, ingestion or inhalation of contaminants for construction works during the constructions stage, maintenance workers during the operation stage and ground workers during the decommissioning stage.
	Neighbouring site users, nearby residential properties, or members of the public during the Construction / Decommissioning Stages.	**Medium** There is potential for direct contact, ingestion or inhalation of contaminants for third-party neighbours.
Controlled Waters	Groundwater within superficial deposits and underlying bedrock.	**Medium - High** High sensitivity determined for Principal and Secondary A Aquifers, which comprise permeable deposits and support local water supplies and / or river base flow on a local and / or strategic scale. Medium sensitivity determined for Secondary Undifferentiated and Unproductive Aquifers, which comprise lower permeability deposits, which have a lesser significance for water supply or river base flow. No source protection zones are located within 250m of the Newbuild Infrastructure Boundary. No potable groundwater abstractions are located within 500m of the Newbuild Infrastructure Boundary.

Sensitivity	Identified Potential Receptor	Comment on Sensitivity
	Surface water features.	**Medium - Very High*** The identified Water Body Catchments received the following status' from the EA 2019 / NRW 2021; ecological classification of poor-moderate, physico-chemical quality elements ranging from poor-high with several fails in concentrations (namely for mercury and PBDE). In addition, the following sensitive environmental designations have been assigned to the following water features within, or within 250m, of the Newbuild Infrastructure Boundary; • River Dee* (Section 4) is a designated SSSI and SAC; • Deeside and Buckley Newt sites* (Section 5) are SACs; and • 2no. active surface water abstraction points within 250m (along Section 1); at the Shropshire Union Canal and Gowy Meadows.
Environmentally Sensitive Sites / Mineral Resources	Flora and fauna within the nearby environmentally sensitive sites	**Negligible – Very High*** No environmental designations or designated protected areas which require consultation have been identified within, or within 250m of, Sections 1, 2 and 3. Sensitive land uses identified within, or within 250m of, of Sections 4, 5 and 6 include; SSSI, SAC and designated ancient woodland.
	Sensitive onsite soils	**Very High** 73% of soil samples collected within the Newbuild Infrastructure Boundary are identified as BMV.
	Bedrock and superficial mineral resources	**Medium** Mineral resources identified include; alluvium, blown sand, peat, glaciofluvial deposits, brick clay and primary and secondary shallow coal.

Sensitivity	Identified Potential Receptor	Comment on Sensitivity
Built Environment	Pipeline infrastructure and Above Ground Installations	**Low – Medium** The Newbuild Infrastructure Boundary has largely been occupied by undeveloped agricultural land to present. In context to the scale of the DCO Proposed Development, few contaminative trades have been identified within, or within 250m of the Newbuild Infrastructure Boundary including historical and existing commercial and industrial land (e.g. Stanlow Manufacturing Complex, active / historic landfills, historic mineral workings etc).

11.8. DESIGN DEVELOPMENT, IMPACT AVOIDANCE, AND EMBEDDED MITIGATION

11.8.1. The following construction methods will have the potential to reduce adverse impacts and have been considered as part of the DCO Proposed Development's Preliminary Design.

CONSTRUCTION STAGE

Construction Methods

11.8.2. The majority of the Newbuild Carbon Dioxide Pipeline will be constructed via open trench excavation with trenchless installation techniques including Guided Auger Boring (GAB), Unguided Auger Boring (UAB), Horizontal Directional Drilling (HDD), and micro-tunnelling, used at site specific locations to;

- Avoid disruption to utilities, major highways and railways.
- Avoid damage to controlled waters and environmentally sensitive land uses such as ancient woodland.
- Prevent exposure pathways to human health.

11.8.3. A comprehensive explanation of the Construction Methods can be read in **Chapter 3 - Description of the DCO Proposed Development.**

Temporary Infrastructure

11.8.4. Temporary installation or upgrade of existing access tracks for the Construction Compounds and work-fronts will be set up to minimise disruption and local environmental impacts to land and soil. Options will include provision of bog matts (where wet soil conditions are anticipated) and compacted gravel tracks (where road-going vehicles or heavy traffic is anticipated) as set out in **D-LS-001** of the **Register of Environmental Actions and Commitments (REAC) (Document reference: D.6.5.1)**.

Coal Mining

11.8.5. The **Coal Mining Risk Assessment (Appendix 11.2 Volume III)** stated the following was required to be considered at the Detailed Design stage. These recommendations will be assessed and addressed in line with best practice guidance (CIRIA C758D Abandoned Mine Workings Manual) (**Ref. 11.43)** at Detailed Design stage.

- Routing of the Newbuild Carbon Dioxide Pipeline will be performed to avoid potential historical mine shafts or shallow workings identified by the CA, particularly in proximity to Alltami Brook, the A550 Gladstone way, Greenacres Animal Park, Colliery Lane, Magazine Lane and Wepre Brook as set out in **D-LS-002** of the **Register of Environmental Actions and Commitments (REAC) (Document reference: D.6.5.1)**.

