



Morven Hawthorn Pit Grid Connection Project

Preliminary Environmental Information Report

Volume 3, Chapter 1: Geology, Hydrogeology and
Ground Conditions

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Annexes

Annex number		Annex title	
Volume 3, Annex 1.1		Phase 1 Geo-Environmental Preliminary Risk Assessment	

Glossary

Term	Meaning
AC connection cables	Alternating current (AC) cables that will connect the proposed onshore land substation to the National Grid Hawthorn Pit Substation.
Blue Onshore Land Substation (LSS) Option Area	Proposed location option for the onshore land substation, located west of the A19 and south of the access road to the Jade Business Park.
Breccia	A clastic rock composed of large angular broken fragments of minerals or rocks cemented by a fine-grained matrix.
Clast	A fragment of broken rock or mineral broken off by physical weathering.
Commitments	Measures (embedded mitigation & secondary) to be adopted during the construction, operation and maintenance, and decommissioning phases of the MHPGC Project.
Cumulative effect	The combined effect of the MHPGC Project in combined with the effects from other proposed developments, on the same receptor or resource.
Cumulative effects assessment	Assessment of the likely effects arising from the MHPGC Project alongside the likely effects arising from other proposed developments on the same receptor or resource.
Dolostone	A sedimentary carbonate rock which is primarily composed of dolomite ($\text{CaMg}(\text{CO}_3)_2$) mineral.
Diamicton	Poorly-sorted sediment with wide clast size range.
Embedded mitigation	Measures included as part of the project design. Includes both primary and tertiary mitigation.
Environmental Impact Assessment (EIA)	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Green Onshore Land Substation (LSS) Option Area	Proposed location option for the onshore land substation, located between Jade Business Park (Spring Rd, Murton, Seaham SR7 9DR) and the National Grid Hawthorn Pit Substation.
Inter-related effects	Effects that may arise from the interactions between different EIA topic effects considered within the project-alone assessment, potentially leading to more significant effects than if they were to be considered in isolation.
Landfall	The area in which the offshore export cables make landfall (come onshore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area between the trenchless technique exit pits and the transition joint bay inclusive of all construction works.
Magnitude	A combination of the spatial extent, duration, frequency and reversibility of an impact.
Marine Directorate Licensing Operations Team (MD-LOT)	The part of the Scottish Government's Marine Directorate responsible for assessing and administering applications for marine licences and Section 36 consent (offshore) in Scotland.
Marine Management Organisation (MMO)	The MMO, as a UK government body, is responsible for licensing, regulating and overseeing activities in the marine environment for English waters. For a DCO and deemed marine licence, the MMO acts as a statutory consultee, advising on marine planning, environmental impacts, habitats and compliance with marine licensing regulations.
Maximum design scenario (MDS)	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the MHPGC Project.

Term	Meaning
Mean High Water Springs (MHWS)	The average height of the high water levels of each pair of successive high waters during the periods of about 24 hours when the tidal range is at its greatest.
Mean Low Water Springs (MLWS)	The average height of the low water levels of each pair of successive low waters during the periods of about 24 hours when the tidal range is at its greatest.
MHPGC PEIR Red Line Boundary: Onshore	Spatial extent used to define the environmental assessment within the PEIR. The area within which all onshore components of the MHPGC Project will be located landward of MHWS, including areas required on a temporary basis during construction and/or decommissioning (e.g. construction compounds).
MHPGC Project Environmental Statement (ES)	The document presenting the results of the Environmental Impact Assessment process.
MHPGC Project Preliminary Environmental Information Report (PEIR)	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
MHPGC Project Scoping Opinions	Separate scoping opinions received from PINS (on behalf of the Secretary of State) and MD-LOT (on behalf of the Scottish Ministers) in response to the MHPGC Project Scoping Report. The MHPGC Project Scoping Opinions contain the range of issues that PINS, and MD-LOT in consultation with statutory stakeholders, have identified should be considered within the EIA process.
MHPGC Project Scoping Report	A Scoping Report for the MHPGC Project, scoping the likely significant effects of the project on the environment, was submitted and accepted by Planning Inspectorate (PINS) and submitted to the Scottish Ministers, via the Marine Directorate – Licencing Operations Team (MD-LOT) in February 2025.
Mineral Safeguarding Area/Mineral Safeguarding Zone (MSA/MSZ)	An area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Morven Hawthorn Pit Grid Connection Project	"The MHPGC Project is comprised of the offshore export cables in Scottish and English waters from the Morven North or the Morven South offshore substation platform(s) (OSP), landfall, onshore export cables, the onshore land substation (LSS) and AC connection cables. Also referred to in this report as the MHPGC Project, for ease of reading.
Morven North Offshore Wind Array Project (hereafter 'Morven North')	The Morven North Offshore Wind Array Project which includes the wind turbines and foundations, Offshore Substation Platforms and foundations, inter-array and interconnector cables and associated infrastructure located within the Morven North Boundary.
Morven South Offshore Wind Array Project (hereafter 'Morven South')	The Morven South Offshore Wind Array Project, which includes the wind turbines and foundations, Offshore Substation Platforms and foundations, inter-array and interconnector cables and associated infrastructure located within the Morven South Boundary.
National Grid Hawthorn Pit Substation	The National Grid substation at Hawthorn Pit, County Durham, which the AC connection cables will connect into from the Onshore Land Substation.
Operations and maintenance phase (O&M)	The operational and maintenance phase of the MHPGC Project.
Onshore components	Infrastructure landward of the transition joint bay at landfall, comprising onshore export cable, onshore export cable corridor, onshore land substation (LSS) AC connection cable and AC connection cable corridor and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses.

Term	Meaning
Onshore export cables	High Voltage Direct Current (HVDC) cables which bring electricity from the Transition Joint Bay (TJB) to the onshore land substation (LSS).
Onshore land substation (LSS)	A purpose-built site comprising a compound containing the electrical components for converting the HVDC to HVAC power. The LSS site associated with the MHPGC Project adjusts the power quality and power factor to meet the requirements of power supply being fed to the National Grid Hawthorn Pit Substation.
Planning Inspectorate (PINS)	The PINS is an executive agency of the UK Government responsible for administering and examining DCO applications for NSIPs in England. PINS manages the application process, oversees consultation and examination, and makes a recommendation to the relevant Secretary of State on whether consent should be granted.
Primary mitigation	Measures included as part of the location or design of the MHPGC Project made during the pre-application phase that are an inherent part of the MHPGC Project and do not require additional action to be taken. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the MHPGC Project, the parameters and associated commitments secured by the DCO and marine licence, or both.
Residual effects	Effects that continue to exist after mitigation has been applied.
Secondary mitigation	Actions that will require further activity to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES. These include measures required to reduce the significance of environmental effects and may be secured through an environmental management plan. For secondary mitigation measures, both pre-mitigation and residual effects are presented.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Tertiary mitigation	Actions that would occur with or without input from the EIA process feeding into the design. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
the Study Areas	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific Study Area. Specific Study Areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of MHPGC Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Transboundary effects	Assessment of likely significant effects resulting from MHPGC Project on the interests of another European Economic Area (EEA) state(s).
Transboundary impact	Potential impacts resulting from MHPGC Project and affecting another EEA state.
Unconformity	A geological term which defines a substantial break or gap in the geological records where a rock unit is overlain by another that is not next in the stratigraphic succession.

Acronyms

Acronym	Meaning
AC	Alternating Current
BAT	Best Available Techniques

Acronym	Meaning
BGL	Below ground level
BGS	British Geological Society
CEA	Cumulative Effect Assessment
CoCP	Code of Construction Practice
CIRIA	Construction Industry Research and Information Association
CLGDS	Contaminated Land and Groundwater Discovery Strategy
CMRA	Coal Mining Risk Assessment
CMS	Construction Method Statement
COSHH	Control of Substances Hazardous to Health
CDM	Construction (Design and Management)
CSM	Conceptual Site Model
DCC	Durham County Council
DCO	Development Consent Order
DEFRA	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
DMP	Dust Management Plan
DoWCoP	Definition of Waste: Development Industry Code of Practice
EIA	Environmental Impact Assessment
EA	Environment Agency
EC	European Commission
ECoW	Ecological Clerk of Works
ES	Environmental Statement
EWG	Expert Working Group
FWRA	Foundation Works Risks Assessment
GCR	Geological Conservation Review
GWDTE	Ground Water Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
ISEP	Institute of Sustainability and Environmental Professional
JNCC	Joint Nature Conservation Committee
LCRM	Land Contamination Risk Management
LEMP	Landscape and Ecological Management Plan
LSS	Land substation
LNR	Local Nature Reserve
MD-LOT	Marine Directorate – Licensing Operations Team
MDS	Maximum Design Scenario
MHPGC	Morven Hawthorn Pit Grid Connection

Acronym	Meaning
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MRA	Mining Remediation Authority
MSA	Mineral Safeguarding Area
MSZ	Mineral Safeguarding Zone
NNR	National Nature Reserves
NPPF	National Planning Policy Framework
NPS	National Policy Statements
O&M	Operations and Maintenance
ODMP	Outline Operational Drainage Management Plan
OSP	Offshore Substation Platform
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPE	Personal Protective Equipment
PPP	Pollution Prevention Plan
PRA	Preliminary Risk Assessment
PWS	Private water supplies
RAMS	Risk assessments and method statements
RIGS	Regionally Important Geodiversity Site
ROMP	Review of Old Mineral Permissions
SAC	Special Area of Conservation
SMP	Soil Management Plan
SoS	Secretary of State
SPA	Special Protection Area
SPZ	Source Protection Zone
SPZ1	Inner Source Protection Zone
SPZ2	Outer Source Protection Zone
SPZ3	Total Catchment Source Protection Zone
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
SWMP	Site Waste Management Plan
SWGMP	Surface Water and Groundwater Management Plan
TPH	Total Petroleum Hydrocarbon
UKHSA	UK Health Security Agency
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance

Acronym	Meaning
VOC	Volatile Organic Compound
WFD	Water Framework Directive
ZOI	Zone of influence

Units

Unit	Meaning
ha	Hectares
km	Kilometres
m	Metres
m ²	Square metres
m ³	Cubic metres
m ² /d	Metres squared per day
mAOD	Metres Above Ordnance Datum
mBGL	Metres Below Ground Level
l/s	Litres per second
%	Percent

1 Geology, Hydrogeology and Ground Conditions

1.1 Introduction

- 1.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary findings of the Environmental Impact Assessment (EIA) work undertaken to date for the Morven Hawthorn Pit Grid Connection Project (hereafter 'MHPGC Project'), as described in **Volume 1, Chapter 2: Project Description, of the PEIR**.
- 1.1.1.2 The chapter considers the potential impacts and likely significant effects on geology, hydrogeology and ground conditions that could result from the construction, operation and maintenance (O&M) and decommissioning phases of the MHPGC Project. Specifically, it relates to the onshore elements of the MHPGC Project landward of Mean High Water Springs (MHWS) at landfall to the National Grid Hawthorn Pit Substation in England.
- 1.1.1.3 This chapter describes the methodology and datasets that have informed the preliminary assessment, baseline conditions, including future baseline, mitigation measures and assesses the preliminary residual likely significant effects on geology, hydrogeology and ground conditions that could result from the MHPGC Project.
- 1.1.1.4 The assessment is informed by the following chapters:
- **Volume 1, Chapter 2: Project Description, of the PEIR;**
 - **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR;**
 - **Volume 1, Chapter 5: Policy and Legislation, of the PEIR;**
 - **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR;**
 - **Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR;**
 - **Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR;**
 - **Volume 3, Chapter 9: Agriculture and Soils, of the PEIR;**
 - **Volume 4, Chapter 5: Inter-related Effects, of the PEIR.**
- 1.1.1.5 The chapter also draws on information contained within the following annexes:
- **Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR;**
 - **Volume 1, Annex 4.3: Transboundary Screening, of the PEIR;**
 - **Volume 1, Annex 4.4: Cumulative Screening and Location Plan, of the PEIR;**
 - **Volume 2, Annex 2.1: Offshore Water Framework Directive Assessment, of the PEIR;**
 - **Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR;**
 - **Volume 3, Annex 2.1: Surface Water Abstraction Licences, Discharge Consents and Pollution Incidents, of the PEIR**
 - **Volume 3, Annex 2.3: Onshore Water Framework Directive Assessment, of the PEIR.**
- 1.1.1.6 This PEIR will offer a comprehensive overview of the MHPGC Project's potential environmental impacts and mitigation measures, presenting essential data to stakeholders for review and feedback. The PEIR will also be informed by the ongoing pre-application consultation process.
- 1.1.1.7 Following consultation, comments will be reviewed and considered, where appropriate, in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate (PINS) for development consent.

1.2 Legislative and policy context

1.2.1 Overview

- 1.2.1.1 The full relevant legislation and policy context for the MHPGC Project has been detailed in **Volume 1, Chapter 5: Policy and Legislation, of the PEIR**. This section sets out the legislation and planning policy that is relevant to the preliminary geology, hydrogeology and ground conditions assessment.

1.2.2 Legislation

The Environmental Protection Act 1990

- 1.2.2.1 Part 2 of the Environmental Protection Act 1990 makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Environmental Protection Act ("Part 2A") provides the regulatory basis for the identification, designation, and remediation of contaminated land.
- 1.2.2.2 Part 2A of the Environmental Protection Act 1990 was implemented by The Contaminated Land (England) Regulations 2006, with subsequent amendments, and accompanying statutory guidance (Department for Environment, Food and Rural Affairs (Defra), 2012). Part 2A takes a risk-based approach to defining contaminated land. In the statutory guidance "risk" means the combination of:
- the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land;
 - the scale and seriousness of such harm or pollution if it did occur.
- 1.2.2.3 For a risk to exist there needs to be one or more contaminant source-pathway-receptor linkages by which a relevant receptor might be affected by a contaminant. For land to be determined as contaminated under the legislation and, therefore, require remedial action, all three elements of a contaminant linkage must be present. There is a test of the significance on the receptor which requires that there is evidence that:
- significant harm is being caused;
 - there is a significant possibility of such harm being caused;
 - significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.
- 1.2.2.4 The statutory guidance indicates that normal background levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise.
- 1.2.2.5 Part 2A requires local planning authorities to inspect their areas with a view to identifying contaminated land, and to do this in accordance with the statutory guidance. Under Part 2A, risks should be considered only in relation to the current use of the land.

Town and Country Planning Act 1990

- 1.2.2.6 Under the Town and Country Planning Act 1990 local planning authorities can ensure that, where development is proposed, contaminated is cleaned up so that it is suitable for its proposed use.
- 1.2.2.7 Under the planning regime, where a site potentially affected by contamination is proposed for development, it must undergo assessment to ensure it is suitable for the proposed land use and, where necessary, remediation must be carried out to ensure the land cannot be determined as Contaminated Land under the Environmental Protection Act 1990.

Environment Act 1995

- 1.2.2.8 The Environment Act 1995 established the Environment Agency (EA) and granted it pollution control powers to protect the environment. Section 57 of the Environment Act 1995 created Part 2A of the Environmental Protection Act 1990 which, as explained above, establishes the legal framework for dealing with contaminated land in England.

The Contaminated Land (England) Regulations 2006

- 1.2.2.9 As set out above, these regulations make provisions for a contaminated land regime, in accordance with Part 2A of the Environmental Protection Act 1990, which includes actions for the remediation of such land. The accompanying 2012 statutory guidance (Defra, 2012)) clarifies the grounds under which land can be classified as contaminated as follows:
- significant harm is being caused to a human, or relevant non-human, receptor;
 - there is a significant possibility of significant harm being caused to a human, or relevant non-human, receptor;
 - significant pollution of controlled waters is being caused; and/or

- there is a significant possibility of significant pollution of controlled waters being caused.

1.2.2.10 The Contaminated Land Regulations 2006 were amended in 2012 by the Contaminated Land (England) (Amendment) Regulations 2012, which came into force on April 6, 2012, making minor updates, clarifying definitions like controlled waters, and streamlining appeal processes. These amendments brought the regulations in line with revised statutory guidance and the Water Framework Directive.

Water Resources Act 1991

1.2.2.11 The Water Resources Act 1991 (Chapter 57), Part III Control of Pollution of Water Resources, provides the statutory framework for preventing pollution of controlled waters (i.e., rivers, lakes, canals, estuaries, coastal waters and groundwater). The EA regulates water quality and discharges to controlled water and may impose conditions or require remedial action where pollution occurs. The Water Resources Act sets out the responsibilities of the EA with regards to water pollution, resource management, flood defence, fisheries and, in some areas, navigation. It also regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater.

Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017

1.2.2.12 The WFD (Council Directive 2000/60/EC) establishes a framework for community action in the field of water policy and was adopted in 2000. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposed the WFD into national law in the UK. The WFD aims to protect and enhance the quality of surface and groundwater bodies. It requires that water abstractions, discharges, and potential pollution risks are carefully managed to maintain or achieve good ecological and chemical status (European Parliament and Council, 2000, Articles 4 and 7).

The Water Supply (Water Quality) Regulations 2016 and 2018

1.2.2.13 The quality of public drinking water supplies in England is regulated by the Water Supply (Water Quality) Regulations 2016 and the Water Supply (Water Quality) Regulations 2018. These regulations set out standards for drinking water quality. Although standards are not specified for all chemical compounds in existence, the regulations do require that, in order to be regarded as 'wholesome', drinking water must not contain any substance at a level which would constitute a potential danger to human health (as well as meeting the other requirements of the regulations).

European Union Groundwater Directive 2006

1.2.2.14 The aim of the European Union Groundwater Directive (2006/118/European Commission (EC)), 2006 is to protect groundwater against pollution caused by dangerous substances. The Directive continues to have effect in England following the UK's exit from the EU through the Environmental Permitting (England and Wales) Regulations 2016.

The Groundwater (England and Wales) Regulations 2009

1.2.2.15 The Groundwater (England and Wales) Regulations 2009 implement the European Union Groundwater Directive (2006/118/European Commission (EC)), 2006 in England and Wales. These regulations provide definitions of key terms including 'groundwater', 'hazardous substances' and 'non-hazardous pollutants' and sets out powers for the Environment Agency to serve notices and to grant permits for activities relating to inputs to groundwater.