- Risk of shallow workings, in particular in proximity to Colliery Lane and Gladstone Way (Sections 4 & 5), will be considered within any construction plan and further works to establish their locations will be considered as set out in **D-LS-003** of the **Register of Environmental Actions and Commitments (REAC) (Document reference: D.6.5.1)**.
- Areas within the construction corridor where potential historic mine shafts may be present will be cordoned off and only excavated if necessary for the installation of the Newbuild Carbon Dioxide Pipeline. The zone of the potential shaft will be determined from the co-ordinates available within the Coal Authority reports as set out in **D-LS-004** of the **Register of Environmental Actions and Commitments (REAC) (Document reference: D.6.5.1)**.

Waste

11.8.6. Detailed information on the waste commitments is included in **Chapter 14 - Materials and Waste (Volume II).** Any waste materials generated during the proposed development will be disposed of in accordance with the Waste Hierarchy set out in the Waste Management Plan which will be produced by the appointed Construction Contractor as set out in **D-MW-002** of the **REAC (Document reference: D.6.5.1).**

OPERATIONAL STAGE

Build Materials/ Build Specification

11.8.7. Construction of all BVSs and AGIs will include floor slabs and hardstanding, which should limit contact with potential contamination.

11.8.8. Any concrete used in below ground infrastructure will be selected based on the appropriate sulphate classifications **D-LS-005** of the **REAC (Document reference: D.6.5.1)**.

11.9. ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

11.9.1. This section details the assessment of predicted impacts and effects for the DCO Proposed Development during the Construction, Operational and Decommissioning Stages based on DMRB documents (including appended Wales National Application Annexes) LA 104 (**Ref. 11.24**), LA 109 (**Ref. 11.25**) and LA 113 (**Ref. 11.27**).

11.9.2. **Table 11.11~~Table 11.11~~**, presented in **Section 11.7**, describes the plausible pollutant linkages between potential sources of contamination and identified sensitive receptors following LCRM (Environment Agency, 2020) (**Ref. 11.16**) and CIRIA C552 (CIRIA, 2001) (**Ref. 11.17**) guidance. The assessment of whether a plausible pollutant linkage is present supports the assessment of potential effects within this Section.

~~11.9.3.~~ The likely significant effects for Land and Soil associated with each phase are provided in **Table 11.12**~~**Table 11.12**~~ to **Table 11.14**~~**Table 11.14**~~.

11.9.3. The following significant effects in relation to Land and Soils have been identified in **Tables 11.12**, **11.13** and **11.14**.

CONSTRUCTION STAGE

11.9.4. The likely significant effects for Land and Soil associated with the Construction Stage are set out below.

- Controlled Waters;
- Agricultural Soils;
- Mineral Resources; and
- EU Designated Surface Waters (i.e., SSSIs, SAC).

OPERATIONAL STAGE

11.9.5. The likely significant effects for Land and Soil associated with the Operational Stage are set out below.

- Controlled Waters;
- Agricultural Soils; and
- EU Designated Surface Waters (i.e., SSSIs, SAC).

DECOMMISSIONING STAGE

11.9.6. The likely significant effects for Land and Soil associated with the Operational Stage are set out below.

- Controlled Waters; and
- EU Designated Surface Waters (i.e., SSSIs, SAC).

Table 11.12 - Construction Stage – Assessment of Significant Impacts

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Human Health: Groundworkers above and below ground	Medium	Effect on workers from potential contamination within the underlying soils / groundwater and from ground gas.	*Minor (adverse):* Construction workers will be wearing PPE to reduce any risk of expose to contaminants or ground gas.	*Slight adverse (not significant)*
Human Health: Third Party Neighbours	Medium	Effect on third party neighbours from potential contamination within underlying soils / groundwater.	*Minor (adverse):* Any construction works are unlikely to expose third parties to contaminative substances.	*Slight adverse (not significant)*
Controlled Waters: Groundwater	Medium (bedrock) and High (superficial deposits)	Effect on groundwater.	***Moderate (adverse):*** The DCO Proposed Development has the potential to intercept sources of contamination and there is potential for groundworks to mobilise and move along migratory pathways through which contaminants could migrate into the underlying aquifer.	***Moderate adverse (significant)***
Controlled Waters: Surface Waters	Low (minor drains) to very high (major watercourses)	Effects on surface waters.	***Moderate (adverse):*** The DCO Proposed Development has the potential to intercept potential sources of contamination and there is potential for groundworks to create migratory pathways through which contaminants could migrate into adjacent surface water course.	***Moderate adverse (significant)***