Environmental Permitting (England and Wales) Regulations 2016

1.2.2.16 The Environmental Permitting (England and Wales) Regulations 2016 regulate activities that can occur during construction, including use of mobile plant, water discharge activities, groundwater activities, and waste operations. In some instances, activities may meet the criteria for an exemption. Defra has published Core Guidance (Defra, 2020) to clarify the current Environmental Permitting regime.

Environmental Damage (Prevention and Remediation) (England) Regulations 2015

1.2.2.17 The Environmental Damage (Prevention and Remediation) Regulations 2015 ensure that any activities resulting in land contamination or pollution must be identified and controlled to avoid

causing “significant risk of adverse effects” to human health or the environment. It aims to prevent and remedy damage to land, water and biodiversity.

Health and Safety at Work etc. Act 1974

- 1.2.2.18 The Health and Safety at Work Act 1974 and regulations made under this Act, in particular the Management of Health and Safety at Work Regulations 1999, place responsibilities upon employers to carry out a risk assessment for every work activity and to document it. Besides carrying out a risk assessment, employers also need to: make arrangements for implementing health and safety measures identified as necessary by the risk assessment; appoint competent people to help them implement the arrangements; set up emergency procedures; provide clear information and training to employees; and work together with other employers sharing the same workplace. In the context of construction hazards could include unstable ground, contaminated soils, ground gases and contaminated groundwater or groundwater ingress to excavations. The Act provides the overarching legal basis for more detailed regulations (such as Construction Design and Management (CDM) 2015) that ensure safe planning, design and execution of construction related work.

Construction (Design and Management) (CDM) Regulations 2015

- 1.2.2.19 The Construction (Design and Management) Regulations 2015 (CDM 2015) set out legal duties for planning, managing and monitoring health and safety throughout the life of a construction project from its inception to its subsequent final demolition and removal. These apply to clients, designers, and contractors.
- 1.2.2.20 The CDM Regulations 2015 require the appointment of a Principal Designer and Principal Contractor to co-ordinate health and safety aspects during construction where there is more than one contractor on a project.
- 1.2.2.21 Under the provisions set out in the CDM Regulations 2015, designers must avoid foreseeable risks, such as ground contamination, so far as reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure; reducing risks from any remaining hazard; and giving collective safety measures priority over individual measures.

The Control of Substances Hazardous to Health (COSHH) Regulations (2002)

- 1.2.2.22 The COSHH Regulations were established to ensure that employers take necessary precautions to protect employees and others from health risks associated with hazardous substances. This includes chemicals, biological agents, and other materials that could cause harm to health. The regulations require employers to assess risks, implement control measures, and provide training and information to employees.

1.2.3 National policy context

National Policy Statements

- 1.2.3.1 National Policy Statements (NPS) set out the primary policy framework for a Development Consent Order (DCO) under which the MHPGC Project will be considered. This framework includes guidelines, requirements and criteria that the MHPGC Project must meet to obtain consent and proceed with development.

1.2.3.2 **Table 1.1** provides details of the NPS relevant to geology, hydrogeology and ground conditions and how and where they are covered in the PEIR:

- NPS for energy (EN-1) (DESNZ, 2025).
- NPS for renewable energy infrastructure (EN-3) (DEZNZ, 2025a)

Table 1.1: Summary of the NPS provisions relevant to geology, hydrogeology and ground conditions

Summary of relevant NPS provisions	How and where considered in the PEIR
NPS EN-1	
Paragraph 5.4.18 states that the ES must clearly set out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance.	The baseline in relation to geological conservation is provided in Section 1.4 . An assessment of the effect of the MHPGC Project on sites of geological conservation importance is presented in Section 1.8 of this chapter. The baseline in relation to ecological conservation sites and assessment of potential effects on these receptors is in Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR . Ecological conservation sites can also be receptors of land contamination impacts. This is considered in the Geoenvironmental Preliminary Risk Assessment (PRA) (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR).
Paragraph 5.4.20 states that the applicant should show how the project has taken advantage of opportunities to conserve and enhance geological conservation interests.	The design of the MHPGC Project has sought to avoid or conserve through design the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 and Volume 1, Chapter 3: Site Selection & Consideration of Alternatives, of the PEIR . Mitigation measures relating to this chapter are presented in Table 1.16 , and the commitments register in Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR .
Paragraph 5.4.39 states that to further minimise any adverse impacts on geodiversity, where appropriate applicants are encouraged to produce and implement a Geodiversity Management Strategy to preserve and enhance access to geological interest features, as part of relevant development proposals	The design of the MHPGC Project has sought to avoid impacts on the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 . The assessment of effects on geological receptors is in Section 1.8 . As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and a Geodiversity Management Strategy has not been required.
Paragraph 5.4.42 states that the benefits of nationally significant low carbon energy infrastructure development may include benefits for biodiversity and geological conservation interests and these benefits may outweigh harm to these interests. The Secretary of State may take account of any such net benefit in cases where it can be demonstrated.	The design of the MHPGC Project has sought to avoid the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 . The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR . The assessment of effects on geological and biodiversity receptors is in Section 1.8 . Mitigation measures relating to this chapter are presented in Table 1.16 , and the commitments register in Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR . As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and no compensation measures have been necessary.

Summary of relevant NPS provisions	How and where considered in the PEIR
Paragraph 5.4.43 states that the development should aim to avoid significant harm to geological conservation interests, including through consideration of reasonable alternatives. Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought.	The design of the MHPGC Project has sought to avoid the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 . The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR . The assessment of effects on geological and biodiversity receptors is in Section 1.8 . Mitigation measures relating to this chapter are presented in Table 1.16 , and the commitments register in Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR . As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and no compensation measures have been necessary.
Paragraph 5.4.49 states that in taking decisions, the Secretary of State should ensure that appropriate weight is attached to designated sites of international, national, and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment.	The design of the MHPGC Project has sought to avoid the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 . The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR . The assessment of effects on geological and biodiversity receptors is in Section 1.8 . Mitigation measures relating to this chapter are presented in Table 1.16 , and the commitments register in Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR . As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and no compensation measures have been necessary.
Paragraph 5.4.52 states that the Secretary of State should use requirements and/or planning obligations to mitigate the harmful (where the term 'harm' should be understood to mean 'significant harm') aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest.	The design of the MHPGC Project has sought to avoid the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4 . The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR . The assessment of effects on geological and biodiversity receptors is in Section 1.8 . Mitigation measures relating to this chapter are presented in Table 1.16 , and the commitments register in Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR . As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and no compensation measures have been necessary.
Paragraph 5.11.4 states that development of land will affect soil resources, including physical loss of and damage to soil resources, through land contamination and structural damage. Indirect impacts may also arise from changes in the local water regime, organic matter content, soil biodiversity and soil process.	Consideration of potential contamination of soils due to construction work is included in the assessment of effects on land contamination receptors is in Section 1.8 . Other impacts on soils due to construction, such as soil compaction, removal of soil or soil sealing, are considered in Volume 3: Chapter 9: Agriculture and Soils, of the PEIR .

Summary of relevant NPS provisions	How and where considered in the PEIR
Paragraph 5.11.5 states that where pre-existing land contamination is within a proposed development, the objective is to ensure that the site is suitable for its intended proposed use, through risk assessment in accordance the contaminated land statutory guidance.	Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). For the MHPGC Project PEIR Red Line Boundary: Onshore details of baseline conditions are provided in Section 1.4 . The assessment of potential effects on land contamination receptors is in Section 1.8 .
Paragraph 5.11.15 states that developments should contribute to and enhance the natural and local environment by preventing new and existing developments from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.	Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1 Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). The assessment of potential effects on land contamination receptors during the construction, operation, and decommissioning phases of the MHPGC Project is in Section 1.8 . The Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) assesses ground stability risks for the MHPGC Project and includes preliminary consideration of existing coal mining risk assessment information. It includes a desk-based assessment of potential geohazards and a geotechnical risk register and its conclusions and recommendations will inform the scope of further ground investigation and the measures required for the detailed design and construction of the Proposed Development. Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16 , and assessment of ground stability risks is therefore not included in this chapter.
Paragraph 5.11.17 states that applicants should ensure that a site is suitable for its proposed use, taking account of ground conditions and any risks arising from land instability and contamination.	Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1 Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). . The assessment of potential effects on land contamination receptors during the construction, operation, and decommissioning phases of the MHPGC Project is in Section 1.8 . The embedded mitigation measures in Table 1.16 include compliance with LCRM, which means that the suitability for use (the proposed end use during the operational phase) will be assessed, using a phased approach, and any remedial measures defined and undertaken as needed. The Geo-environmental PRA (Volume 3, Annex 1. 1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) assesses ground stability risks for the MHPGC Project and includes preliminary consideration of existing coal mining risk assessment information. It includes a desk-based assessment of potential geohazards and a geotechnical risk register. Its conclusions and recommendations will inform the scope of further ground investigation and the measures required for the detailed design and construction of the Proposed Development. Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16 , and assessment of ground stability risks is therefore not included in this chapter.

Summary of relevant NPS provisions	How and where considered in the PEIR
Paragraph 5.11.19 states that applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place	The MHPGC Project has considered impacts on mineral resources during the site selection process. The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR and the associated landfall and onshore annexes. Effects on mineral resources are considered in Section 1.8 of this chapter.
Paragraph 5.11.28 states that where a proposed development has an impact upon a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.	The MHPGC Project has considered impacts on mineral resources during the site selection process. The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR and the associated landfall and onshore annexes. Effects on mineral resources are considered in Section 1.8 of this chapter.
NPS EN-3	
Paragraph 2.1.21 states that while land type should not be a predominating factor in determining the suitability of the site location applicants should, where possible, utilise suitable previously developed land, brownfield land, contaminated land and industrial land.	The use of brownfield land has been considered during the site selection process. The MHPGC Project includes areas of previously developed land, notably at the Green LSS Option at the former Hawthorn Combined Mine. The approach to site selection and consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR and the associated landfall and onshore annexes. Effects on land contamination receptors are considered in Section 1.8 of this chapter.
Paragraph 2.12.63 states that applicants are encouraged to develop and implement a Soil Resources and Management Plan which could help to use and manage soils sustainably and minimise adverse impacts on soil health and potential land contamination.	An Outline Soil Management Plan (SMP) will form part of the Outline CoCP which will be prepared and submitted as part of the application for the development consent (commitment CoT40 in Table 1.16). In relation to materials management planning and stockpiled materials or excavated soils, the MHPGC Project is committed to the development of an Outline SWMP (commitment CoT40 in Table 1.16).

National Planning Policy Framework

- 1.2.3.3 The National Planning Policy Framework ((NPPF), Ministry of Housing, Communities and Local Government, 2025) does not form part of the primary policy framework under which the MHPGC Project will be determined, but it could be considered a material consideration by the Secretary of State (SoS) in the determination. **Table 1.2** provides details of the elements of the NPPF that are relevant to geology, hydrogeology and ground conditions and how and where they are covered in the PEIR or will be covered within the ES.

Table 1.2: Summary of NPPF requirements relevant to geology, hydrogeology and ground conditions

NPPF section	How and where this is considered in the PEIR
Section 19, Conserving and enhancing the natural environment N6: Areas of particular importance for biodiversity and geodiversity states that: 1. To support the conservation of important habitats, species and sites of geodiversity value, development proposals affecting: b. A site of national importance, which for the purpose of this policy is one designated as a Site of Special Scientific Interest, should only be supported if:	The design of the MHPGC Project has sought to avoid impacts on the identified sensitive geological receptors within the MHPGC Project PEIR Red Line Boundary: Onshore and the Geology, Hydrogeology and Ground Conditions Study Areas, as detailed in Section 1.4. The assessment of effects on geological receptors is in Section 1.8. As the MHPGC Project will avoid disturbance to sensitive geological receptors, no potential for significant effects have been identified and a Geodiversity Management Strategy has not been required. Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in

NPPF section	How and where this is considered in the PEIR
i. There would be no adverse effect (either individually or in combination with other developments) on the site's features of special scientific interest; or. ii. The benefits of the development in the location proposed clearly outweigh both the likely impact on the features of special scientific interest, and any broader impact on the national network of Sites of Special Scientific Interest; or iii. The impact of development on the relevant protected feature of the protected site is being addressed through an Environmental Delivery Plan which has been made and the developer has committed to paying the nature restoration levy. c. A site of local importance, which for the purpose of this policy is one designated as a Local Nature Reserve or identified as a local wildlife site, local geological site or equivalent in the development plan, should only be supported if: i. There would not be a significant adverse effect on the integrity of the site; or ii. The benefits of development in the location proposed clearly outweigh the likely impact on the features which make the site valuable for nature conservation.	Table 1.16, and assessment of ground stability risks is therefore not included in this chapter.
Section 17, Pollution, public protection and security. P1: Planning for clean and safe places, states that development plans should ensure that: a. i. Opportunities can be taken to improve local environmental conditions, such as by remediating despoiled, degraded, derelict, contaminated and unstable land; ii. Ground conditions will not inhibit or pose a risk to the nature of the development proposed (such as due to land instability), and occupiers and users will not be put at risk from, or be adversely affected by, unacceptable levels of pollution; iii. Development proposals will not cause unacceptable levels of pollution, either alone or in combination with other pollution sources, taking into account communities which may be particularly vulnerable to its effects, such as children and older people, as well as habitats and species which may be vulnerable to pollution. P2: Ground conditions states that 1. Sites proposed for development should be suitable for their proposed use taking into account: a. Ground conditions, including any risks arising from land instability or contamination (whether due to natural hazards or current and former activities such as mining or fuel storage); and b. The extent to which any such risks can be mitigated, and the potential impacts on the natural environment arising from remediation. 2. Where land is remediated it should, as a minimum, not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.	Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). The assessment of potential effects on land contamination receptors during the construction, operation, and decommissioning phases of the MHPGC Project is in Section 1.8. The embedded mitigation measures in Table 1.16 include compliance with LCRM, which means that the suitability for use (the proposed end use during the operational phase) will be assessed, using a phased approach, and any remedial measures defined and undertaken as needed. If remedial works are required, validation of the remedial works will need to be undertaken to demonstrate that the land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990. The Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) assesses ground stability risks for the MHPGC Project and includes preliminary consideration of existing coal mining risk assessment information (detailed in Section 1.4). Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16, and assessment of ground stability risks is therefore not included in this chapter.

NPPF section	How and where this is considered in the PEIR
3. Adequate site assessment information, prepared by a competent person, should be available to inform these considerations. 4. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.	
M2: Safeguarding mineral resources and infrastructure through plan-making 1. The development plan should: a. Define Mineral Safeguarding Areas and (in two tier areas) Mineral Consultation Areas to support the safeguarding of mineral resources; b. Where necessary to prevent the sterilisation of mineral resources, require the prior extraction of minerals on sites allocated for non-mineral development, where practical and environmentally feasible; and c. Identify existing, planned and potential sites which need to be safeguarded for: the bulk transport, handling and processing of minerals; the manufacture of concrete and concrete products; and the handling, processing and distribution of substitute, recycled and secondary aggregate material.	The location of mineral resources is discussed in Section 1.4. Effects on safeguarded mineral resources are assessed in Section 1.8 of this chapter.
M6: Safeguarding mineral resources and infrastructure through decision-making. 1. Proposals for non-mineral development should not: a. Constrain potential future use for mineral working in a Mineral Safeguarding Area; or b. Prevent or constrain the use of existing, planned and potential sites for: i. The bulk transport, handling and processing of minerals; ii. The manufacture of concrete and concrete products; or iii. The handling, processing and distribution of substitute, recycled and secondary aggregate material. 2. Where proposals for non-mineral development are located within a Minerals Consultation Area, the decision-making authority should consult the mineral planning authority and take account of the local minerals plan before determining the planning application. 3. The prior extraction of minerals, where practical and environmentally feasible, should be supported where it would prevent the sterilisation of minerals deposits as a consequence of other forms of development proposals or allocations.	The location of mineral resources is discussed in Section 1.4. Effects on safeguarded mineral resources are assessed in Section 1.8 of this chapter.

1.2.4 Local policy context

- 1.2.4.1** The MHPGC Project lies within the jurisdiction of Durham County Council (DCC). Durham Local Plan (DCC, 2020) provides the local policies relevant to geology, hydrogeology and ground conditions, which are outlined in **Table 1.3**.

Table 1.3: Local policy relevant to geology, hydrogeology and ground conditions

Policy description	How and where considered in the PEIR
Durham Local Plan	
Policy 32 Despoiled, Degraded, Derelict, Contaminated and Unstable Land, sets out the requirements for proposed developments on land known to be or potentially affected by contamination. The policy also notes in relation to land stability that failure to deal with land stability issues could cause risks to human health, local property and associated infrastructure, and the wider environment. Within County Durham the principal issue which relates to ground instability relates to past coal mining. Large parts of County Durham have been identified by the Mining Remediation Authority as 'Development High Risk Areas' and 'Development Low Risk Areas' due to the known occurrence of coal mining legacy issues and related hazards. It is necessary for developers to demonstrate that new development will be safe and stable. Where there is reason to believe that unstable land could be present due to coal mining legacy issues a Coal Mining Risk Assessment Report will be required.	Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). The assessment of potential effects on land contamination receptors (human health, Controlled Waters and property) during the construction, operation, and decommissioning phases of the MHPGC Project is in Section 1.8. The embedded mitigation measures in Table 1.16 include an Outline CLGDS (CoT33) which would be produced in compliance with LCRM, which means that the suitability for use (the proposed end use during the operational phase) will be assessed, using a phased approach, and any remedial measures defined and undertaken as needed. If remedial works are required, validation of the remedial works will be undertaken to demonstrate that the land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990. Potential for significant effects due to ground instability associated with former coal mining is scoped out of the assessment (see Table 1.14 in Section 1.6). The Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) assesses ground stability risks for the MHPGC Project and includes preliminary consideration of existing coal mining risk assessment information (detailed in Section 1.4). Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16.
Policy 35 states that the quantity and quality of groundwater bodies shall be protected and where possible enhanced. The development must demonstrate control of the quality of surface water runoff during construction and for the lifetime of the development. New development will be required to incorporate appropriate water pollution control measures. Development which could adversely affect the quality or quantity of groundwater, flow of groundwater or ability to abstract water will not be permitted unless it can be demonstrated that no adverse impact would occur or mitigation could be put in place to minimise this impact.	An initial Hydrology and Flood Risk Expert Working Group (EWG) was held on 11 November 2025, which included discussion on the scoping of hydrogeological impacts. A second Hydrology and Flood Risk EWG was held on 13th August 2026. Meeting minutes and comments received as part of this discussion and subsequent feedback, specifically limited to those in relation to the geology, hydrogeology and ground conditions, are set out in Table 1.5. Information relating to hydrogeological receptors has been obtained and reviewed. This is presented Section 1.4. Effects on groundwater receptors with regards to quality, flow and levels are considered in Section 1.8. Land contamination risks for the MHPGC Project have been assessed in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) in accordance with UK land contamination risk assessment guidance, LCRM (EA, 2025). The assessment of potential effects on land contamination receptors, including groundwater and surface water receptors is in Section 1.8. Effects associated with surface water runoff and water resources, including groundwater abstractions, are

Policy description	How and where considered in the PEIR
	assessed in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Policy 41 states that development proposals will not be permitted if significant harm to geodiversity cannot be avoided, or appropriately mitigated, or, as a last resort, compensated for. Development proposals are expected to protect geological features and have regard to Geodiversity Action Plans, the Durham Geodiversity Audit and where appropriate promote public access, appreciation and interpretation of geodiversity.	The MHPGC Project has been designed to avoid sensitive geological receptors. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR. Sites designated for the geological features are detailed in the baseline in Section 1.4 and effects on geodiversity are considered in Section 1.8 of this chapter.
Policy 48 for the safeguarding of minerals sites states that existing and allocated minerals sites will be safeguarded and protected from non-mineral development, and that planning permission will not be granted for non-minerals development next to a safeguarded minerals processing facility, minerals related transportation infrastructure, minerals site or waste management site, or within a defined minerals or waste site safeguarding zone (where defined in the policies map document) other than if: suitable alternative provision is available; the site is not in active use and is no longer required; or, the need for the development outweighs the benefits of retaining the existing site.	The MHPGC Project has considered impacts on mineral resources during the site selection process. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR. Effects on mineral resources are considered in Section 1.8 of this chapter.
Policy 56 states that planning permission will not be granted for non-minerals development within an identified safeguarding area unless one of the following applies: the mineral in the location safeguarded is not viable for extraction, prior extraction can be undertaken in a satisfactory and timely manner, the non-minerals development is temporary and does not inhibit extraction during its temporary lifespan, there is an overriding need for the non-minerals development that outweighs the benefit of safeguarding the mineral, or it is an exempt development.	The MHPGC Project has considered impacts on mineral resources during the site selection process. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR. Effects on mineral resources are considered in Section 1.8 of this chapter.
Policy 57 states that areas of the county underlain by high grade dolomite by non-mineral development will be protected and prevented from sterilisation. The policy also ensures that existing and future permitted reserves of high grade dolomite are worked for high grade purpose and not unnecessarily for low grade purposes. It is expected that demand for high grade dolomite over the plan period will be met from existing permissions in the county, the policy therefore states that permission for further reserves will only be granted if; it can be demonstrated that demand will not be met by existing permissions, the purpose for which their specific qualities are essential can be demonstrated and its use for high grade purposes can be maximised, and there will be no unacceptable adverse impacts on the environment, human health, or local amenity.	The MHPGC Project has been designed to avoid mineral resources, where possible. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR. Effects on mineral resources are considered in Section 1.8 of this chapter.

1.3 Consultation and engagement

1.3.1 Scoping

- 1.3.1.1 A Scoping Report for the MHPGC Project was issued to the PINS and Marine Directorate – Licencing Operations Team (MD-LOT) in February 2025 (RPS, 2025). Following consultation with the appropriate statutory bodies, PINS (on behalf of the SoS) and MD-LOT both provided Scoping Opinions in March 2025 (PINS, 2025; MD-LOT, 2025, respectively).

1.3.1.2 **Table 1.4** sets out the key comments raised during the scoping process specific to geology, hydrogeology and ground conditions, with details of how these comments have been addressed within the PEIR.

Table 1.4: Summary of scoping responses relevant to geology, hydrogeology and ground conditions

Comment	How and where considered in the PEIR
Durham County Council	
It is advised that the risks posed to water dependent features, ground and surface water, by the proposed quarry extension be considered. Quarry operations should not detrimentally impact on the quality or quantity of water within the vicinity of the site. The proposed assessments as suggested within the section titled 'Water Resources' of the submitted scoping document are considered to be acceptable. It is accepted that one Hydrogeological Risk Assessment to cover both the extension and existing site would be appropriate. The Environment Agency has advised that if is intended to abstract more than 20m³ of water per day from a surface water source e.g. a stream or from underground strata (via borehole or well) for any particular purpose, then an abstraction licence would be required. There is no guarantee that a licence would be granted, as this is dependent on available water resources and existing protected rights. It is stated within Section 2.0 of the Dust Management Plan that there would be lagoons. It is not, however, stated where the water for these would come from. Details of water supply and discharge should be provided. The scoping report states that no dewatering is expected, however, discharge from temporary excavations can occur if the discharge can meet all of the conditions of the Regulator Position Statement "Temporary dewatering from excavations to surface water", if needed. If any discharge cannot meet all of the conditions, a Bespoke Environmental Permit would be required.	We note that the comment from DCC references quarrying operations and a Dust Management Plan, however there is no quarrying currently planned to take place as part of the works associated with the MHPGC Project and no Dust Management Plan was submitted with the Scoping Report for the MHPGC Project. It is assumed that the comment is an error from DCC. In terms of the MHPGC Project and the water environment, commitments are included in Table 1.16. An Outline Dust Management Plan (DMP) will form part of the Outline CoCP, which will be prepared and submitted as part of the application for development consent. Information relating to the hydrogeological baseline has been obtained and reviewed. This is presented in Section 1.4. Impacts from dewatering associated with the MHPGC Project on groundwater receptors are considered in Section 1.8. Where relevant, the requirement for water quality discharge permits or abstraction licences is considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Environment Agency	
Coastal Geomorphology - We are unable comment on whether the design principles and construction method are appropriate in this location, especially given the industrial history of the area, and the protected status of the coastline. Further consultation should be undertaken when further information is available regarding landfall location.	The landfall location is described in Volume 1, Chapter 2: Project Description, of the PEIR with trenchless techniques confirmed for landfall construction. Impacts on coastal geomorphology to Mean High Water Springs (MHWS) are discussed and assessed in Volume 2, Chapter 1: Physical Processes, of the PEIR. The Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment , of the PEIR) identifies potential sources of contamination and assesses ground stability risks for the MHPGC Project, within MHPGC Project PEIR Red Line Boundary: Onshore. Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16, and assessment of ground stability risks is therefore not included in this chapter.
Colliery waste and historic railway material. Colliery waste materials and historic mineral railway lines are present within the order limits along the coastline. Potential increase in pollution risks and/or water quality	The use of brownfield land has been considered during the site selection process. The MHPGC Project includes areas of previously developed land, notably in former mining areas. The approach to site selection and

Comment	How and where considered in the PEIR
deterioration. The location(s) in which the Project would transition onshore needs to be carefully considered to ensure that the development proposals would not cause detrimental impact to water quality by the disturbance of colliery waste/ historic railway materials.	consideration of alternatives is presented in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR and the associated landfall and onshore annexes. Effects on land contamination receptors are considered in Section 1.8 of this chapter. The potential for contamination and pollution and detrimental impacts from disturbed colliery waste and historic railway materials is presented in Section 1.8.
Historic landfill site (i) The cliffs and beach alongside Halliwell Banks former landfill site act as a form of 'sidewall' to the landfill. Contaminants of concern, from the landfill, include speciated Total Petroleum Hydrocarbons (TPH), speciated polycyclic aromatic hydrocarbons (PAHs), BTEX (benzene, toluene, ethylbenzene & xylene), polychlorinated biphenyls (PCBs), cyanide, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), solid and liquid waste matter. Potential for the Project to introduce new contaminant mobilisation pathways and increase erosion of existing colliery waste. Should the cable(s) disturb this site, this could result in the applicant becoming one of the identified appropriate persons for the landfill. The location and installation of the cable(s) should avoid this site to prevent further deterioration and/or erosion of the waste materials and cliffs, and to prevent the creation of new preferential pathways for the migration of contaminants associated with the landfilled materials. Furthermore, the location and installation of the cable(s) should not result in any water quality deterioration and/or an increase in pollution risks.	Following the site selection process, the cliffs and beach alongside Halliwell Banks former landfill are outside of the MHPGC Project PEIR Red Line Boundary: Onshore and study area for land contamination (greater than 500m away and as such unlikely to impact land contamination receptors within the MHPGC Project PEIR Red Line Boundary: Onshore), and therefore the proposed infrastructure will not affect this landfill site.
Historic landfill site (ii) The Hetton Moor Farm landfill and Murton Lane landfill polygons extend into the western part of the Scoping Boundary. Landfill material, which is presumed to be situated off-site, could possibly be encountered within the Scoping Boundary. Recognise that Hetton Moor Farm and Murton Lane landfill sites extend into the Project Scoping Boundary.	Following the site selection process, the Hetton Moor Farm and Murton Lane landfills are both outside (greater than 500m away) of the MHPGC Project PEIR Red Line Boundary: Onshore and study area for land contamination, and therefore the proposed infrastructure will not affect this landfill site. The location and potential effects of disturbing other identified landfills within the land contamination study area are considered in full in Section 1.4 and Section 1.8, respectively.
Potential sources of contamination. The list of identified potential sources of land contamination identified within the Scoping Boundary does not consider the full study area (including buffer distance). Potential for significant off-site contamination sources to be discounted from consideration, which may result in inadequate assessment of risks. Potential land contamination sources within the full study area, not just the Scoping Boundary, need to be considered.	A Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) has been produced for the PEIR, this was not available at Scoping. This identifies the potential contamination sources located within the MHPGC Project PEIR Red Line Boundary: Onshore and in the land contamination study area, which includes a 500m buffer around the MHPGC Project PEIR Red Line Boundary: Onshore. Baseline land contamination information is presented in Section 1.4.
Designed in measures (legislation). The Health and Safety at Work Act (1974) and the Construction (Design and Management) Regulations 2015 is specifically protective of human health. Adherence to	The CoCP will include an Outline Contaminated Land and Groundwater Discovery Strategy (CoT33, see Table 1.16) in line with Government guidance: LCRM and a

Comment	How and where considered in the PEIR
this legislation would not directly ensure the avoidance and minimisation of contamination. Ensure that the unexpected contamination protocol is in accordance with current UK guidance.	Contaminated Land and Groundwater Discovery Strategy during the works. Compliance with the Health and Safety at Work etc Act (1974) and legislation made under the Act, notably The Management of Health and Safety at Work Regulations 1999, requires a risk assessment to be undertaken before any ground works commence. Risk assessments and method statements (RAMS) for the MHPGC Project will detail appropriate working methods, training and Personal Protective Equipment (PPE) to be used to protect construction workers or other ground workers. For this reason, impacts on construction workers and groundworkers are scoped out of the assessment. Potential human health impacts on other site users and visitors, and neighbouring site users, are included in the assessment in Section 1.8. The mitigation measures to prevent impacts on human health and other land contamination receptors are detailed in Section 1.7.
Study area for risks to groundwater. No indication of the study area for risks to groundwater is stated. It is unclear what the extent of the study area for groundwater impacts relating to the project is. This could lead to sensitive groundwater receptors which could be impacted by the Project not being assessed adequately. The study area for groundwater impacts needs to be confirmed.	The Geology, Hydrogeology and Ground Conditions Study Areas defined in Section 1.4 are receptor specific and intended to cover the area within which an impact (direct or indirect) can be reasonably expected to occur. For land contamination receptors, a Study Area comprising the MHPGC Project PEIR Red Line Boundary: Onshore, with a 500m buffer bounded at MHWS, has been applied. For hydrogeology impacts, such as effects on groundwater levels or flow, a 1km buffer bounded at MHWS has been applied. This considers the location of the MHPGC Project PEIR Red Line Boundary: Onshore within groundwater Source Protection Zones (SPZs). Impacts on hydrogeology resources including groundwater abstractions are considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Saline intrusion within the Magnesian Limestone aquifer - Local over-pumping has led to saline intrusion within the Magnesian Limestone aquifer near the coast. Potential for the Project to exacerbate ongoing aquifer degradation resulting from saline and mine water intrusion. The risk of impacting or otherwise influencing flow paths and /or connectivity between the Magnesian Limestone and Coal Measures and/or the sea should be assessed, where required.	The baseline for hydrogeological receptors including the Magnesian Limestone aquifer, is presented in Section 1.4. Potential impacts on groundwater quality are assessed in Section 1.8. The study area for hydrogeology comprises a 1km buffer for the MHPGC Project PEIR Red Line Boundary: Onshore including groundwater SPZs. Impacts on groundwater abstraction resources are considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Impacts related with landfall cables and associated earthworks during the operation and maintenance and decommissioning phases have been scoped out. No justification has been provided for leaving these impacts Scoped Out of further assessment, and details of the proposed location and spatial extents of landfall cable infrastructure are limited. The landfall cables and associated infrastructure could act as a source of contamination or as a preferential pathway for migration of mobile contaminants during the operation and maintenance phase and following decommissioning if not adequately designed and managed. Impacts to groundwater quality from landfall cables should be scoped in during the operation and maintenance and decommissioning phases until it can be demonstrated that this aspect of the Project would not cause impact.	The MHPGC Project acknowledges the view of the EA and has included a preliminary assessment of the potential impacts on land contamination receptors related to the landfall and associated subsurface infrastructure during the O&M and decommissioning phases. This is presented in Section 1.8.

Comment	How and where considered in the PEIR
Impacts from onshore cable construction and associated earthworks are not 'Scoped In' during the operation and maintenance phase and decommissioning (and presumed 'Scoped Out') without justification. Onshore cables and associated infrastructure could act as a source of contamination or as a preferential pathway for migration of mobile contaminants during the operation and maintenance phase and following decommissioning if not adequately designed and managed. Table 8.25 identifies that onshore cables will be retained in-situ following decommissioning. Impacts from the construction of onshore cables and associated infrastructure during the operation and maintenance and decommissioning phases should be scoped in until it can be demonstrated that this aspect of the Project would not cause impact.	The MHPGC Project acknowledges the view of the EA and has included a preliminary assessment of the potential impacts on land contamination receptors related to the onshore export cables and Alternating current (AC) connection cables and associated subsurface infrastructure during the O&M and decommissioning phases. This is presented in Section 1.8.
Impacts from the substation construction and associated earthworks during the decommissioning phase have been scoped out. Sub-surface infrastructure is proposed to be retained in-situ in the decommissioning phase. Potential for aspects of the proposed substation development to pose a significant risk to groundwater quality if these are not adequately assessed and mitigated. Impacts from the substation construction and associated earthworks should be Scoped In during the decommissioning phase until it can be demonstrated that this aspect of the Project would not cause impact. The siting of the substation is still to be determined and based on the information available there is significant potential for foundation structures, such as piled foundations, to extend into the underlying bedrock Principal Aquifer, designated locally as Source Protection Zones 2 and 3.	Site selection between the two LSS options will be determined following consultation. The MHPGC Project acknowledges the view of the EA and has included a preliminary assessment of the potential impacts related with the substation and associated earthworks during the O&M and decommissioning phases. This is presented in Section 1.8.
Thermal emissions from buried high voltage cables topic not mentioned in Scoping Report. Potential impacts to groundwater from thermal emissions from buried high voltage cables have not been included in the list of potential impacts to the water environment. Potential for significant thermal impacts on groundwater not to be identified and mitigated. The potential impacts of buried high voltage cables on groundwater bodies need to be considered.	The risks posed by thermal emissions from buried high voltage cables to groundwater during the O&M phase are considered in Section 1.8. There is currently limited guidance on assessing the effects of thermal emissions on groundwater. Following EWG consultations, the EA provided guidance on how to assess these impacts for the MHPGC Project. The assessment undertaken and presented in this chapter adopted this guidance.
The identified risk issues identified for Impact Assessment are not fully comprehensive. Potentially significant risks to WFD Groundwater bodies may not be assessed in the proposed WFD Compliance Assessment. The following impact risks should also be considered: • The potential for piling and other foundation works to result in the creation of new contaminant migration pathways affecting the WFD Groundwater bodies. • The potential for trenchless cable installation methods such as HDD to result in the creation of new contaminant migration pathways affecting the WFD Groundwater bodies. • The potential for residual below ground infrastructure following decommissioning to act as a source of contamination and /or a preferential pathway for the mobilisation of mobile contaminants. • The potential for drainage infrastructure to introduce mobile contaminants such as fire water or spills and	All WFD groundwater bodies that interact with the WFD Assessment Area are identified within the baseline environment presented in Volume 3, Annex 2.3: Onshore Water Framework Directive Assessment, of the PEIR. The WFD assessment has concluded that the Wear Magnesian Limestone groundwater body is the only designated groundwater body under WFD within the Geology, Hydrogeology and Ground Conditions Study Area. Potential impacts to the Wear Magnesian Limestone groundwater body (including those listed in the Scoping Opinion comment) are considered in Section 1.8. Potential effects on groundwater during construction of the landfall and associated earthworks and onshore export cable and AC connection cable construction (including watercourse crossings) resulting in potential impacts on water quality are considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR. The potential for the subsurface cable routes to act as a

Comment	How and where considered in the PEIR
leaks from operational plant which may affect water quality in WFD Groundwater bodies.	preferential pathway for migration of mobile contaminants is considered in Section 1.8 of this chapter. The potential for piling and other foundation works to result in the creation of new contaminant migration pathways affecting the WFD Groundwater bodies is considered in Section 1.8. The potential for drainage infrastructure to introduce mobile contaminants is covered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Operation and maintenance phase activities. Anticipated activities during the operation and maintenance phase of the Project are not listed. Uncertainty about the risks posed by the Project to the environment during the operation and maintenance phase. Confirmation of anticipated operation and maintenance activities for the onshore portion of the Project is required.	A description of the proposed O&M activities is provided in Volume 1, Chapter 2: Project Description, of the PEIR and impacts are considered in Section 1.8 .
The retention of buried structures is likely during the decommissioning phase. Retained infrastructure could cause contaminative impact to controlled waters following decommissioning phase if risks are not properly assessed. The risks posed by the retention of below ground infrastructure following decommissioning needs to be considered and assessed.	The risks posed by the retention of below ground infrastructure following decommissioning are considered in Section 1.8 .
Study area buffer. A 250m buffer for assessing impacts to geology, hydrogeology, minerals and land contamination is insufficient. The entire study area is underlain by Principal Aquifer. Potentially significant sensitive receptors may be excluded from assessment due to the adoption of an insufficient search buffer. The applicant should increase the study area boundary to adequately identify sensitive groundwater receptors which may be affected by the Project.	An appropriate study area and buffer area to account for hydrological and hydrogeological settings and connectivity of 1km has been applied for hydrogeological receptors and 500m for land contamination receptors has been considered and is presented in Section 1.4 . Relevant study areas were presented during EWG2.
Sources of baseline data. Several potentially significant sources of baseline data are not indicated to have been assessed in support of the EIA at this stage, notably authorised landfill sites, historic Ordnance Survey maps and site walkover survey information. Risk that the baseline conditions established do not take account of potentially significant contamination sources or adequately identify historic or current potentially contaminative activities. Baseline conditions need to be informed by adequate information in future stages of the DCO process. We recognise that no authorised landfill sites are present within the Study Area, however the EIA should demonstrate that this information has been considered.	Presented in the PEIR, in Section 1.4 are the full sources of baseline data. Potential land contamination sources including landfills within the MHPGC Project PEIR Red Line Boundary: Onshore and the land contamination study area are detailed in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment those listed within the Scoping Opinion comment.
Characterisation of ground conditions. There is no reference to the presence of: • localised superficial River Terrace Deposits (superficial Secondary A Aquifer) • Seaham Residue mudstone (Principal Aquifer) • Pelaw Lay Member (superficial Unproductive strata) Inadequate characterisation of ground conditions could lead to an inadequate conceptual model and potentially	A comprehensive assessment of available geological information has been undertaken in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) and summary information is presented in Section 1.4 , including the geological units referenced, if present, within the Land Contamination, Geology, Hydrogeology and Mineral Study Areas.