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Building Structures	Medium	Effects on the DCO Infrastructure	*Minor (adverse):* Potential contamination within underlying soils and groundwater may adversely affect the DCO Proposed Development Infrastructure. However, there may be opportunities for soil quality improvements in the event that remediation is required.	*Slight adverse (not significant)*
Agricultural Soil	Low (3b, 4 and 5) to very high (1, 2 and 3a)	Effects on soil quality.	***Moderate adverse:*** Potential loss and deterioration of BMV (Grade 1-3a) soil at above ground facilities (AGIs and BVSs). The magnitude of the impact will be mitigated through careful extraction, handling and re-use of the differing agricultural soils which is to be documented in a Soil Management Plan.	***Moderate adverse (significant)***
	BMV Soils	Loss of BMV Soils	***Moderate (adverse):*** Loss of >1ha of BMV land (loss of 1.37ha in total).	***Moderate (significant)***
Mineral Resources	High	Sterilisation of Mineral Resource.	***Moderate (adverse):*** Limited mineral resources will be sterilised and the MRA has determined that prior extraction is unlikely to be viable. However, Incidental Extraction will occur and fits in with approach set out within **Chapter 3 – Description of the DCO Proposed Development (Volume II)** which includes the replacement of material into trenches that has been extracted (where practicable).	***Moderate adverse (significant)***
EU Designated Surface Waters (i.e., SSSIs, SAC)	Very high	Effects on water quality.	***Moderate (adverse):*** The DCO Proposed Development has the potential to intercept potential sources of contamination and there is potential for groundworks to mobilise and move along migratory pathways through which contaminants could migrate into the adjacent EU designated surface water courses.	***Moderate adverse (significant)***

Table 11.13 - Operational Stage – Assessment of Significant Impacts

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Human Health: Workers (maintenance workers below ground and above ground operatives)	Medium	Effect on workers from potential contamination within the underlying soils / groundwater and from ground gas.	*Minor (adverse):* The operation of the DCO Proposed Development is unlikely to expose workers to contaminative substances or ground gas.	*Neutral (not significant)*
Human Health: Third Party Neighbours	Medium	Effect on third party neighbours from potential contamination within underlying soils / groundwater.	*Minor (adverse):* The operation of the DCO Proposed Development is unlikely to expose third parties to contaminative substances.	*Neutral (not significant)*
Controlled Waters: Groundwater	Low (bedrock) and Medium (superficial deposits)	Effect on groundwater.	*Minor (adverse):* The operation of the DCO Proposed Development has the potential to allow migration of contamination within the pipeline bedding which could migrate into the underlying aquifers.	*Slight adverse (not significant)*
Controlled Waters: Surface Waters	Low (minor drains) to very high (major watercourses)	Effects on surface waters.	***Moderate (adverse**):* The operation of the DCO Proposed Development has the potential to allow migration of contamination within pipeline bedding which could migrate into the adjacent surface water courses.	***Moderate adverse (significant)***
Building Structures	Medium	Effects on the DCO Infrastructure	*No change:* Appropriate construction materials including concrete classification will be selected prior to construction.	*Neutral (not significant)*

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Agricultural Soil	Low (3b, 4 and 5) to very high (1, 2 and 3a)	Effects on soil quality.	*Neutral:* During operation, the identified agricultural soils will not be disturbed.	*Neutral (not significant)*
	BMV Soils	Loss of BMV Soils	*Neutral:* During operation, the ground will not be disturbed.	*Neutral (significant)*
Mineral Resources	High	Sterilisation of Mineral Resource.	*Neutral:* During operation, the ground will not be disturbed.	*Neutral (not significant)*
EU Designated Surface Waters (i.e., SSSIs, SAC)	Very high	Effects on water quality.	***Moderate (adverse):*** The operation of the DCO Proposed Development has the potential to allow migration of contamination within the pipeline bedding which could migrate into the adjacent EU designated surface water courses.	***Moderate adverse (significant)***

Table 11.14 - Decommissioning Phase – Assessment of Significant Impacts

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Human Health: Groundworkers	Medium	Effect on workers from potential contamination within the underlying soils / groundwater and from ground gas.	*Minor (adverse):* The decommissioning works are unlikely to expose workers to contaminative substances or ground gas. The end of life Decommissioning Environmental Management Plan and operational procedures would mitigate any risk from unexpected contamination or ground gas.	*Neutral (not significant)*
Human Health: Third Party Neighbours	Medium	Effect on third party neighbours from potential contamination within underlying soils / groundwater.	*Minor (adverse):* The decommissioning of the DCO Proposed Development is unlikely to expose third parties to contaminative substances. End of life Decommissioning Environmental Management Plan would mitigate any risk from unexpected contamination migrating offsite.	*Neutral (not significant)*
Controlled Waters: Groundwater	Low (bedrock) and Medium (superficial deposits)	Effect on groundwater.	*Minor (adverse):* The decommissioning of the DCO Proposed Development is unlikely to allow contaminative substances to migrate into underlying aquifers. End of life Decommissioning Environmental Management Plan would mitigate any risk from unexpected contamination migrating offsite.	*Slight adverse (not significant)*
Controlled Waters: Surface Waters	Low (minor drains) to very high (major watercourses)	Effects on surface waters.	***Moderate (adverse)**:* The decommissioning of the DCO Proposed Development has the potential to allow migration of contamination within pipeline bedding which could migrate into the adjacent surface water courses.	***Moderate adverse (significant)***