Comment	How and where considered in the PEIR
insufficient mitigation of risks to controlled water. All strata indicated to be present within the study area needs to be accounted for and their characteristics considered to inform the assessment of risks to controlled waters.	
Relevant policy and legislation - The following policy and guidance, which we would expect to see cited, is missing from the Scoping Report. • The National Planning Policy Framework was most recently revised in December 2024. • The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 have been updated with The Environmental Damage (Prevention and Remediation) (England)(Amendment) Regulations. • Durham County Council, The County Durham Plan (adopted 2020): Policy 35 – Water Quality is not referenced with respect to ground conditions and land contamination, which along with Sections 5.368 and 5.381 set out expectations about water body protection. • The Environment Agency’s Land Contamination Risk Management guidance was updated in 2023. • The Environment Agency’s Approach to Groundwater Protection is not cited as a point of reference. Potential for aspects of the Project not to be in accordance with current guidance and legislation. Ensure the above is included as relevant policy and legislation.	Relevant policy, legislation and guidance is presented in Section 1.2 and includes all those referenced.
Design of onshore cables - No information is provided regarding the design of onshore cables. Potential for underground cables to pose an unacceptable risk to groundwater quality. Confirmation of whether fluid filled cables are proposed as part of the design of the Proposed Developer is required. In accordance with Statement C5 of the Environment Agency’s Approach to Groundwater Protection, the Environment Agency will normally object to pipelines or fluid-filled cables that transport pollutants, particularly hazardous substances that: • Pass through SPZ1 or SPZ2 where this is avoidable; • Are below the water table in principal or secondary aquifers. Where there is an unavoidable need for pipelines or fluid-filled cables to pass through SPZ1 or SPZ2, operators are expected to adopt Best Available Techniques (BAT) and operate in accordance with the Energy Networks Association guidance. The Environment Agency expects operators to carry out a site-specific risk assessment prior to the decommissioning of fluid-filled cables in SPZ1 and SPZ2 and will work with operators to agree the best available environmental option.	Both the onshore export cables and AC connection cables are not anticipated to be fluid filled that could transport pollutants, through SPZ1 or SPZ2 or below the water table in principal or secondary aquifers. Should this be required, the MHPGC Project will follow the EA’s guidance and undertake relevant risk assessment relating to potential presence of hazardous substances and potential risks to controlled waters receptors.
Proposed water drainage for the Land Substation (LSS) site. No detail of the proposed drainage solution for the LSS is provided at this stage, including how this will manage potentially contaminated water, in particular firefighting water in the event of a substation fire.	The management of surface water runoff and potentially contaminated waters at the LSS Options Areas are discussed in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.

Comment	How and where considered in the PEIR
It is also presumed that the LSS would require a local water supply for emergency firefighting purposes, and that this may require the construction of a borehole-fed emergency water supply. Insufficiently mitigated rainwater runoff and emergency fire water runoff from this facility could result in impacts to controlled waters. Potential for firefighting water supply constraints to be encountered. Confirmation of how surface water runoff from the LSS will be managed to avoid impacting surface and groundwater bodies is required. Should a borehole-fed emergency water supply be required, a groundwater investigation consent may be required. A Surface Water Drainage Strategy and/or Surface Water Management Plan should be developed which includes measures for the isolation and removal of potentially contaminated runoff from the LSS. This information should include, but not be limited to: • A detailed drainage plan which demonstrates, in the event of an emergency, that contaminated firewater can be adequately contained within the site to ensure that there is no discharge of polluted water to ground or surface water bodies. • The scheme should include an impermeable base or layer beneath the substation infrastructure, to ensure infiltration beneath the site can be controlled. • Any system for the storage of contaminated firewater should have sufficient capacity/headroom for the volumes expected in the event of a fire, even during periods of intense rainfall. • The system for containing firefighting effluent should be automatic with a backup system in place in case of power failure.	In relation to water supply, no groundwater abstractions will be required for water consumption during the project. Water will be tankered in / taken from mains. An Outline Surface Water and Groundwater Management Plan (SWGMP) will form part of the Outline CoCP, will be submitted with the application for development consent. The Outline SWGMP will set out measures to protect surface water and groundwater during construction, covering surface water and drainage management measures, flood risk control measures, and management of foul water from construction compounds. A Detailed SWGMP will be developed substantially in accordance with the Outline SWGMP. This is commitment (CoT23) is detailed in Table 1.16.
Mining Remediation Authority As of 28 November 2024, the Coal Authority has been renamed as the Mining Remediation Authority. The Applicant should refer to the correct public body in forthcoming documentation to prevent inaccurate citation of data sources.	The PEIR and ES will refer to the Mining Remediation Authority and not to the Coal Authority.
Chapter 8, Table 8.5 MM-70, Item MM070 of the Unexpected Contamination Protocol states that an unexpected contamination protocol will be produced in line with UK statutory guidance (LCRM/CLR11). Although LCRM is current guidance, the applicant should note that LCRM supersedes CLR11, which was withdrawn in 2020.	LCRM will be used for the assessment of contamination in line with current UK guidance. This is discussed in Section 1.8.
The value of groundwater supporting groundwater dependant terrestrial ecosystems (GWDTEs) or impacts on GWDTEs is not considered within the list of definitions. Potential for impacts to GWDTEs from alterations to groundwater flow and quality not to be identified. The sensitivity and magnitude of impacts to GWDTEs arising from changes to groundwater from the Project need to be considered. The below Sites of Special Scientific Interest are recorded as GWDTEs (GWDTE map/features) and as such are sensitive to impacts to groundwater quantity and quality: • Hesledon Moor West SSSI; • Hesledon Moor East SSSI; • Durham Coast SSSI.	The baseline characteristics of the groundwater environment are presented in Section 1.4. The risks posed by the MHPGC Project to groundwater receptors (quality and levels) are considered in Section 1.8. The value of groundwater supporting GWDTEs and an assessment of potential for impacts to GWDTEs from alterations to groundwater flow and quality are presented in Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR and will be informed by the findings of this chapter. As detailed in Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR, Environment Agency data on Groundwater Dependent Terrestrial Ecosystems (GWDTEs) and baseline surveys identify potential presence of GWDTEs within the MHPGC

Comment	How and where considered in the PEIR
	PEIR Redline Boundary: Onshore within Durham Coast SSSI/SAC and Hesledon Moor East and West SSSIs. A Habitats Regulations Assessment (HRA) has been prepared for the MHPGC Project to assess the potential for the MHPGC Project to affect designated sites. This assessment is set out in Habitats Regulations Appraisal/Habitats Regulations Assessment RIAA, prepared to accompany the PEIR.
Horizontal Directional Drilling (HDD) might be employed. HDD or other trenchless installation methods could impact groundwater or surface water quality if not suitably managed. HDD crossings should be supported by the development and implementation of a Drilling Fluid Breakout Plan. If HDD is proposed to be used to cross watercourses the Applicant would need to assess whether this would affect local licensed or unlicensed abstractions by carrying out a water feature survey. A Hydrogeological Risk Assessment should also be carried out where HDD or other trenchless installation methods are proposed which may interact with Principal or Secondary A Aquifers or pass beneath surface watercourses or sensitive ecological habitats.	The risks posed by HDD or other trenchless installation methods to groundwater receptors are considered in Section 1.8. Where the works may interact with a Principal or Secondary A Aquifer, the hydrogeological conceptual understanding will be advanced in consultation with EA to better understand the risks to groundwater, and the need and scope for any future Hydrogeological Risk Assessment confirmed. The risks posed by HDD or other trenchless installation methods to surface water receptors are considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR and mitigation includes a bentonite breakout plan (BBP) as per CoT47 (Table 1.16.).
Natural England	
Ground Conditions and Contamination - Geological Conservation Review (GCR) sites not described in the baseline. The northern part of the Scoping Boundary will not impact the GCR site around Seaham, but to the south the Scoping Boundary encompasses the Shippersea Bay GCR Site. Natural England recommends that this site is avoided when selecting the landfall location.	Following selection of the Central landfall, the Shippersea Bay GCR site is outside of the Geology, Hydrogeology and Ground Conditions Study Areas. There are no GCR sites present within the Geology, Hydrogeology and Ground Conditions Study Areas. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, of the PEIR.
Use of the Rochdale Envelope. Natural England recognises the need to use a Rochdale Envelope approach to allow flexibility in project design to ensure that changes in available technologies and project economics can be considered post consent. However, Natural England has concerns over the extent to which uncertainty in ground conditions is driving the extent of the project envelope, and that the Rochdale Envelope approach is resulting in the provision of insufficient baseline information to inform both project design and assessment of impacts. The lack of understanding of the ground conditions results in the use of Maximum Design Scenarios (MDSs) that are conservative enough to make up for that lack of understanding and allow for all eventualities. This in turn translates into a vast number of variables, causing difficulties in assessment, as it is difficult to identify and assess a realistic worst-case scenario for each of the relevant receptors with any certainty, which in turn necessitates precautionary assessments given this uncertainty. That presents challenges when it comes to identifying appropriate mitigation measures	The Rochdale envelope approach is a well-established methodological mechanism to ensure that worst-case environmental effects are considered in the EIA process. At the PEIR stage, the scheme design is still evolving and the use of Maximum Design Scenarios (MDSs) appropriately captures design development scenarios, this will continue to evolve into the final project parameters and MDS to be determined for each topic in the ES with the application for development consent. The assessment in Section 1.8 considers reasonable worst case scenario, utilising the robust baseline data from the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment).
Water quality Water quality impacts scoped out: release of sediment-bound contaminants. The English north-east coast has had a considerable amount of historic industrial use and sections of the coast are known to be contaminated. The northern landfall is adjacent to the Halliwell Banks contaminated land. Natural England advise that all landfall	Potential impacts to coastal water quality from the release of sediment-bound contaminants during works associated with the MHPGC Project are discussed and assessed in Volume 2, Chapter 2: Offshore water and Sediment Quality, of the PEIR.

Comment	How and where considered in the PEIR
locations are scoped in for water quality impacts from the release of sediment-bound contaminants.	
Ground Conditions and Contamination Contaminated land at the former Halliwell Banks landfill site Natural England advise that thorough testing of soils and seabed is required to be able to determine potential impacts of works in the vicinity of Halliwell Banks.	Following the site selection process, the cliffs and beach alongside Halliwell Banks former landfill are outside of the MHPGC Project PEIR Red Line Boundary: Onshore, and therefore the onshore components will not affect this landfill site.
PINS (Planning Inspectorate)	
Permanent loss of or damage to a locally or nationally important geological feature (operation and decommissioning) - The Scoping Report proposes to scope out an assessment of permanent loss of or damage to a locally or nationally important geological feature during operation and decommissioning on the basis that any loss of or damage to a locally or nationally important geological feature would occur during construction and is therefore scoped in for construction. The Inspectorate agrees this matter can be scoped out of further assessment.	Permanent loss of or damage to a locally or nationally important geological feature during operation and decommissioning is not considered in the assessment as detailed in Table 1.14: Impacts scoped out of the assessment.
Temporary loss of access to geological features with statutory conservation designations (operation) - The Scoping Report proposes to scope out an assessment of temporary loss of access to geological features with statutory conservation designations on the basis that loss of access is unlikely during operation. This matter is scoped in for construction and decommissioning as the three corridors and landfall options cross through Sites of Special Scientific Interest (SSSIs) designated for their geological features. The Inspectorate agrees this matter can be scoped out of further assessment.	Temporary loss of access to geological features with statutory conservation designations during operation is not considered in the assessment as detailed in Table 1.14: Impacts scoped out of the assessment.
Sterilisation of mineral resources due to permanent development in or near existing or allocated mineral sites (operation and decommissioning) - The Scoping Report proposes to scope out an assessment of sterilisation of mineral resources due to permanent development (including landfall, onshore substation, and buried cables) in or near existing or allocated mineral sites during operation and decommissioning on the basis that this effect would be assessed for the construction phase. The Inspectorate agrees this matter can be scoped out of further assessment.	Sterilisation of mineral resources due to permanent development (including landfall, onshore substation, and buried cables) is considered in the construction stage (see Section 1.8.3). Operation and decommissioning effects due to permanent development is not considered in the assessment in accordance with the scoping opinion.
Temporary sterilisation of mineral resources due to construction activities such as presence of temporary construction compounds (operation) - The Scoping Report proposes to scope out an assessment of the temporary sterilisation of mineral resources during operation on the basis that this matter is likely to occur during construction or decommissioning. The Inspectorate agrees this matter can be scoped out of further assessment.	Temporary sterilisation of mineral resources during operation is not considered in the assessment as detailed in Table 1.14: Impacts scoped out of the assessment.
Accidental release of contaminants to ground (operation) - The Scoping Report seeks to scope out this matter on the grounds that the proposed development will be designed and constructed to comply with industry good practice for pollution prevention, the above ground infrastructure will be secure and only accessible to suitably trained and authorised workers, and all operations will be subject to the Health and Safety at Work Act (1974), and regulations made under this Act.	Agreement to scope out effects of accidental releases from the operational above ground infrastructure is noted and confirmed in Section 1.6 . An Outline Operational Drainage Management Plan (ODMP) (CoT22 in the commitments Table 1.16) would address pollution control at the LSS during operation.

Comment	How and where considered in the PEIR
The Inspectorate notes that effects from the release of contaminants to ground or surface water due to during construction and decommissioning would be assessed as part of the ES. The Inspectorate agrees that the potential for such effects during operation are capable of mitigation through standard management practices and can be scoped out of the assessment. The ES should provide details of the proposed mitigation measures to be included in the Environment Management Plan. The ES should also explain how such measures will be secured.	
Health effects on groundworkers due to land contamination (all phases) - The Scoping Report proposes to scope out this matter on the basis that direct contact, inhalation and/ or ingestion of contaminants in or on the ground is not anticipated to result in a LSE during construction, O&M or decommissioning. The Scoping Report states that any work that may bring workers into contact with contaminants would be subject to The Construction (Design and Management) Regulations 2015 (CDM), the Health and Safety at Work Act (1974) and legal obligations for appropriate risk assessments. The Inspectorate has considered the characteristics of the proposed development and is content that the operational and maintenance phase is unlikely to result in significant human health effects on groundworkers from exposure to contaminants. As such, an assessment of the O&M phase can be scoped out of further assessment. However, in the absence of further information about the site, such as a Phase 1 Geo-environmental Desk Study at this stage, it is unclear whether the potential for exposure during the construction and decommissioning phase. In the absence of information such as evidence demonstrating clear agreement with relevant consultation bodies, the Inspectorate is not in a position to agree to scope these matters from the assessment. The ES should include an assessment of the likely significant effects on human health resulting from exposure to contaminants during construction and decommissioning or provide evidence to demonstrate the absence of LSE including evidence of agreement with relevant consultation bodies.	A Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) has been completed for the PEIR. This provides a comprehensive review of potential contamination sources within the MHPGC Project PEIR Red Line Boundary: Onshore and the land contamination study area. It also considers land instability hazards and coal mining hazards including voids and potential for mine gas. Compliance with The Construction (Design and Management) Regulations 2015 (CDM), the Health and Safety at Work Act (1974) and regulations made under the act is embedded mitigation (CoT24 in Table 1.16). In accordance with CDM, the PRA and associated reports would form preconstruction information for contractors to inform their risk assessments and method statements for any ground disturbance work. On this basis, it is still proposed to scope out effects on construction workers and other site workers due to land contamination for all phases of the MHPGC Project.
O&M activities resulting in a potential impact on groundwater levels -The Inspectorate agrees that as a result of the limited land disturbance during the operational and maintenance stage it is unlikely for such activities to culminate in significant effects. This matter can be scoped out of further assessment.	Potential impact on groundwater level during the O&M phase is scoped out.
Decommissioning activities resulting in a potential impact on groundwater levels - The Scoping Report states that sub-surface infrastructure will be left in place in the decommissioning phase and there will be no dewatering works. The Inspectorate agrees that where the proposed development is to be left in situ and there would be no disruption of flow to groundwater arising from decommissioning activities, this matter can be scoped out of further assessment.	Potential impact on groundwater level during decommissioning phase, where the onshore cables will be left in situ and there would be no disruption of flow to groundwater arising from decommissioning activities, is scoped out as detailed in Table 1.14: Impacts scoped out of the assessment.
The Mining Remediation Authority (formerly The Coal Authority)	
Our records indicate that within the onshore area identified for the project there are recorded coal mining features present at surface and shallow depth including; mine	Following the MHPGC Project refinement, the PEIR includes a more comprehensive baseline to consider such mining related features. This is presented in Section 1.4.

Comment	How and where considered in the PEIR
entries, fissures, mine gas sites and reported surface hazards. These features pose a potential risk to surface stability and public safety. Our records also indicate that monitoring points are present within the area, continuing access to these by the Mining Remediation Authority (trading name of the Coal Authority) may be required.	
The Environmental Impact Assessment Scoping Report dated February 2025 and prepared by RPS includes a section of ground conditions, and although it acknowledges that coal mining features are present does not confirm if risks posed are scoped in or out. It is difficult to assess the risks posed in more detail without a layout for the on-shore development being prepared as this would enable the recorded coal mining features and the location of the on shore infrastructure to be assessed.	Following MHPGC Project refinement, the PEIR includes a more comprehensive baseline to consider such mining related features. This is presented in Section 1.4.
We would expect the on shore infrastructure layout to be assessed against the recorded coal mining features in the area and an assessment made of the potential risks posed where necessary. If the layout of the infrastructure is still unknown at the submission stage we would expect an assessment to be made of the project area, in broad terms, and the potential risks to likely infrastructure siting identified. This could be included in the ground conditions chapter of the EIA. However, we would also have no objections to land stability being scoped out of this report and a Coal Mining Risk Assessment being submitted as a stand-alone document.	Following MHPGC Project refinement, the PEIR includes a more comprehensive baseline to consider such mining related features. This is presented in Section 1.4. Information relating to coal mining has been obtained and reviewed for the Geology, Hydrogeology and Ground Conditions chapter study areas. This is presented in Section 1.4. Coal mining legacy issues with regards to land contamination and mine gas have been considered and are presented in Section 1.8. Geotechnical hazards associated with coal mining including land stability could be assessed as part of the ground investigation to inform the design of the MHPGC Project. If assessed as required, a Coal Mining Risk Assessment could be undertaken as part of these works.

1.3.2 Further consultation and engagement

- 1.3.2.1 The scope and methodology of the geology, hydrogeology and ground conditions assessment completed to date have been discussed and, where appropriate, agreed with stakeholders via Hydrology and Flood Risk Expert Working Group (EWG) meetings, noting that these meetings have been utilised to discuss key points in relation to the geology, hydrogeology and ground conditions assessment due to the receptor overlap.
- 1.3.2.2 An initial Hydrology and Flood Risk EWG was held on the 11 November 2025, which focussed on obtaining clarifications on a number of scoping comments, data requests and baseline, initial mitigation and commitments. Due to an alteration of topic contents from Scoping to PEIR with regards to groundwater receptors, it was clarified during the EWG meeting that impacts to groundwater quality and level are assessed within the geology, hydrogeology and ground conditions chapter. Impacts to surface water receptors and water resources are considered within **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**. Additional effects to be considered within this chapter, following Scoping Opinion comments received from stakeholders (**Table 1.4**) were also presented and discussed. Meeting minutes and comments received as part of this discussion and subsequent feedback, specifically limited to those in relation to the geology, hydrogeology and ground conditions, are set out in **Table 1.5**.
- 1.3.2.3 During the EWG, it was suggested by the Applicant that the following impacts to groundwater may be scoped out for specific phases of works, as follows:
- Impacts associated with historic contamination sources during the O&M and decommissioning phases;
 - Impacts associated with accidental release of contaminants during decommissioning works.
- 1.3.2.4 However, it was subsequently decided that these impacts were better scoped in, and an assessment of these effects for these phases is provided in **Section 1.8**.
- 1.3.2.5 A second Hydrology and Flood Risk EWG was held on the 13th August 2026. Meeting minutes and comments received as part of this discussion and subsequent feedback, specifically limited to those in relation to the geology, hydrogeology and ground conditions, are set out in **Table 1.5**.
- 1.3.2.6 No other consultation or engagement has been completed in relation to geology, hydrogeology and ground conditions beyond that set out in the above.

Table 1.5: Summary of further consultation and engagement

Date	Consultee and response type	Comment	How and where considered in the PEIR
November 2025	EA	Hydrogeological Risk Assessments should be carried out when trenchless techniques are used under watercourses and close to primary and secondary aquifers.	The risks posed by HDD or other trenchless installation methods to groundwater receptors are considered in Section 1.8 . Where the works may interact with a Principal or Secondary A Aquifer, the hydrogeological conceptual understanding will be advanced in consultation with EA to better understand the risks to groundwater and need and scope for any future Hydrogeological Risk Assessment to assess the risks to groundwater.
November 2025	EA	Attention was drawn to the scoping comments provided on Halliwell Banks and other former landfill sites and colliery waste and historic railway materials within the project boundary.	Following site selection process, the cliffs and beach alongside Halliwell Banks former landfill are outside of the MHPGC Project PEIR Red Line Boundary: Onshore, and therefore the proposed infrastructure will not affect this landfill site. The PEIR includes a comprehensive list of potential sources of contamination within the Geology, Hydrogeology and Ground Conditions Study Areas and buffer zone. This is presented in Section 1.4 . The potential for contamination and pollution and detrimental impacts to geology, hydrogeology and ground conditions receptors are presented in Section 1.8 .
November 2025	EA	The scoping out of accidental release of contaminants in the decommissioning phase may not be advisable.	The accidental release of contaminants to ground during the decommissioning phase is assessed in Section 1.8 .

Date	Consultee and response type	Comment	How and where considered in the PEIR
November 2025	EA	Thermal emissions is a topic of concern for various energy projects. It was stated that there is currently no guidance for the assessment of impacts from thermal emissions. The EA indicated that they are working on a draft guidance to help narrow down where risks of thermal emissions impacting groundwater could be screened out or scoped out. It was stated that the EA would provide some guidance for the assessment of these impacts for the MHPGC Project. It was noted that information on ground conditions may not be known and therefore quantifying extent of radiation spread is difficult.	There is currently limited guidance on assessing the effects of thermal emissions on groundwater and the offer of the draft guidance was welcomed by the Applicant who will continue to consult with the EA on the matter as the ES progresses. The draft guidance was provided in a follow up email from the EA. The risks posed by thermal emissions from buried high voltage cables to groundwater during the O&M phase are considered in Section 1.8 , using the draft EA guidance, though limited detailed information is currently available on cable thermal emissions and a high-level assessment only has been undertaken at PEIR. As the design progresses, these impacts will be further assessed at ES.
November 2025	EA	The EA provided, via email, project specific guidance on assessing the potential for thermal impacts from buried cables for the MHPGC Project. The EA indicated that the guidance provided was specific to the MHPGC Project and should not be used for other projects. It was also requested for the guidance to not be shared as stated to be non-applicable to other projects.	The guidance will be applied in assessing the thermal impacts throughout the ES. Preliminary consideration of potential thermal impacts on receptors is discussed in Section 1.8.7 .
June 2026 EA			
WSP requested updates to the study areas for geodiversity, mineral resources, land contamination and hydrogeology within the PEIR via an email to the Environment Agency in July 2026	EA	WSP requested updates to the Geology, Hydrogeology and Ground Conditions Study Areas within the PEIR.	The justification for the Geology, Hydrogeology and Ground Conditions Study Areas is detailed in Section 1.4 .

Date	Consultee and response type	Comment	How and where considered in the PEIR
An email response was received in July 2026.			
August 2026			
EWG meeting with - Environment Agency; and - DCC. Responses from stakeholders are awaited	EA and DCC	The EA queried whether information on private water supplies and private abstractions had been obtained. DCC confirmed that the Environmental Health team holds PWS records for council, and that a direct contact would be provided for consultation.	In line with the Private Water Supplies Regulations 2016, DCC is understood to hold a register of PWS within the council area. This information has since been provided by DCC and is included and considered in the Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR and Volume 3, Annex 2.1 Water Resources, Discharge Consents and Pollution Incidents of the PEIR)
September 2026			
Email Consultation request to DCC regarding PWS	DCC	Email Consultation request to DCC regarding PWS	DCC provided a consultation response in September 2026 regarding PWS. Information is presented within Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR and Volume 3, Annex 2.1 Water Resources, Discharge Consents and Pollution Incidents of the PEIR.

1.4 Baseline characterisation

1.4.1 Overview

1.4.1.1 **Volume 1, Chapter 2: Project Description, of the PEIR** sets out the description of the MHPGC Project and **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** sets out the overarching approach that has been used in developing the preliminary environmental information.

1.4.1.2 This section describes the methods and data sources used to characterise the baseline for geology, hydrogeology and ground conditions within the study areas and describes the existing baseline characteristics.

1.4.2 The Geology, Hydrogeology and Ground Conditions Study Areas

1.4.2.1 Study areas within the Geology, Hydrogeology and Ground Conditions chapter are the spatial extents of the areas used to define the environmental assessment within the PEIR. This is intended to cover the area within which an impact (direct or indirect) can be reasonably expected to occur and describes the geographical extent subject to desk-based research. The Study Areas comprise the

MHPGC Project PEIR Red Line Boundary: Onshore, with a specific buffer considered appropriate for the receptors assessed.

- 1.4.2.2 For Geology, Hydrogeology and Ground Conditions receptors, study areas have been defined based on receptor type, as outlined below.
- 1.4.2.3 For land contamination receptors the study area comprises the MHPGC Project PEIR Red Line Boundary: Onshore with a 500m buffer bounded at MHWS. A 500m buffer is considered appropriate, based upon professional experience in land contamination assessment, taking into account the nature of the proposed development (i.e., the type and scale of potential contamination sources likely to be introduced), being sufficient to enable the identification of nearby current or historic land uses that may have contributed to contamination within the MHPGC Project PEIR Red Line Boundary: Onshore, and to enable the identification of potentially sensitive receptors in the surrounding area that could be impacted if any contaminants were mobilised within the MHPGC Project PEIR Red Line Boundary: Onshore. The study area for these receptors is the Land Contamination Study Area.
- 1.4.2.4 For the hydrogeology assessment in this chapter, a 1km buffer has been adopted, again based upon professional experience, with respect to the potential for the MHPGC Project to affect on-site and off-site hydrogeological receptors. This is considered a suitably conservative spatial extent for consideration of potential physical and contamination effects on hydrogeological receptors (e.g. impact to groundwater level or flow). This is in line with the requirements set out by the EA following the consultation taking into consideration the presence of groundwater SPZs. It is noted that impacts on groundwater abstraction resources are considered in **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**. The study area for these receptors is the Hydrogeology Study Area.
- 1.4.2.5 For geological receptors e.g. geodiversity features designated as Sites of Special Scientific Interest (SSSI) or Regionally Important Geodiversity Sites (RIGS), the study area comprises the MHPGC Project PEIR Red Line Boundary: Onshore with a 250m buffer applied. Effects on geological receptors would be most likely to occur where designated features are within the MHPGC Project PEIR Red Line Boundary: Onshore. The 250m buffer ensures that potential impacts on adjacent/nearby offsite receptors are also considered. Effects could include permanent damage during construction, permanent change to geological features, or loss of public access to features due to construction of buildings or other structures in or around the geological features. The study area for these receptors is the Geology Study Area.
- 1.4.2.6 The 250m buffer is also considered appropriate for the minerals study area, with identified minerals resources outside of the 250m distance unlikely to be affected by either the temporary construction or the permanent infrastructure of the MHPGC Project. The study area for these receptors is the Minerals Study Area.
- 1.4.2.7 The Geology, Hydrogeology and Ground Conditions Chapter study areas (i.e. the Hydrogeology Study Area, the Land Contamination Study Area and the Geology and the Minerals Study Areas) are shown on **Figure 1.1**
- 1.4.2.8 **Figure 1.2** shows the designated geological conservation sites across the Geology and Minerals Study Areas.

Figure 1.1: Study Area

Figure 1.2: Designated geological conservation sites across the geology and minerals study areas

1.4.3 Relevant guidance

- 1.4.3.1 The PEIR assessment has been carried out with reference to the following guidance documents:
- Construction Industry Research and Information Association (CIRIA), 2001, Document C552 – Contaminated Land Risk Assessment: A Guide to Good Practice;
 - CIRIA, 2001b, Document C532 – Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors;
 - CIRIA, 2006a, Document C649: Control of water pollution from linear construction projects. Site guide;
 - CIRIA, 2006b, Document C648: Control of water pollution from linear construction projects. Technical guidance;
 - CIRIA, 2007, Document C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings;
 - CL:AIRE, 2021, Good Practice for the Risk Assessment for Coal Mine Gas Emissions;
 - DEFRA, 2012, Defra Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance;
 - EA, 2025, LCRM (see further details below);
 - EA, 2018, The EA's approach to groundwater protection;
 - NHBC/ CIEH / Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008.

Environment Agency, Land Contamination Risk Management (LCRM) (Environment Agency, 2025)

- 1.4.3.2 The LCRM guidance provides the technical framework for applying a risk management process when dealing with land affected by contamination and can be applied in a range of regulatory and management contexts, including voluntary remediation, planning, and assessing liabilities under the Part 2A contaminated land regime. It is an expectation of The Environment Agency in England, and the other national environmental regulators around the UK, that the LCRM guidance is followed where developers are managing the risks from historical land contamination in a planning context. This is an implicit requirement of CoT62 (EM1). LCRM references relevant British Standards for all stages of land contamination assessment and therefore compliance with LCRM also requires compliance with the applicable British Standards.

1.4.4 Baseline data sources

Geo-environmental PRA (desk study)

- 1.4.4.1 The desktop study is based on the review of Groundsure Enviro + Geo Insight Reports ('Groundsure Reports'), publicly accessible geo-environmental data, mapping and viewer resources and previous reports as detailed below:
- Groundsure reports
 - WSP-Y2J-X4K-308-K1Z – Groundsure GIS Data, 2026 (coverage of land contamination study area);
 - WSP-QB1-HLO-H9L-3VR – Groundsure Historical Mapping GIS Data, 2026 (coverage of land contamination study area).
 - Previous third-party reports
 - Cundall, 2021. Jade Business Park. Preliminary Geoenvironmental Assessment (Phase 1 Desk Study). Ref. 1023943.RPT.GL.001. Revision A;
 - AECOM, 2023. Morven Offshore Wind Geohazards Desk Study and Terrain Evaluation, Ref. 60705572;
 - Fugro, 2024. Geological & Geotechnical Desk Studies & Initial Ground Models (Morven Nearshore Landfalls), Ref. F230760-DS-CLO 03;
 - H R Wallingford, 2024. Morven OWF cable landfall coastal erosion survey, Ref. DER6955-RT001 R04-00;
 - Sirius, 2024. Phase I (Desk Study) Geoenvironmental Appraisal Report. Land Adjacent to Seaham Garden Village, Seaham, County Durham. Reference: C10152. Revision: C;

- SLR Consulting Limited, 2025, Remediation Method Statement, Hawthorn Pit Substation;
- Arup, 2026, Morven Offshore Wind Farm: EXC GC-1 Onshore Converter Station at Jade Business Park, Geotechnical and Geoenvironmental Review. Ref. MVEXC-G4023-ARP-20001;
- TetraTech, 2026. Desk Study for Potential UXO contamination (Morven Export Cable Corridor Grid Connection No. 1), ref. 797-XM000087 R-01-01;
- Arup, 2026, Morven Offshore Wind Farm. Morven offshore wind farm – onshore pre-FEED: stage 2 coal mining review, Ref. MVEXC-G4022-ARP-200002.
- Other desktop data sources
 - British Geological Society (BGS), 1965. Geological Survey of England and Wales, New Series 1:63,360/1:50,000 geological map series. Sheet Number 27. Durham. Drift;
 - BGS, 2008. Geological Survey of England and Wales, New Series 1:63,360/1:50,000 geological map series. Sheet Number 27. Durham. Solid;
 - BGS, 2026, Onshore GeoIndex Map Viewer;
 - EA, 2025, Request for information – Ref: EIR2025/37122, email to Ramboll;
 - EA, 2025, Historic Landfill Sites;
 - Defra, 2026, Magic Maps Interactive Mapping;
 - Natural England, 2025, Designated Sites View;
 - Mining Remediation Authority (MRA), 2026, Mining Remediation Authority Map Viewer.

1.4.4.2 The Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) has been produced in accordance with EA guidance on land contamination assessment (LCRM [EA, 2025]), informed primarily by Groundsure environmental data and historical maps providing coverage of the land contamination study area in GIS, also third party reports, BGS borehole logs, and information obtained from the EA including on landfills and groundwater abstraction points. A targeted site walkover will be undertaken for a later iteration of the report prior to the ES.

1.4.4.3 Further environmental information is awaited from DCC with regard to the presence of any additional landfills), presence of contaminated land sites under Part 2A, and prosecutions or enforcements. DCC has provided information on groundwater abstraction points including private water supplies (PWS) and this is also included in the Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).

Site specific surveys

1.4.4.4 No site-specific surveys have been undertaken to date; however, ground investigation works are being undertaken currently.

1.4.4.5 The project is committed to fulfilling the requirement for ‘good design’, as prescribed in the National Policy Statements EN-1, EN-3 and EN-5 (as per CoT62). In regard to land contamination, this will include compliance with LCRM (EA, 2025), which sets out a phased approach to dealing with land contamination, from preliminary (desk-based) assessment, to ground investigation, and more detailed risk assessment, and ultimately remediation, if this is needed to render the site suitable for the proposed use.

1.4.4.6 As outlined above, a targeted site walkover will be completed for the PRA to inform the ES; the conceptual model, risk assessments, and conclusions and recommendations, in the PRA will be updated as required based on the walkover observations.

Data limitations and assumptions

1.4.4.7 The baseline information collected to date has been mainly desk based to provide a preliminary indication of the geology, hydrogeology, ground conditions and contamination within the land contamination, geology and minerals study areas, and does not include site-specific investigations or other exploratory information across most of the MHPGC Project PEIR Red Line Boundary. Onshore meaning data for ground and groundwater conditions is limited. A Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) has been completed for the MHPGC Project PEIR Red Line Boundary: Onshore. This includes a PRA in accordance with the EA (2025) LCRM guidance and an assessment of potential ground stability

risks. The PRA has been informed by a comprehensive environmental dataset and historical mapping for the land contamination study area and consideration of available third-party reports, including a Coal Mining Risk Assessment (CMRA) for the onsite former Hawthorn Combined Mine¹.