Resource / Receptor	Sensitivity of Receptor	Effect	Magnitude of Impact	Significance of Effect
Building Structures	Medium	Effects on the DCO Infrastructure	*No change:* DCO surface infrastructure would be removed during the decommissioning, whilst the Newbuild Carbon Dioxide Pipeline would be left in-situ in the ground.	*Neutral (not significant)*
Agricultural Soil	Low (3b, 4 and 5) to very high (1, 2 and 3a)	Effects on soil quality.	*Slight (beneficial):* Potential to restore agricultural land to its former quality and use during decommissioning of the above ground facilities (BVSs and AGIs).	*Slight beneficial (not significant)*
	BMV Soils	Loss of BMV Soils	*Slight (beneficial):* Potential to restore the agricultural land to its former quality and then start using for agricultural purposes	*Slight beneficial (not significant*
Mineral Resources	High	Sterilisation of Mineral Resource.	*Slight (beneficial):* There is the potential that the decommissioning of the DCO Proposed Development will allow mineral reserves to be accessed and extracted. However, this is dependent on the decommissioning plan.	*Neutral (not significant)*
EU Designated Surface Waters (i.e., SSSIs, SAC)	Very high	Effects on water quality.	***Moderate (adverse):*** The decommissioning of the DCO Proposed Development has the potential to allow migration of contamination within the pipeline bedding which could migrate into the adjacent EU designated surface water courses.	***Moderate adverse (significant)***

~~11.9.4. The following significant effects in relation to Land and Soils have been identified by the above **Tables**; **Table 11.12**, **Table 11.13** and **Table 11.14**.~~

~~**CONSTRUCTION STAGE**~~

~~11.9.5. The likely significant effects for Land and Soil associated with the Construction Stage are set out below.~~

- ~~Controlled Waters;~~
- ~~Agricultural Soils;~~
- ~~Mineral Resources; and~~
- ~~EU Designated Surface Waters (i.e., SSSIs, SAC).~~

~~**OPERATIONAL STAGE**~~

~~11.9.6. The likely significant effects for Land and Soil associated with the Operational Stage are set out below.~~

- ~~Controlled Waters;~~
- ~~Agricultural Soils; and~~
- ~~EU Designated Surface Waters (i.e., SSSIs, SAC).~~

~~**DECOMMISSIONING STAGE**~~

~~11.9.7. The likely significant effects for Land and Soil associated with the Operational Stage are set out below.~~

- ~~Controlled Waters; and~~
- ~~EU Designated Surface Waters (i.e., SSSIs, SAC).~~

11.10. MITIGATION AND ENHANCEMENT MEASURES

11.10.1. This section sets out the avoidance, mitigation and compensation measures which are required to address the significant effects as assessed in **Section 11.9.**

CONSTRUCTION

~~11.10.2.~~ The **Register of Environmental Actions and Commitments** (**REAC), (Document reference: D.6.5.1)** includes the following measures on construction practices.

Materials Management Plan

~~11.10.4.~~11.10.3. The Construction Contractor will produce a Material Management Plan (MMP) as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1).** The MMP will provide a clear, consistent and efficient process to enable the reuse of excavated material without it being classified as a waste and outline a cut / fill balance to reduce the amount of material permanently removed during the construction of the Proposed Development **D-MW-006** and **D-LS-006** of the **REAC (Document reference: D.6.5.1)**.

Soil Management

~~11.10.5.~~11.10.4. An **OSMP (Document reference: D.6.5.4.1)** has been produced to present options to manage the risk of damage to soil structure during construction and reinstatement. The findings of the OSMP will be used by the appointed Construction Contractor as a basis for preparing the detailed construction SMP, as part of a detailed Construction Environmental Management Plan (CEMP) prior to construction and the detailed design will take into consideration the location of BMV soils and the alignment of the Newbuild Carbon Dioxide Pipeline, and working areas will seek to reduce impacts to and /or avoid these areas, as far as practicable as set out in **D-LS-007** of the **REAC (Document reference: D.6.5.1)**.

Peat Management

~~11.10.6.~~11.10.5. An **OPMP (Document reference: D.6.5.4.2)** was produced to provide a report estimating the potential volume of peat to be excavated during the construction process and present options to minimise / re-use excavated peat. The findings of the OPMP will be used by the appointed Construction Contractor as a basis for preparing the detailed construction PMP, as part of a detailed Construction Environmental Management Plan (CEMP) prior to construction as set out in **D-LS-008** of the **REAC (Document reference: D.6.5.1)**.