- 1.4.4.8 The awaited environmental information from DCC is described in Section **Error! Reference source not found.** However, without this information it is still considered that the assessment is based on a comprehensive data set provided within the Groundsure report and supported by reliable online data sources. Often the information provided by the councils is only anecdotal and therefore cannot be relied on. Information on private water supplies has been received and is discussed in section 5.4.2.3.
- 1.4.4.9 As noted above, further environmental information is awaited from DCC in regard to the presence of any additional landfills, presence of contaminated land sites under Part 2A, and prosecutions or enforcements. This includes potential information on contaminated land sites, landfills, and environmental permits. However, relevant Local Authority information is contained within the Groundsure report (Groundsure GIS Data, 2026) and any new information would therefore be expected to be limited.

¹ Note: the Hawthorn Combined Mine is referred to inconsistently in various information and data source references in the PRA and within this chapter. Other references include Hawthorn Mine (often seen on OS mapping and in several previous reports); Hawthorn Colliery (previous reports), Hawthorn Pit (most often used specifically in relation to the Morven Hawthorn Shaft (which is also known as the 'Hawthorn Shaft' or in relation to the substation in proximity to the Green LSS Option Area); Hawthorne Mine (an incorrect spelling, identified in some previous reports).

1.4.5 Overview of baseline environment

Geology

Anthropogenic Ground (generally referred to as 'made ground')

- 1.4.5.1 Anthropogenic ground deposits are shown on **Figure 1.3**. This consists of made ground, worked ground, infilled ground and landscaped ground used to fill or raise land. However, in general, made ground is the preferred or most often used general term in most information sources and previous reports and more widely in the geo-environmental industry.
- 1.4.5.2 BGS 1:10,000 scale mapping shows large scale and localised made ground in the MHPGC Project PEIR Red Line Boundary: Onshore, the largest area (approximately 72ha) is a continuous area in the northwest which includes the whole of the Green LSS Option Area and a significant area of land surrounding it associated with the former Hawthorn Combined Mine which has been subject to extensive development as well as remedial works.
- 1.4.5.3 Other significant and mapped areas of made ground exist in the east of the MHPGC Project PEIR Red Line Boundary: Onshore and within the 500m buffer for the Land Contamination Study Area in the landfall area and along the coast associated with modified coastline and ground workings (which also has landscaped ground), the Hawthorn Quarry and Dawdon Colliery. Made ground and worked ground is present in smaller areas within the red line boundary associated with roads and railway lines, the former scrapyard, now caravan park (in the southwest).
- 1.4.5.4 Landscaped ground is identified by the BGS in the northeast corner of the Blue LSS Option Area, this appears to be associated with landscaping adjacent to the A19 road, the road itself is shown as a worked ground (void).

Superficial Geology

- 1.4.5.5 BGS mapping records show the MHPGC Project PEIR Red Line Boundary: Onshore to be underlain predominantly by clays, silts sands and gravels of Glacial Till, with small sections of Glaciofluvial Deposits, Alluvium and Beach Deposits of sand and gravel.
- 1.4.5.6 Within the east of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated superficial geology predominantly comprises Glacial Till. Areas of absent/unmapped superficial deposits are shown in the western half of this area. Glaciofluvial deposits are shown in the southeastern corner and directly to the northeast and beach deposits (sand and gravel) are shown along the eastern boundary.
- 1.4.5.7 Within the centre of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated superficial geology predominantly comprises Glacial Till with Glaciofluvial deposits (sand and gravel) shown in the centre of this area. Areas of absent/unmapped superficial deposits are shown in the north of this area by the B1432, to the east of the A19.
- 1.4.5.8 Within the west of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated superficial geology predominantly comprises Glacial Till with Patches of Glaciofluvial deposits across the entire area. Bands of Alluvium (clay, silt, gravel, sand and silt, can contain peat layers) are shown across the centre of the area and in the west where it is intersected by surface watercourses. Lacustrine deposits (clay and silt) are present in the southwest.
- 1.4.5.9 Available BGS boreholes across the MHPGC Project PEIR Red Line Boundary: Onshore indicate that the glacial till ranges in thickness from 3m to 26m.

Figure 1.3: Superficial geology and anthropogenic ground across the land contamination, geology and minerals study areas

Bedrock geology

- 1.4.5.10 Bedrock beneath the MHPGC Project PEIR Red Line Boundary: Onshore is recorded by BGS mapping to comprise Limestone of the Ford Formation, Limestone and Dolomite of the Shelf-Edge Reef Ford Formation and Dolostone of the Roker Formation. The Seaham Formation (limestone with areas of abundant calcite concretions and part of the Upper Magnesian Limestone) is shown to the northeast outside of the MHPGC Project PEIR Red Line Boundary: Onshore but within the study area. The geology from east to west within the MHPGC Project PEIR Red Line Boundary: Onshore to the west is summarised below.
- Within the east of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated bedrock geology predominantly comprises the Roker Formation. Two narrow sections of the Ford Formation Shelf-Edge Reef are shown in the north and central south of this area;
 - Within the centre of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated bedrock geology predominantly comprises the Roker Formation with the Ford Formation present along the southern boundary and the northeast;
 - Within the west of the MHPGC Project PEIR Red Line Boundary: Onshore the anticipated bedrock geology comprises the Ford Formation only.
- 1.4.5.11 Several faults are identified across the MHPGC Project PEIR Red Line Boundary: Onshore and all faults extend beyond this boundary:
- One in the east of the MHPGC Project PEIR Red Line Boundary: Onshore in a N-S direction;
 - One to the east of the A19 in a N-S direction;
 - Five in the centre of the MHPGC Project PEIR Red Line Boundary: Onshore. Two in a NE-SW direction, two in a NW-SE direction and one in a N-S direction. Of these, two are present across the Blue LSS Option Area;
 - One in the west of the MHPGC Project PEIR Red Line Boundary: Onshore in a NW-SE direction.
- 1.4.5.12 Mapping of the bedrock and faults across the MHPGC Project PEIR Red Line Boundary: Onshore are displayed on **Figure 1.4**.

Figure 1.4: Bedrock geology across the land contamination, geology and minerals study areas

1.4.5.13 BGS borehole records are available within the MHPGC Project PEIR Red Line Boundary: Onshore and the geological sequence is summarised by area in **Table 1.6**. The BGS borehole records are shown on **Figure 1.5** of the Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).

Table 1.6: Summary of BGS borehole logs across the MHPGC Project PEIR Red Line Boundary: Onshore

Summary of borehole logs	BGS Borehole reference
Within the east of the MHPGC Project PEIR Red Line Boundary: Onshore (including the landfall) - Superficial deposits or residual weathered rock present from GL – 3m bgl (except in NZ44NW74 which recorded no superficial deposits and NZ44NW62 which shows superficial deposits (Devensian Till with no description provided), to 26m bgl); - Within borehole NZ44NW370, limestone underlying superficial deposits was proven to a maximum depth of 107.5m bgl in under which ‘no returns’ were recorded to 188.30m bgl within which suspected sands were encountered at 177.3m bgl. Limestone was proven to a depth of 30.5m bgl (the maximum drill depth) in borehole NZ44NW62 (correlating with the BGS mapped areas of the Ford Formation); - Dolomite underlying superficial deposits, within NZ44NW57/J, NZ44NW57/E and NZ44NW27 (locations mapped by the BGS as underlain by the Roker Formation) and proven to a maximum depth of 60m bgl; - Interbedded sandstone, siltstone, mudstone and coal in NZ44NW74; - Groundwater not recorded in any boreholes in this section of the MHPGC Project PEIR Red Line Boundary: Onshore.	NZ44NW74 NZ44NW57/J NZ44NW370 NZ44NW62 NZ44NW57/E NZ44NW27
Within the centre of the MHPGC Project PEIR Red Line Boundary: Onshore (including Blue LSS Option Area) - Topsoil GL – 0.4m bgl (NZ44NW395); - Made Ground GL – 4m bgl in A19 location (average) (NZ44NW396, NZ44NW397, NZ44NW398, NZ44NW399); - Soft to firm sandy clay (Glacial Till) 0.4 – 9m bgl; - Firm to stiff clay (Glacial Till) 4 – 15.5m bgl; - Mudstone 11.03 – 17m bgl, Limestone 17 – 138m bgl (NZ44NW368); - Limestone 11-15m bgl (NZ44NW396, NZ44NW397, NZ44NW398 and NZ44NW399); - Weathered Limestone 13.3 – 14.5m bgl (base) (NZ44NW395); - Interbedded mudstone, siltstone and coal (NZ44NW49); - NZ44NW395 records moist ground 2.9 to 3.7m bgl - NZ44NW368, dated 2012, records no water strikes but records ‘rest water level on completion’ as 95m bgl.	NZ44NW49 NZ44NW368 NZ44NW395 NZ44NW396 NZ44NW397 NZ44NW398 NZ44NW399 NZ44NW400
Within the west of the MHPGC Project PEIR Red Line Boundary: Onshore (including Green LSS Option Area) - Topsoil GL – 0.4m bgl; - Firm sandy silty clay (Glacial Till) 0.4m bgl – 8.7m bgl (base); - NZ34NE79 records the borehole to be wet at surface to 0.3m bgl.	NZ34NE79 NZ34NE81

1.4.5.14 There are no publicly available borehole logs within the Blue LSS Option Area. The nearest available borehole logs, located adjacent to the eastern and northern boundaries of the Blue LSS Option Area, are NZ44NW396, NZ44NW397, NZ44NW398, NZ44NW399 and NZ44NW400 and these indicate the following geology:

- Made Ground between 1.40m and 7.00m in thickness; typically described as a firm to stiff slightly sandy and gravelly clay fill with sandstone, mudstone, limestone, dolomite and brick or, as a medium dense very sandy gravel with limestone and mudstone gravel, which was underlain by;
- Devensian Till between 2.50m and >11.4m in thickness, which is typically described as a firm to stiff reddish brown and grey sandy slightly gravelly clay, with sandstone, limestone and mudstone gravel and cobbles, which was underlain by;
- Ford Formation encountered from between 4.80m and 9.50m below ground level, which is typically described as a light yellowish cream highly to very weathered fine to coarse grained dolomitic limestone with honeycomb texture. This unit has been proven up to the depth of 15.45m below ground level, with no proven base.

1.4.5.15 Several borehole logs are available for the Green LSS Option Area. These are summarised in BGS borehole log NZ34NE51 which records deposits of made ground in boreholes NZ34NE48 and NZ34NE49 (no description provided) in the southwest of the Green LSS Option Area, to depths of between 1.20m to 1.80m below ground level. Across the remainder of the Green LSS Option Area, topsoil was recorded to 0.30m below ground level. This was underlain by superficial deposits of Till and sand or sand and gravel to the maximum drilled depth of 19.80m below ground level. The base of the Till was not proven at any of the locations and therefore no bedrock was encountered in the Green LSS Option Area.

Ground stability

1.4.5.16 The Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) has taken into consideration mining and ground stability. This includes details of identified preliminary geotechnical considerations relevant to the MHPGC Project and a geotechnical risk register, which is a 'live' register that will need to be updated as further information becomes available, including any relevant data from the ongoing any ground investigation. Identified mining hazards are shown on **Figure 1.5**, for the MHPGC Project PEIR Red Line Boundary: Onshore and the 500m buffer applied to the Land Contamination Study Area. Ground stability features are shown on Figures 1.9A - 1.9E of the Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).

1.4.5.17 A review of the geotechnical hazards across the Land Contamination Study Area identified several constraints that require further investigation for the safe and economic design and construction of the proposed development. Notably, there is limited information on the ground and groundwater conditions across most of the site. BGS mapping indicates the potential presence of soft alluvial/glacial deposits which are unlikely to provide a competent founding stratum for any foundations. Additionally, these superficial deposits are likely to require trench support for any excavations. The varying ground conditions may also impact the choice of underground cable, based on their thermal resistivity characteristics.

1.4.5.18 The area of the proposed works has been subjected to historic mining and legacy workings that could impact the proposed development which have been identified underlying the west and east of the site.

Mining Hazards and Risks

1.4.5.19 The MHPGC Project is located within a minable coal area and is identified as being within a Coal Mining Reporting Area. These are areas identified by the MRA (MRA, 2026), requiring assessment of potential risks to developments including subsidence, mine related gases and pit entries/voids.

1.4.5.20 Groundsure data (Groundsure, 2026) identified several Brit Pits (mining database entries) within the MHPGC Project PEIR Red Line Boundary: Onshore and the study area buffers.

1.4.5.21 A mining review was completed by Arup (Arup 2026) for targeted areas of the MHPGC Project PEIR Red Line Boundary: Onshore including at the former Hawthorn Pit coal mine in the west and at the former Dawdon Colliery in the east).

- 1.4.5.22 Further detail of mining hazards and risks including consideration of the Arup (Arup, 2026) report is provided in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**). Mining constraints across the Land Contamination, Geology and Minerals Study Areas are described in the above report, are summarised below and are shown on **Figure 1.5**. Within the MHPGC Project PEIR Red Line Boundary: Onshore and within the study area buffers, several mining features have been identified.
- 1.4.5.23 These include 'BritPits' records of surface and underground workings for both sand and coal extraction. These exist predominantly in the vicinity of the Green LSS Option Area and to the north and south of landfall. Surface mining includes for sand at Hesledon Moor Sand Pit and Hawthorn Sand Pit, for dolomite at Kinley Hill, Kinley Hill Tower and Hesledon East House and for limestone at Hawthorn Quarry. Several collieries to the north, northeast, southeast and west of the MHPGC Project PEIR Red Line Boundary: Onshore, as well as records of underground mining to the north and west are also identified. Additionally, there may have been small, unrecorded sand pits and quarries across the MHPGC Project PEIR Red Line Boundary: Onshore but there is no evidence that any recorded or unrecorded surface mining and quarrying was extended below ground. These areas of surface mining may have been backfilled with spoil or other unknown materials.
- 1.4.5.24 There are also numerous surface ground workings within the MHPGC Project PEIR Red Line Boundary: Onshore. These features are typically associated with former railway lines or sidings, or other industrial or extraction processes. They do not occur at the Blue LSS Option Area but are found adjacent to its south-eastern edge and along the southern part of the Green LSS Option Area. Records also indicate surface ground workings at the Hawthorn Combined Mine within and adjacent to the landfall.
- 1.4.5.25 The MRA (MRA, 2026) identifies deep (>30m bgl) coal mining within the Ryhope Five Quarters, High Main, Yard, Main, Maudlin, Low Main and Hutton seams beneath the MHPGC Project PEIR Red Line Boundary: Onshore). The seams have been worked at depths of between 209 and 491m bgl, at thicknesses of between 70 and 230cm with the most recent working date of 1990. These seams relate to several former mines and collieries and mine entries to the west, north and north east of the MHPGC Project PEIR Red Line Boundary: Onshore. Three former mines encroach onto the MHPGC Project PEIR Red Line Boundary: Onshore); these are the South Hetton Colliery to the west, Hawthorn Mine within Green LLS Option Area and adjacent to the southwest, north and northeast of it, and the Dawdon Colliery to the northeast of landfall. Merton Colliery, to the north of the Blue LSS Option Area is within the Land Contamination Study Area buffer but is not within the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.26 According to BGS and MRA records, no coal seams subcrop² the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.27 One mine shaft named the Murton Hawthorn shaft (Ref: 438545-003) is located within the MHPGC Project PEIR Red Line Boundary: Onshore 50m directly north of the Green LSS Option Area. The shaft extends to 455m bgl and has a diameter to of 6.71m. There are associated risks with mine shafts are assessed by considering the potential zone of influence (ZOI), the zone where ground subsidence may reasonably be expected to occur in the event of a shaft failure, collapse or settlement of any infill. Thus, there is a requirement to avoid the zone ZOI when locating structures during detailed design.
- 1.4.5.28 The MRA identifies three small areas of development high risk on site. One encompassing the zone of influence of the mine entry described in Section 1.4.5.27 approximately 50m to the north/northwest of the Green LSS Option Area, two smaller areas in the east of the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.29 Further adits and shafts are identified outside the boundary of the MHPGC Project PEIR Red Line Boundary: Onshore, however these are not considered to pose risks of shallow ground collapse. The

² Note: The term 'subcrop' is sometimes used interchangeably with 'outcrop' in some reports/sources. Both denote shallow coal but outcrop is used to refer to coal that is present at surface. Subcrops refer to shallow coal that has an overburden of sediments or sedimentary rocks that are not visible at surface and would be the subject of surface mining as opposed to deep mining.

Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) utilises the mine risk summary information to provide inputs into an assessment of mine gas risks in accordance with the CL:AIRE Publication: Good Practice for Risk Assessment for Coal Mine Gas Emissions (October 2021). The assessment concludes that the mine gas risk on the site is High, based on the CL:AIRE guidance, principally in relation to the presence of a mine entry (mine shaft) within the MHPGC Project PEIR Red Line Boundary: Onshore at the former Hawthorn Pit Shaft.

Figure 1.5: Mining constraints across the land contamination, geology and minerals study areas

Mineral resources

- 1.4.5.30 Hawthorn Quarry is present directly south of the landfall (partly within the MHPGC Project PEIR Red Line Boundary: Onshore and wholly within the Geology and Ground Conditions Study Area). The quarry is safeguarded from sterilisation as a minerals extraction site with an extant planning permission (Local Plan Policy 48) and due to its high-grade dolomite reserve (Local Plan Policy 57). Policy 48 also provides a mineral safeguarding zone, covering land for 500m around the quarry. This safeguarding zone is within the MHPGC Project PEIR Red Line Boundary: Onshore. Most of the quarry also sits within a wider Magnesian Limestone safeguarding area.
- 1.4.5.31 Hawthorn Quarry was opened in 1906, with the most recent extraction taking place in 1993. The site of the quarry was designated as a geological SSSI in 1990 due to the presence of nationally important exposures of Middle Magnesian Limestone features and unique reef and biostromal formations, revealed through past quarrying, which provide key evidence into the evolution of Mid-Magnesian carbonate environments.
- 1.4.5.32 Hawthorn Quarry is subject to longstanding mineral planning consents which remain extant and provide the legal basis for continued and future mineral extraction. To continue working the quarry, a Review of Old Mineral Permissions (ROMP) is required in accordance with minerals and planning legislation to ensure that historic mineral planning consents are updated to modern environmental, operational and restoration standards. A ROMP application for Hawthorn Quarry was submitted to DCC in December 2017 and remains under consideration, with the latest documentation on the planning application files dating from 2019. Regardless of the decision on the outstanding ROMP application, the quarry currently has a permitted end date of 2042.
- 1.4.5.33 The boundary associated with the ROMP application is largely consistent with the land identified in Policies 48 and 57 of the Local Plan and includes land within the MHPGC Project PEIR Red Line Boundary: Onshore. This land includes an area at landfall adjacent to the Durham Coast rail line and an access road which runs through Hawthorn Quarry from near Chourden Point to Kinley Hill.
- 1.4.5.34 Local Plan Policy 56 provides for several Mineral Safeguarding Areas (MSAs) across the MHPGC Project PEIR Red Line Boundary: Onshore associated with the geological deposits of:
- Magnesian Limestone;
 - Glacial Sand and Gravel;
 - River Sand and Gravel;
 - Blown Sand and Raised Beach Deposits.
- 1.4.5.35 The eastern half of the Minerals Study Area is within the designated MSA due to the presence of Magnesian Limestone. The MSA relating to the Glacial and River Sand and Gravel are scattered across the Geology and Ground Conditions Study Area, including within the MHPGC Project PEIR Red Line Boundary: Onshore. The MSA relating to the Blown Sand and Raised Beach Deposits is present along the coastline in the east of the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.36 **Figure 1.6** presents these mineral constraints present within the minerals study area.

Figure 1.6: Mineral constraints across the minerals study area

Radon and ground gases

- 1.4.5.37 Radon is a colourless, odourless, radioactive gas which occurs naturally due to the decay of uranium and thorium in rocks and soil (also some building materials). The UK Health Security Agency (UKHSA) publishes maps showing areas of the UK that are affected by radon gas, including some areas where radon may be present at sufficiently high levels to require protection measures to prevent the gas entering enclosed spaces (e.g., through floors) and then accumulating to hazardous levels within properties.
- 1.4.5.38 Approximately 30% of the land contamination study area, including all of the Green LSS Option Area, is located within an area where less than 1% of homes are at or above the radon Action Level (western extent of the MHPGC Project). The remainder (approximately 70%), including the Blue LSS Option Area and the landfall, are within an area where between 1% and 3% of homes are at or above the radon Action Level.
- 1.4.5.39 As the land contamination study area is in an area where less than 3% of homes are at or above the radon Action Level, no basic radon protection measures are required within the MHPGC Project. Guidance is only provided for homes and is used in the PEIR for reference only.
- 1.4.5.40 Potential for ground gases can also arise from historical landfills and infilled land, Made Ground and mining (discussed above and below). Typically, gases from these sources are produced by degradation of organic matter and mainly comprise methane, carbon dioxide, and reduced levels of oxygen.
- 1.4.5.41 Assessment of the risks to land contamination receptors from ground gases and mine gas is included in the Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).

Designated geological sites

- 1.4.5.42 The landfall, the Green LSS Option Area and Blue LSS Option Area are not situated within designated geological sites. Within the MHPGC Project PEIR Red Line Boundary: Onshore, the following designated sites exist that include geological features of interest:
- Durham Coast SSSI is present east of the landfall in the east of the MHPGC Project PEIR Red Line Boundary: Onshore. This feature extends along the entire coast to the north and south of the MHPGC Project PEIR Red Line Boundary: Onshore;
 - Nose's Point Local Nature Reserve (LNR) is present immediately east of the railway line in the east of the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.43 Durham Coast SSSI is of biological, geological and physiographic interest, as it supports nationally important birds, colonies of invertebrates, plant communities, and contains extensive cliff and foreshore exposures of dolomites and limestones of later Permian age.
- 1.4.5.44 Nose's Point LNR is a designated LNR due to the presence of rare geology outcrops (Magnesian Limestone), biodiversity and habitat restoration.
- 1.4.5.45 The Joint Nature Conservation Committee (JNCC) records no GCR sites within the MHPGC Project PEIR Red Line Boundary: Onshore or the Geology and Ground Conditions Study Area. MHPGC Project PEIR Red Line Boundary: Onshore
- 1.4.5.46 Within the geology study area, but outside of the MHPGC Project PEIR Red Line Boundary: Onshore, the following designated geological sites exist:
- Hawthorn Quarry SSSI is present immediately south of the MHPGC Project PEIR Onshore Red Line Boundary in the southeast.
- 1.4.5.47 Hawthorn Quarry SSSI is identified as of national importance in the Geological Conservation Review. The Quarry exposes sections in the Middle Magnesian Limestone, including the upper reef-core, reef-flat and stromatolites of the Ford Formation which provide rare and valuable evidence of the reef development.
- 1.4.5.48 **Figure 1.21** illustrates the location of the designated geological sites within the Geology and Minerals Study Areas.

Hydrogeology

Aquifer designation

- 1.4.5.49 The aquifer designation for each of the bedrock and superficial geological formations within the MHPGC Project PEIR Red Line Boundary: Onshore is summarised in **Table 1.6**.

Table 1.6: Summary of hydrogeological aquifer designation for the Geology, Hydrogeology and Ground Conditions Study Area

Stratum*	Aquifer Designation	Hydrogeological Significance
Made ground	None	None
Beach Deposits	Secondary A	Permeable formations with potential to support localised abstractions.
Alluvium		
River Terrace Deposits		
Glaciofluvial Deposits		
Devensian Till	Secondary Undifferentiated	Variable permeability formation with potential to support small or localised abstractions.
Lacustrine Deposits	Unproductive superficial aquifer	Superficial deposits with low permeability that have negligible significance for water supply or river base flow
Roker Formation – Dolostone	Principal	Highly permeable, with significant water storage. Able to support large abstractions.
Ford Formation (Shelf-Edge Reef) – Dolostone		
Ford Formation – Dolostone		
* As noted elsewhere, the old name of Magnesian Limestone is often used in literature and other information sources. Magnesian Limestone is a Principal Aquifer.		

- 1.4.5.50 The superficial deposits (Glacial Till) prominently underlying the MHPGC Project PEIR Red Line Boundary: Onshore are classified by the EA as Secondary Undifferentiated aquifer (Defra, 2026). These are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable nature of the deposits.
- 1.4.5.51 Localised areas of Secondary A aquifers are also present comprising the Glaciofluvial deposits, alluvium and beach deposits (BGS, 2026). These are bedrocks that contain permeable strata that can support local water supplies and may form an important source of base flow to rivers. Large, localised areas in the landfall have no classification (Defra, 2026).
- 1.4.5.52 The BGS GeoIndex Onshore Viewer 1:625,000 scale Hydrogeological Map of England and Wales indicates that the entire Geology, Hydrogeology and Ground Conditions Study Area is within a highly productive aquifer (the Magnesian Limestone – see also earlier discussion on nomenclature) up to 300m thick and locally yields up to 50 litres per second (l/s) of very hard water.
- 1.4.5.53 Limited information is available on groundwater levels across the site. Groundwater was only encountered within three of the available BGS logs located on the site. Borehole reference NZ44NW368, dated 2012 and located approximately 1.1km to the west of the A19, recorded no water strikes but 'rest water level on completion' was recorded at 95m bgl within the limestone.
- 1.4.5.54 Borehole reference NZ44NW395 located approximately 0.5km to the southeast of the Blue Option LSS Option Area recorded moist ground at 2.9 to 3.7m bgl within the superficial deposits. Borehole reference NZ34NE79 located in the southwest of the MHPGC Project PEIR Red Line Boundary: Onshore recorded the borehole to be wet from the surface to 0.3m bgl, however, the borehole log recorded that a spring was adjacent to this location.

- 1.4.5.55 Previous ground investigation undertaken in the west of the MHPGC Project PEIR Red Line Boundary. Onshore (described within the AECOM report (AECOM, 2023)) recorded water strikes within the made ground at 5.2mbgl in the area to the south of the existing substation and between 1.3 to 4.6m bgl within the superficial deposits in the area to the north of Coop House Wood.
- 1.4.5.56 Ground investigation undertaken by Fugro in 2024 did not encounter any groundwater strikes during drilling, except one for the BGD borehole near the former Dawdon Colliery (BGS borehole reference NZ44NW13867/2R) where groundwater was encountered about 8.5m bgl. Fugro suggest that this represents a perched water table within the superficial deposits.
- 1.4.5.57 Ground investigation undertaken by Arup in 2026 recorded groundwater strikes between 1.2m bgl and 11.5m bgl during drilling/excavation both in made ground and natural superficial deposits. Groundwater monitoring undertaken post ground investigation, identified many of the installations to be dry. Where groundwater was present, it was typically recorded at around 5 to 8 mbgl.
- 1.4.5.58 Allen *et al.* (1997) present a detailed appraisal of Magnesian Limestone aquifer properties within the County Durham area. Transmissivity values vary in the range 11 to 2,200 metres squared per day (m^2/d). The geometric mean of all the location values in the County Durham area is $263\text{m}^2/\text{d}$ and the median value is lower at $205\text{m}^2/\text{d}$.
- 1.4.5.59 Local over-pumping has led to saline intrusion within the Magnesian Limestone aquifer near the coast and groundwater vulnerability in this area is high to medium and identifies a soluble rock risk (Bearcock and Smedley, 2009). In addition, a higher risk to pollution inputs into the Magnesian Limestone aquifer occurs along the coastline where bedrock is exposed and also beneath more permeable superficial deposits, such as alluvial sands and gravels along river channels.
- 1.4.5.60 There has been a general rise in groundwater water levels in the County Durham area in past due to the reduction in public water abstraction along the coast and the cessation of dewatering in underlying coal workings (Allen *et al.*, 1997). This has implications for groundwater quality in the Magnesian Limestone, especially as the underlying Coal Measures' water levels continue to rise.

Groundwater quality

- 1.4.5.61 The EA currently classifies groundwater (Wear Magnesian Limestone, Water Framework Directive body ID GB40301G703900) beneath the entire Geology, Hydrogeology and Ground Conditions Study Area as being of poor chemical quality and of good quantitative status, and poor overall status under the WFD classification scheme (2019 dataset). The reasons for not achieving good chemical classification for the waterbody are due to the poor nutrient management from agriculture and rural land management. The WFD assessment presented in **Volume 2, Annex 2.1: Onshore Water Framework Directive Assessment, of the PEIR** concluded that the Wear Magnesian Limestone groundwater body is the only designated groundwater body under WFD within the Geology, Hydrogeology and Ground Conditions Study Area.
- 1.4.5.62 Groundwater vulnerability mapping has been obtained from the Groundsure data (Groundsure, 2026). Groundwater vulnerability assesses the vulnerability of groundwater to a pollutant discharged at ground level based on hydrological, geological, hydrogeological and soil properties, and it is described as High, Medium or Low, as defined below:
- High – areas able to easily transmit pollution to groundwater, and which are characterised by high leaching soils and absence of low permeability superficial deposits;
 - Medium – intermediate between High and Low vulnerability;
 - Low – areas that provide the greatest protection from pollution and which are characterised by low leaching soils and/or presence of low permeability superficial deposits.
- 1.4.5.63 The Green LSS Option Area is underlain by a Secondary A Aquifer associated with Devensian Till (Diamicton), and the underlying Principal Aquifer of the Ford Formation (Dolostone). Groundsure mapping classifies both the superficial and bedrock geology as having a Low Groundwater Vulnerability at the Green LSS Option Area.
- 1.4.5.64 The Blue LSS Option Area is underlain by a Secondary A Aquifer (Devensian Till (Diamicton) and sporadic pockets of Glaciofluvial Deposits (sand and gravel)). The underlying bedrock is a Principal Aquifer (Dolostone of Ford and Roker Formations). Both the superficial and bedrock geology have a Low Groundwater Vulnerability, resulting in an overall combined Low Groundwater Vulnerability

classification across approximately 80% of the total Blue LSS Option Area. Approximately 20% of the total Blue LSS Option Area is located within an area of High Groundwater Vulnerability (High superficial aquifer vulnerability and Low bedrock aquifer vulnerability) due to the presence of high leaching class soils in the easternmost part of the Blue LSS Option Area.

- 1.4.5.65 The land between the Green LSS Option Area and Blue LSS Option Area is similarly classified as having a combined Low Groundwater Vulnerability (comprising Low superficial aquifer vulnerability and Low bedrock aquifer vulnerability), reflecting the presence of low leaching class of the soils and low permeability deposits.
- 1.4.5.66 The landfall is underlain by Secondary A Aquifers associated with the superficial Devensian Till (Diamicton) and Glaciofluvial Deposits (sand and gravel). There is an area east of the landfall where superficial deposits are absent and the area is directly underlain by the Principal Aquifer of the Roker Formation (Dolostone). At the landfall and beneath the superficial deposits, a Principal Aquifer is present associated with the Roker Formation (Dolostone) and Ford Formation (Shelf- Edge Reef) Dolostone bedrock.
- 1.4.5.67 At the landfall, in the north of the MHPGC Project PEIR Red Line Boundary: Onshore, the area is classified as having a Medium Groundwater Vulnerability (associated with the superficial deposits), with the underlying bedrock classified as Low Vulnerability. The combined effects of these layers results in an overall Medium Groundwater Vulnerability. A small area in the east at the landfall does not have a superficial vulnerability classification, with a Principal bedrock aquifer classified as having Low Groundwater Vulnerability. The southern area at the landfall is underlain by superficial and bedrock deposits of High Vulnerability, resulting in a combined High Groundwater Vulnerability classification.
- 1.4.5.68 The land located between the Blue LSS Option Area and landfall is within an area of High Groundwater Vulnerability (high superficial aquifer vulnerability and low bedrock aquifer vulnerability), with exception of sporadic patches where no superficial deposits are present and which are indicated as areas of Low Groundwater Vulnerability (with Low bedrock Vulnerability classification only).
- 1.4.5.69 The land between the landfall and the coastline has a combined Medium Groundwater Vulnerability classification (medium superficial and low bedrock Vulnerabilities) to the north, and High Groundwater Vulnerability classification (high superficial and bedrock Vulnerabilities) to the south.
- 1.4.5.70 The groundwater vulnerability map for the eastern extent of the Blue LSS Option Area, Green LSS Option Area and landfall appears complex owing to the juxtaposition of different classifications within the mapping grids, and in places, erroneous. For example, within areas where superficial deposits are absent, but where the bedrock remains the same, there is both Medium and High Groundwater Vulnerability classification assigned in the eastern part of the Hydrogeology Study Area. As such, the more conservative classification of groundwater vulnerability has been assumed (i.e., High). Consultation will be sought with the EA during the preparation of the ES to obtain clarifications on vulnerability classification.
- 1.4.5.71 The hydrogeology study area is within an area where significant soluble rocks are likely to be present (with a Hazard Rating B in Groundsure); however, the BGS classification means despite the presence of the soluble rocks, they are 'unlikely to cause problems except under exceptional conditions'.

Groundwater abstraction points

- 1.4.5.72 There are three active licensed groundwater abstraction points within the Hydrogeology Study Area. One additional abstraction borehole is situated 1.2km to the north of the MHPGC Project PEIR Red Line Boundary: Onshore which is outside of the study area, however the SPZ1 with which it is associated is with the Hydrogeology Study Area boundary. Details of the purpose, source and operator for these abstraction points are provided in **Table 1.7** and shown on Figure 1.7.

Table 1.7: Summary of local licensed groundwater abstraction points within the hydrogeology study area

Operator (Licence Number)	Distance	Purpose	Source
The Coal Authority (now the Mine Remediation Authority) (NE/025/0005/001 and NE/025/0005/004)	240m to the north of the MHPGC Project PEIR Red Line Boundary: Onshore in the east	Transfer between sources; Heat Pump	Groundwater (not specified)
Northumbrian Water Ltd (1/25/05/004)	370m to the north of the northwest corner of the Blue LSS Option Area (outside the MHPGC Project PEIR Red Line Boundary: Onshore)	Potable Water Supply – Direct	Magnesian Limestone – Dalton
Northumbrian Water Ltd (1/25/05/007)	520m to the south of the MHPGC Project PEIR Red Line Boundary: Onshore	Potable Water Supply – Direct	Magnesian Limestone – Hawthorn

1.4.5.73 All groundwater abstraction points are located outside of the Blue LSS Option Area and Green LSS Option Area. Groundwater is reported to be drawn from the underlying bedrock Principal Aquifer (noted to be Magnesian Limestone), apart from the Coal Authority (now MRA) abstraction which is not specified.

1.4.5.74 Information on private water supplies (PWS) has been provided by DCC to inform the PEIR for the MHPGC Project as detailed in **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**. DCC records no PWS within the MHPGC Project PEIR Red Line Boundary: Onshore and one PWS is located within the land contamination and hydrogeology study areas at Hesledon Farm to the north, at grid coordinates 439774, 546404 (this is over 500m from the nearest proposed LSS which is the Green LSS Option Area). The abstraction is from the Magnesian Limestone Group Principal Aquifer at approximately 70m bgl. The PWS is located within an area designated as SPZ2. DCC note that their records do not preclude the presence of other PWSs, springs or other water abstraction points within the area.

1.4.5.75 The identified PWS is for a rural property. This PWS and other similar PWS if present, utilise smaller yields of groundwater (less than 20,000 litres a day) and do not require a licence.

Source Protection Zones

1.4.5.76 Groundwater supply sources are protected by the EA's designated SPZs which show the level of risk to the source from contamination, and are divided into three zones:

- Inner Protection Zone (SPZ 1) – defined as an area within 50m of a point where groundwater is abstracted for domestic supply or food production purposes or an area where it takes groundwater up to 50 days to travel to the groundwater abstraction point;
- Outer Protection Zone (SPZ 2) – defined as an area within 250m or 500m (depending on the maximum allowable annual volume of water to be abstracted) of the source point and an area where it takes groundwater up to 400 days to travel to the groundwater abstraction point;
- Total Catchment (SPZ 3) – defined as an area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken and can extend some distance from the source point.