General practices

~~11.10.7.~~11.10.6. Any facilities for the storage of oils, fuels or chemicals will be sited on impervious bases and surrounded by impervious bund walls. The volume of the bunded compound should be 110% of the capacity of the tank, all filling points, gauges, vents and sight glasses will be located within the bund. Associated pipework should be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets will be detailed to discharge downwards into the bund and refuelling will be supervised at all times, preferably on an impermeable surface. This system will reduce the potential for the addition of new contaminants to the existing baseline environment (e.g., spill or leak) as set out in **D-LS-009** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.8.~~11.10.7. The Construction Contractor will follow a Waste Management Plan for reducing, storing, handling, transporting and disposing of waste during construction as set out in **D-MW-002** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.9.~~11.10.8. If, during open trench construction and excavations, unexpected contamination is encountered, the open trench will be lined in order to inhibit water percolation and subsequent leachate generation as set out in **D-LS-010** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.10.~~11.10.9. Measures contained within the detailed CEMP to resolve impacts to land and soil will include (refer to **D-LS-011** of the **REAC (Document reference: D.6.5.1)**:

- Using appropriate risk assessments and method statements (RAMS);
- All site operatives will follow hygiene best practices and be provided with the correct PPE (e.g., safety glasses, gloves and face masks where applicable) to reduce the risk of inhaling / ingesting / touching contaminated materials;
- All site operatives will be made aware of the risks posed from ground conditions likely to be encountered during the construction, for example through toolbox talks before undertaking any works; and
- All site operatives will be fully trained and competent. There will be a trained and responsible manager on site during construction works, including any movement of the stockpiles.

~~11.10.11.~~11.10.10. Acute exposure to potential contamination will be mitigated through normal working practice using appropriate RAMS and use of standard PPE and hygiene best practice. Where contamination is suspected, construction workers will be provided with appropriate Personal Protective Equipment (PPE) or Respiratory Protective Equipment (RPE) (over and above the standard PPE) to prevent direct contact, ingestion or inhalation of potential soil or groundwater contamination as set out in **D-LS-012** of the **REAC (Document reference: D.6.5.1).**

~~11.10.12.~~ During construction, the use of bowsers for dust suppression in dry weather and wheel washes and road sweepers in locations where required will be employed to limit exposure pathways to human health, in particular to offsite neighbouring site users, nearby residential properties, or members of the public as set out in **D-LS-013** of the **REAC, Document reference: D6.5.1**.

~~11.10.14.~~11.10.12. The Construction Contractor will appoint an appropriately qualified person (e.g., Environmental Clerk of Works (EnvCoW)) to maintain a Watching Brief for the duration of any ground excavations. The aim and scope of the Watching Brief will be to identify any unexpected contamination and advise on the correct course of action if discovered. Should unexpected Made Ground or unexpected contaminated ground (i.e. visual or olfactory evidence of contamination) be encountered during the construction phase, the EnvCoW or equivalent qualified person will be notified. Testing of Made Ground for a minimum of asbestos, metals, petroleum hydrocarbons and polyaromatic hydrocarbons to assess suitability for re-use and potential risks to construction works will be undertaken as set out in **D-LS-014** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.15.~~11.10.13. The Construction Contractor will undertake ongoing monitoring and maintenance to ensure that any temporary or permanent drainage in the main works area is meeting its operational requirements. This will prevent surface runoff and/ or contamination from entering surface water or groundwater bodies and migrating. Appropriate measures and maintenance procedures will be detailed in the detailed CEMP. Emergency procedures will be in place should a leak of contamination i.e. from a drainage failure or machine tank, occur. These emergency procedures will be documented in the detailed CEMP. Should a leak or drainage failure occur the EnvCoW will be informed, and appropriate actions taken as set out in **D-LS-015** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.16.~~11.10.14. Any unexpected disused below ground tanks, structures and / or pipework/ services encountered during construction that cannot be avoided will be appropriately decommissioned and removed (where necessary) by an appropriately qualified person as appointed by the Construction Contractor as set out in **D-LS-016** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.17.~~11.10.15. Should asbestos containing material (ACM) be encountered during the construction, or soil testing indicate that asbestos fibres are present, the EnvCoW will be notified as set out in **D-LS-017** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.18.~~11.10.16. For excavation in areas of known Made Ground the EnvCoW will supervise the excavation to observe for visual or olfactory evidence of contamination or ACM as set out in **D-LS-018** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.19.~~11.10.17. An Unexploded Ordnance (UXO) assessment will be undertaken for the Newbuild Infrastructure Boundary and will be used during the production of all risk assessments and method statements as set out in **D-LS-019** of the **REAC (Document reference: D.6.5.1)**.Additional investigation including groundwater monitoring and analysis and ground gas assessment will be undertaken for points sources i.e. Stanlow Manufacturing Complex and Ewloe infilled land as set out in **D-LS-020** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.20.~~11.10.18. If, following **D-LS-020** above, remediation is determined to be required, suitable remediation strategy will be produced following the additional Ground Investigation of point sources of contamination or if unexpected Made Ground is encountered during the construction phase. The remediation strategy will be approved by the Local Authority (FCC / CWCC/ EA/ NRW) prior to being implemented to mitigate unacceptable contaminated land related risks. Ground gas measures are not considered necessary however following **D-LS-020** the requirement for ground measures will be reassessed in the areas that are investigated as set out in **D-LS-021** of the **REAC (Document reference: D.6.5.1)**.

~~11.10.21.~~11.10.19. Areas of known Made Ground are discussed in **Ground Investigation Report (Appendix 11.6, Volume III).** These areas of Made Ground have been tested and are below the GAC. They are therefore considered to be suitable for re-use within the DCO Proposed Development however they will be supervised in a watching brief to assess for previously unidentified Made Ground as set out in **D-LS-022** of the **REAC (Document reference: D.6.5.1)**.

DECOMMISSIONING

~~11.10.22.~~11.10.20. Prior to decommissioning, a Decommissioning Environmental Management Plan will be developed as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**). Prior to production, consultation with relevant stakeholders will be undertaken. The approach/scope of the Decommissioning Environmental Management Plan will be agreed with the Local Authority prior to commencement as set out in **D-LS-023 of the REAC (Document reference: D.6.5.1)**.

11.11. RESIDUAL EFFECTS

11.11.1. **Table 11.15**~~**Table 11.15**~~ below summarises the residual effects associated with the DCO Proposed Development during construction, operation and decommissioning.

11.11.2. As presented by **Table 11.15**~~**Table 11.15**~~, one significant residual effect for Land and Soil associated with the Construction, Operational or Decommissioning Stages of the DCO Proposed Development has been identified.

Table 11.15 - Summary of Residual Effects

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
Construction			
Effect on Construction users / workers from potential contamination within the underlying soils / groundwater and ground gas	*Slight adverse (not significant)*	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation. • Additional targeted site investigation and remediation strategy for point sources of contamination if necessary. • Implementation of detailed CEMP as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effect on third party neighbours from potential contamination within underlying soils / groundwater and ground gas	*Slight adverse (not significant)*	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation. • Additional targeted site investigation and remediation strategy for point sources of contamination if necessary. • Implementation of detailed CEMP as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effect to groundwater	***Moderate adverse (not significant)***	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation. • Additional targeted site investigation and remediation strategy for point sources of contamination if necessary. • Implementation of detailed CEMP as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
Effect on surface waters	***Moderate adverse (not significant)***	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation. • Additional targeted site investigation and remediation strategy for point sources of contamination if necessary. • Implementation of detailed CEMP as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on the DCO Infrastructure	*Slight adverse (not significant)*	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation. • Additional targeted site investigation and remediation strategy for point sources of contamination will be undertaken.	*Neutral (not significant)*
Effects on soil quality – loss of quality	***Moderate adverse (significant)***	• Implementation of Soil Management Plan and Peat Management Plan is included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on soil quality – loss of BMV land	***Moderate adverse (significant)***	• N/A	***Moderate adverse (significant)***
Sterilisation of mineral resource	***Moderate adverse (not significant)***	• MRA has determined that prior extraction is unlikely to be viable but recommended incidental extraction where possible and material re-use within the DCO Proposed Development.	*Slight adverse (not significant)*
Effects on water quality	***Moderate adverse (not significant)***	• No mitigation required as current understanding of ground conditions precludes the requirement for significant mitigation.	*Neutral (not significant)*

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
		• Additional targeted site investigation and remediation strategy for point sources of contamination will be undertaken. • Implementation of detailed CEMP as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	
Operation			
Effect on workers (maintenance workers below ground and above ground operatives) from potential contamination within the underlying soils / groundwater and ground gas	Neutral *(not significant)*	• RAMS during works should prevent exposure to any residual contamination. • Construction of BVSs and AGIs will include floor slabs and hardstanding limiting potential exposure risk. Construction methods include removal of shallow soils and replacement with geotechnically suitable material which would remove contact potential.	*Neutral (not significant)*
Effect on third party neighbours from potential contamination within underlying soils / groundwater and ground gas	*Neutral (not significant)*	• Standard operating procedures (SOPs) to prevent contamination migration from underlying soils and groundwater offsite.	*Neutral (not significant)*
Effect to groundwater	*Slight adverse (not significant)*	• Use of trench breakers and appropriate drainage at permanent above ground installations (i.e. BVSs and AGIs) to prevent contamination migration to underlying aquifers via the pipeline trench fill where required **(D-WR-039** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
Effect on surface waters	***Moderate adverse (significant)***	• Appropriate drainage at permanent above ground installations (i.e. BVSs and AGIs) to prevent contamination migration to adjacent surface water courses **(D-WR-006, D-LS-015** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*
Effects on the DCO Infrastructure	*Neutral (not significant)*	• Appropriate drainage at permanent above ground installations (i.e. BVSs and AGIs) to prevent contamination migration **(D-WR-006, D-LS-015** of the **REAC, Document reference: D.6.5.1)**. • Appropriate construction materials including concrete classification will be selected prior to construction based on site investigation results **(D-LS-005** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*
Effects on soil quality – loss of quality	*Neutral (not significant)*	• During operation, mitigation is not required as soils will not be disturbed. • Any maintenance procedures which may disturb the soils should be mitigated using appropriate RAMS **(D-LS-015** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*
Effects on soil quality – loss of BMV land	***Neutral (significant)***	• No changes are proposed during operation so the land will not be disturbed.	*Neutral (significant)*

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
Sterilisation of Mineral Resource	*Neutral (not significant)*	• During operation, mitigation is not required as the mineral resources will not be disturbed. • Any maintenance procedures which may disturb the mineral resources should be mitigated using appropriate RAMS **(D-LS-015** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*
Effects on water quality	***Moderate adverse (significant)***	• Appropriate drainage at permanent above ground installations (i.e. BVSs and AGIs) to prevent contamination migration to controlled waters **(D-WR-006, D-LS-015** of the **REAC, Document reference: D.6.5.1)**.	*Neutral (not significant)*
Decommissioning			
Effect on decommissioning workers from potential contamination within the underlying soils / groundwater	*Neutral (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effect on third party neighbours from potential contamination within underlying soils / groundwater	*Neutral (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effect to groundwater	*Slight adverse (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*

Description of the Effect	Pre-mitigation Significance of Effects	Mitigation Measure	Residual Effect
Effect on surface waters	*Moderate adverse (significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on the DCO Infrastructure	*Neutral (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on soil quality – loss of quality	*Slight beneficial (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan to ensure no further impact (i.e., loss / deterioration) to agricultural soils, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on soil quality – loss of BMV land	*Slight beneficial (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan to ensure land is returned to its pre-construction stage agricultural grade and that it is suitable for use, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Sterilisation of Mineral Resource	*Neutral (not significant)*	• Implementation of end of life Decommissioning Environmental Management Plan to ensure no further impact (i.e., loss / deterioration) to mineral resources, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*
Effects on water quality	*Moderate adverse (significant)*	• Implementation of end of life Decommissioning Environmental Management Plan, as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**).	*Neutral (not significant)*

11.12. IN-COMBINATION CLIMATE CHANGE IMPACTS

11.12.1. Climate change impacts are considered for the Operation Stage of the DCO Proposed Development. For example, the proposed BVSs and AGIs will include drainage systems which are designed to accommodate future climate change projection.

11.12.2. It is understood that NRW has committed to maintaining the standard of protection for coastal flood defence throughout the next 100 years according to the latest Shoreline Management Plan (**Ref. 11.45**).

11.13. MONITORING

11.13.1. Groundwater and surface water monitoring plans will be developed by the Construction Contractor to ensure appropriate monitoring before, during and after the construction works as included as a Requirement of the **Draft DCO** (**Document reference: D.3.1**). The details of this monitoring will be agreed between the Construction Contractor and the regulator (FCC/ NRW/ CWCC and the EA) prior to the commencement of the Construction Stage. These commitments are included in **D-LS-024** of the **REAC (Document reference: D.6.5.1)**.

11.13.2. Monitoring of gas ingress, such as mine gas, will be undertaken during trenching and drilling works where necessary. In addition, any trenches / excavations should be gas tested (as it is standard practice) prior to entry as set out in **D-LS-025** of the **REAC (Document reference: D.6.5.1)**.

11.14. REFERENCES

- **Ref. 11.1:** *Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment, 2006 (2006/11/EC)* Available at: [redacted]
- **Ref. 11.2:** Contaminated Land Regulations *(England), 2006 (amended 2012) (these regulations apply to England only).*
- **Ref. 11.3:** The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017; Available online: https://www.legislation.gov.uk/uksi/2017/407/contents/made.
- **Ref. 11.4**: *Environmental Damage (Prevention and Remediation) (England) Regulations 2015.*
- **Ref. 11.5:** *The Environmental Permitting (England and Wales) Regulations 2016;* Available online: https://www.legislation.gov.uk/uksi/2016/1154/contents/made
- **Ref. 11.6:** *Control of Substance Hazardous to Health Regulations 2002;* Available online: https://www.hse.gov.uk/nanotechnology/coshh.htm.

- **Ref. 11.7:** *Control of Asbestos Regulations (CAR) 2012*; Available online: https://www.hse.gov.uk/asbestos/regulations.htm.
- **Ref. 11.8:** Construction (Design & Management) Regulations (CDM), 2015; Available online: https://www.hse.gov.uk/construction/cdm/2015/index.htm
- **Ref. 11.9:** *National Planning Policy Framework (2021).* Available: https://www.gov.uk/government/publications/national-planning-policy-framework--2 .
- **Ref. 11.10:** Cheshire West and Chester Council (CWCC) Local Plan (Adopted 2019).
- **Ref. 11.11:** *Flintshire County Council Development plans and policies (Adopted).* Available online: https://www.flintshire.gov.uk/en/Resident/Planning/Development-plans--policies.aspx.
- **Ref. 11.12:** *Flintshire Local Development Plan (2015-2030) (Adopted).* Available online: https://www.flintshire.gov.uk/en/PDFFiles/Planning/Key-Stage-Documents-Policy/LDP-KSD-DEP1-Deposit-Plan-Sept-2019-%E2%80%93-written-statement.pdf.
- **Ref. 11.13:** *Flintshire County Council, Council Plan 2017 – 2023 (Adopted).* Available online: https://committeemeetings.flintshire.gov.uk/documents/s45072/Appendix%201%20Council%20Plan%202017-18.pdf?LLL=0.
- **Ref. 11.14:** *The Deeside Plan (2017).* Available online: https://www.flintshire.gov.uk/en/PDFFiles/Business-AdviceGuidance/Deeside-Plan-A4-v13.2.pdf.
- **Ref. 11.15:** Health and Safety Executive (HSE) (1991) Guidance Note HS(G)66, Protection of Workers and the General Public during the Development of Contaminated Land. Not available online.
- **Ref. 11.16:** *Environment Agency (2020) Land Contamination Risk Management (LCRM).* Available online: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm.
- **Ref. 11.17:** *CIRIA C552 (2001), Contaminated Land Risk Assessment: A guide to good practice.* Available online: https://www.ciria.org/ItemDetail?iProductCode=C552&Category=BOOK&WebSiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91.
- **Ref. 11.18:** *CIRIA C532 (2001) Control of Pollution from Construction Sites.* Available online: https://www.ciria.org/ProductExcerpts/C532.aspx.

- **Ref. 11.19:** Environment Agency and NHBC (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66; Available online: https://www.brent.gov.uk/media/16410690/filedownload-33595-en.pdf.
- **Ref. 11.20:** BS 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice (+A2:2017). Not available online.
- **Ref. 11.21:** *Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012*; Available online: https://www.gov.uk/government/publications/contaminated-land-statutory-guidance.
- **Ref. 11.22:** *Environment Agency (2017) Groundwater Protection*. Available online: https://www.gov.uk/government/publications/groundwater-protection-position-statements.
- **Ref. 11.23:** British Standards Institute (BSI) BS 5930 (2020) The Code of Practice for Site Investigations. Not available online.
- **Ref. 11.24:** *Design Manuals for Roads and Bridges (DMRB) 104 (Environmental Assessment and Monitoring).* Available online: https://standardsforhighways.co.uk/dmrb/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a.
- **Ref. 11.25:** *DMRB 109 (Geology and Soils) (Wales Annex).* Available online: https://www.standardsforhighways.co.uk/dmrb/search/adca4c7d-4037-4907-b633-76eaed30b9c0.
- **Ref. 11.26:** *DMRB 110 (Material assets and waste).* Available online: https://www.standardsforhighways.co.uk/dmrb/search/6a19a7d4-2596-490d-b17b-4c9e570339e9.
- **Ref. 11.27**: *DMRB 113 (Road drainage and the water environment).* Available online: https://www.standardsforhighways.co.uk/dmrb/search/d6388f5f-2694-4986-ac46-b17b62c21727.
- **Ref. 11.28:** NRW Guide to our discretionary advice service for development planning and marine advice (published April 2017 and updated April 2018). Available online: https://cdn.cyfoethnaturiol.cymru/media/684617/das-guide-to-discretionary-service.pdf?mode=pad&rnd=132554586270000000.
- **Ref. 11.29:** *Natural England – Environmental Planning Guidance: Developers: Get environmental advice on your planning proposals (March 2015).* Available online: Developers: get environmental advice on your planning proposals - GOV.UK (www.gov.uk).
- **Ref. 11.30:** Code of Practice for the Sustainable Use of Soils on Construction Sites.

- **Ref. 11.31:** *The Institute of Quarrying (IoQ) Good Practice Guide for Handling Soils in Mineral Workings (2021).* Available online: https://www.quarrying.org/soils-guidance.
- **Ref. 11.32:** *British Geological Survey (BGS) Onshore GeoIndex online viewer.* Available online: *https://www.bgs.ac.uk/map-viewers/geoindex-onshore/.*
- **Ref. 11.33:** *Coal Authority Interactive Map viewer.* Available online: https://mapapps2.bgs.ac.uk/coalauthority/home.html.
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