1.4.5.77 The MHPGC Project PEIR Red Line Boundary: Onshore is located within all three SPZs as described below:

- West and east area of the MHPGC Project PEIR Red Line Boundary: Onshore, including landfall: mainly located inside SPZ 3 (Total Catchment). The SPZ 3 expands to the north and west of the hydrogeology study area;
- Blue LSS Option Area: Located within SPZ 1 (Inner Catchment) in the northeast, and SPZ 2 (Outer Catchment) in the remainder of the Blue LSS Option Area;

- Central area of the MHPGC Project PEIR Red Line Boundary: Onshore. SPZ2 extends across most of the central area of the MHPGC Project PEIR Red Line Boundary: Onshore and extends to the northwest, south and northeast;
- Green LSS Option Area: Located within SPZ 2 in the northeast, and SPZ 3 in the remainder of the Green LSS Option Area. The SPZ 2 extends to the east and northeast, and SPZ 3 extends to the northwest, west and south of the hydrogeology study area.

1.4.5.78 Hydrogeological features are presented in Figure 1.7.

Figure 1.7: Hydrogeological constraints across the hydrogeology study area

Land contamination

- 1.4.5.79 To inform the land contamination baseline, a Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) was undertaken. This is based upon a comprehensive environmental data search and historical mapping obtained from Groundsure in GIS format for the land contamination study area. The PRA is also information by review of previous third-party reports, satellite imagery and other environmental data obtained from the EA.

Geology, Hydrogeology and Ground Conditions Study Area history

- 1.4.5.80 Historically, the land uses in the land contamination study area have been mainly agricultural, and mineral extraction, including coal mining and quarrying. A brief description is presented in the next sections, and a more detailed summary of historical activities is provided in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).
- 1.4.5.81 Historically, farms and agricultural land were largely concentrated in the west and northeast of the land contamination study area. Mining had taken place by the early 1900s, with Dawdon Colliery (and associated mine shafts) recorded to the northeast of the MHPGC Project PEIR Red Line Boundary: Onshore, and South Hetton Colliery was present by 1856, adjacent to the southwest of the MHPGC Project PEIR Red Line Boundary: Onshore. A mineral railway leading to Murton Colliery was recorded to the north but outside of the Geology, Hydrogeology and Ground Conditions Study Area. Hawthorn Quarry was marked adjacent to the southeastern MHPGC Project PEIR Red Line Boundary: Onshore. Old Quarries occur generally in the eastern portion of the Geology, Hydrogeology and Ground Conditions Study Area.
- 1.4.5.82 The landfall generally comprised agricultural land and beach until c1919, whereby the Leeds Northern and Blast Furnace Branch railway lines are present with cuttings and embankment. Dowden Colliery is present off-site at the northeastern boundary of the landfall from c1919, having previously been the Seaham Iron Works site. Hawthorn Quarry is present, adjacent to and within the MHPGC Project PEIR Red Line Boundary: Onshore to the southwest of the landfall.
- 1.4.5.83 The Blue LSS Option Area has remained generally undeveloped, with only a track traversing the area and use as agricultural field. A railway line including embankments is present at its eastern edge. MHPGC Project PEIR Red Line Boundary: Onshore
- 1.4.5.84 The Green LSS Option Area appears largely vacant until development of Hawthorn Combined Mine begun in 1952 (evident for the first time on 1955-1959 OS mapping). Prior to development the land consisted of agricultural fields and the South Hetton Railway line (later referred to as a 'Mineral Railway') in the south of the area which was first evident on the earliest OS mapping available (dated 1857). The Hawthorn Combined Mine closed in 1992 after which the colliery infrastructure was demolished by the late 1990s/early 2000s. Industrial development within the Green LSS Option Area related to Hawthorn Combined Mine, featured tanks, railway lines/sidings, conveyor belts and structures across the entire Green LSS Option Area. The wider Hawthorn Combined Mine site featured additional electrical substations, sludge beds, tanks, railway lines/sidings and buildings/structures, these are generally located to the north and northwest of the Green LSS Option Area, within the MHPGC Project PEIR Red Line Boundary: Onshore.
- 1.4.5.85 Other historical and current site uses in the land contamination study area comprise residential housing, a sand pit, refuse heaps, several railway lines/sidings, a garage, ponds and road infrastructure. Current uses with potential for contamination comprise a depot, industrial estate, service station, farms and agricultural land.

Summary

- 1.4.5.86 The Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) identifies potential contaminant sources that include historical railway land, waste disposal areas, made ground, former industrial land uses, historical tanks, quarries, collieries, electrical substations and infrastructure and infilled sand/gravel pits. Principal contaminants of concern comprise asbestos, heavy metals, polyaromatic hydrocarbons (PAHs), petroleum hydrocarbons, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) and ground gases.

- 1.4.5.87 The principal environmental risks identified in the PRA relate to the potential migration of contaminants from made ground and historical contamination sources into groundwater and surface water receptors, including Secondary A/undifferentiated and Principal Aquifers and Dalton Beck. In several areas, made ground is widespread and may be hydraulically connected to underlying granular deposits and aquifers, creating potential contaminant migration pathways. Ground gas generation associated with made ground, historical waste materials and historical mining may also present a risk to future development and confined subsurface structures. Mine gas is considered separately under Mining Hazards and Risks in **Section** Error! Reference source not found..
- 1.4.5.88 **Figure 1.8** summarise the identified current and historic sources of potential contamination based on the review of the land contamination study area history.

Figure 1.8: Site sources across the land contamination study area

1.4.6 Future baseline conditions

- 1.4.6.1 During the 35-year operational lifetime of the MHPGC Project, the geology, hydrogeology and ground conditions baseline can be expected to evolve both on a natural basis and in response to global trends such as climate change and other anthropogenic activities. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, require that *"an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge"* is included. Therefore, an assessment of future baseline conditions, in the absence of the MHPGC Project, has been undertaken and is described within this section.
- 1.4.6.2 The baseline conditions associated with the geology, hydrogeology and ground conditions are not subject to significant changes should the MHPGC Project not be constructed or become operational.
- 1.4.6.3 In terms of geology, underlying superficial and bedrock deposits are expected to remain unchanged and only evolve through weathering of near-surface soils (e.g. erosion of soil from potential increase in flooding due to climate change). The landfall will remain approximately 90m in land of predicted coastal erosion extents. Due to project design, the MHPGC Project is not considered to be at risk from the credible maximum scenario. Further assessment is detailed in **Volume 3, Chapter 2 Water Resources and Flood Risk of the PEIR**.
- 1.4.6.4 The hydrogeological conditions are expected to continue to respond to natural recharge patterns and seasonal variations in groundwater levels. These could change to some degree as climate change may produce wetter weather and/or drier periods.
- 1.4.6.5 Ground conditions and stability are anticipated to remain broadly the same with no new sources of or pathways for contamination or ground instability. However, potential higher rainfall due to climate change could increase leaching of contaminants or raise groundwater levels into contaminated soil.
- 1.4.6.6 In summary, climate change could potentially influence geology, hydrogeology and ground conditions through increased rainfall intensity leading to localised erosion, greater variability in groundwater levels and increased leaching of contaminants from the soil sources.
- 1.4.6.7 Hawthorn Quarry is subject to an extant, planning permission. However, this permission cannot be re-implemented until a Review of Old Minerals Permissions (ROMP) consent is issued. A ROMP application was submitted to Durham County Council in 2017 and has remained undetermined since that date. If the ROMP application was to be approved, then Hawthorn Quarry could recommence extraction works.

1.5 Impact assessment methodology

1.5.1 Overview

- 1.5.1.1 **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** sets out the overarching approach that has been used in developing the preliminary environmental information. This section describes the technical methods used to determine the sensitivity of the receptors and magnitude of effects and sets out the significance criteria that have been used for the geology, hydrogeology and ground conditions assessment. The methodologies for assessing sensitivity, magnitude and significance for geology, hydrogeology and ground conditions assessment are described in more detail below, including additional topic-specific detail based on and adapted from those used in the Design Manual for Roads and Bridges (DMRB) methodology (Highways England et al., 2020).
- 1.5.1.2 The assessment methodology applied within this PEIR chapter for land contamination differs from that outlined at Scoping, this brings the assessment in line with DMRB Sustainability & Environmental Appraisal, LA 109 Geology and Soils guidance and the change has been made to simplify the overall assessment process, given the number and type of impacts and range of receptors covered in this chapter.

1.5.2 Receptor sensitivity

- 1.5.2.1 When defining sensitivity, reference has been made to the criteria levels set out in **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR**. To determine sensitivity of the receptor, the vulnerability of the receptor to the specific impact and its ability to recover and adapt were also considered [see **Table 1.12**].
- 1.5.2.2 The definition of terms relating to geology and contamination are based on DMRB LA 109: Geology and soils. Hydrogeology definition terms are based on DMRB LA 113: Road drainage and the water environment.
- 1.5.2.3 It should be noted that there is no established methodology for assessing the environmental effects of a development on mineral safeguarding. The methodology has therefore, been developed based on professional judgement and from the experience of similar linear projects, for example, the Rampion 2 Wind Farm.

Table 1.8: Definition of terms relating to the sensitivity of the receptor

Sensitivity	Definition
Very High	<u>Geology</u> Very rare and of international importance with no potential for replacement (e.g. United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Sites, UNESCO Global Geoparks, SSSIs and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such.
	<u>Hydrogeology</u> Principal Aquifer providing a regionally important resource and/or supporting a site protected under the EC or UK legislation. Groundwater supports the Inner Source Protection Zone (SPZ1).
	<u>Mineral Resources</u> No minerals resources criteria identified.
	<u>Contamination</u> Human health: very high sensitivity land use such as residential or allotments.
High	<u>Geology</u> Rare and of national importance with little potential for replacement or substitution (e.g. geological SSSI, Special Areas of Conservation (SAC), and National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such.
	<u>Hydrogeology</u> Principal Aquifer is present, providing locally important resource or supporting a river ecosystem. Groundwater supports the Outer Source Protection Zone (SPZ 2).
	<u>Mineral Resources</u> Existing minerals sites Allocated minerals sites
	<u>Contamination</u> Human health: high sensitivity land use such as public open space.
Medium	<u>Geology</u> Of regional importance with limited potential for replacement (e.g. Regionally Important Geodiversity Site, RIGS). Geology meeting regional designation citation criteria which is not designated as such.
	<u>Hydrogeology</u> Aquifer providing water for agricultural or industrial use with limited connection to surface water. Groundwater supports the Total Catchment Source Protection Zone (SPZ 3).
	<u>Mineral Resources</u> MSAs Minerals areas of search

Sensitivity	Definition
	<u>Contamination</u> Human health: medium sensitivity land use such as commercial or industrial.
Low	<u>Geology</u> Of local importance/interest with potential for replacement (e.g. non-designated geological exposures, former quarries/mining sites).
	<u>Hydrogeology</u> Unproductive strata.
	<u>Mineral Resources</u> No minerals resources identified
	<u>Contamination</u> Human health: low sensitivity land use such as highways and rail.
Negligible	<u>Geology</u> No geological exposures, little/no local interest.
	<u>Hydrogeology</u> Not applicable.
	<u>Mineral Resources</u> No minerals resources identified
	<u>Contamination</u> Human health: undeveloped surplus land/no sensitive land use proposed.

1.5.3 Magnitude of impact

- 1.5.3.1 The magnitude of an impact that could affect geology, hydrogeology and ground conditions is influenced by several key factors, including the scale of the change, the spatial extent the impact is likely to occur and the duration and frequency of the impact. When defining the magnitude of the impact, criteria detailed in **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** has been followed [see **Table 1.9**]. The terms used to define magnitude in **Table 1.9** are consistent with those in DMRB LA 109: Geology and soils (Highways England, 2019) and DMRB LA 113: Road drainage and the water environment (Highways England, 2020).
- 1.5.3.2 **Table 1.9** presents definitions of adverse impacts on receptors, and for most of the receptors dealt with in this PEIR chapter, this is appropriate, as impacts are likely to be adverse rather than resulting in an improvement to the baseline. In the case of land contamination, remediation completed for development could result in an improvement from baseline conditions (positive impact).

Table 1.9: Definition of terms relating to the magnitude of an impact

Magnitude	Definition
Major	<u>Geology</u> Loss of geological feature/designation and/or quality and integrity, with severe damage to key characteristics, features or elements.

Magnitude	Definition
	<u>Hydrogeology</u> Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects. Deterioration in groundwater levels, flows or water quality, leading to non-temporary downgrading of WFD groundwater body status, or the inability of the groundwater body to attain Good status in line with the measures identified in the RBMP. Complete or severely reduced water availability and/or quality, compromising the ability of water users to abstract. <u>Mineral Resources</u> Development permanently prevents viable exploitation of a resource. Development directly and negatively affects the operation of an ongoing mineral extraction site to the extent that its viability is clearly and demonstrably reduced. <u>Contamination</u> Significant contamination identified with levels which significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) with potential for a significant harm to human health. Contamination heavily restricts future use of land.
Moderate	<u>Geology</u> Partial loss of geological feature/designation attributes, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. <u>Hydrogeology</u> Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures. Deterioration in groundwater levels, flows or water quality, leading to potential temporary downgrading of WFD groundwater body status, although not affecting the ability of the groundwater body to achieve future WFD objectives. Moderate reduction in water availability and/or quality, which may compromise the ability of the water user to abstract on a temporary basis or for limited periods, with no longer term impact on the purpose for which the water is used. <u>Mineral Resources</u> Development has permanent effects that will sterilise a significant proportion of a mineral deposit (excluding those under ongoing extraction). Development has temporary effects that sterilise a significant proportion of a mineral deposit (excluding those under ongoing extraction), but which would be expected to be reversed in the short to medium-term. <u>Contamination</u> Contamination 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 and to make land suitable for intended use.
Minor	<u>Geology</u> 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.

Magnitude	Definition
	<u>Hydrogeology</u> Minor effects on an aquifer, abstractions and structures. Measurable effect on groundwater levels, flows or water quality, but with no short-term or permanent downgrading of WFD groundwater body status. Minor reduction in water availability and/or quality, but unlikely to affect the ability of a water user to abstract.
	<u>Mineral Resources</u> Development permanently affects a minor proportion of a mineral deposit, to an extent that is unlikely to significantly affect its overall viability or quality. Development has temporary effects that sterilise minor parts of a mineral deposit (excluding those under ongoing extraction), which would be expected to be reversed in the short to medium-term.
	<u>Contamination</u> Contamination concentrations are below the 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.
Negligible	<u>Geology</u> Very minor loss or detrimental alteration to one of more characteristics, features or elements of geological/ feature/designation. Overall integrity of resource not affected.
	<u>Hydrogeology</u> Short-term or very localised effects on groundwater quality or resource availability. No change in groundwater body WFD status or its ability to meet WFD objectives. No measurable effect on groundwater levels, flows or water quality, and no consequences in terms of WFD groundwater body status. No measurable change in water availability or quality and no change in ability of the water user to exercise licensed rights.
	<u>Mineral Resources</u> Development has no permanent or temporary effects on mineral deposits that would affect the ability to extract the deposits, their viability or their quality.
	<u>Contamination</u> Contamination concentrations are substantially below the relevant screening criteria. No requirements for control measures to reduce the risks to human health/make land suitable for intended use.
No change	<u>Geology</u> No temporary or permanent loss/disturbance of characteristics, features or elements.
	<u>Hydrogeology</u> No loss or alteration of characteristics, features or elements; no observable impact in either direction.
	<u>Mineral Resources</u> Development has no permanent or temporary effects on minerals deposits.
	<u>Contamination</u> Reported contaminant concentrations below background levels.

1.5.4 Significance of effect

- 1.5.4.1 The significance of the effect upon geology, hydrogeology and ground conditions is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in **Table 1.10** for geology, hydrogeology and contamination receptors, and in **Table 1.11** for mineral resource receptors.

- 1.5.4.2 Where the significance of the effect is assessed to be either “Negligible or Minor”, “Minor or Moderate” or “Moderate or Major”, professional judgment has been used to assign the appropriate significance classification to the effect.
- 1.5.4.3 Following the classification of an effect using this methodology, a clear statement will then be made as to whether that effect is significant or not significant. Major and moderate effects are considered to be significant, whilst minor and negligible effects are considered to be not significant. However, professional judgement will also be applied in reaching conclusions as to the significance of effects. Typical definitions for the classification of effects are shown in **Table 1.12**.
- 1.5.4.4 Where the magnitude of impact is ‘no change’, no effect would arise.

Table 1.10: Matrix used for the assessment of the significance of the effect for geology, hydrogeology and contamination

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Minor	Moderate	Major
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major
Very high	Minor	Moderate or major	Major	Major

Table 1.11: Matrix used for the assessment of the significance of the effect for mineral resources

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Minor	Moderate	Major
Negligible	Negligible	Negligible	Negligible	Minor
Low	Negligible	Negligible	Minor	Moderate
Medium	Negligible	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

Table 1.12: Significance definitions

Significance classification	Definition	Significant effect
Major	A large and detrimental change to a valuable/sensitive receptor, likely exceeding an accepted threshold. A large and beneficial change, resulting in enhancements in baseline conditions, transitioning from previously poor conditions to new legal compliance, or making a major contribution to national goals. These effects may represent key factors in the decision-making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional scale. Major effects may relate to features that are unique and irreplaceable.	Significant
Moderate	A medium scale change that, although not beyond an accepted threshold, is likely to be important and on their own could influence on decision making. If adverse, these effects are likely to be important at a regional or local scale. A positive moderate effect is a medium scale change that improves baseline conditions sufficiently to contribute to guideline targets.	Significant

Significance classification	Definition	Significant effect
Minor	A minor adverse change that remains within legal and planning policy limits. A minor positive change that is unlikely to significantly impact the overall balance of considerations. These effects might be raised as local issues and could be relevant to the detailed design of a project, but they are unlikely to be critical in the decision-making process.	Not significant
Negligible	A very small change that is so inconsequential it can be considered acceptable to disregard. These effects fall below perceptible limits, lie within normal variations, or fall within the margin of forecasting error. They are unlikely to influence decision-making.	Not significant

1.5.5 Assumptions and limitations of the assessment

1.5.5.1 The assessment of effects has been undertaken from a desk-based review of publicly available information, information provided by the client and information provided by third parties. As the design progresses, site-specific geology, hydrogeology and ground condition information will be gathered for the process of detailed design, including from site specific desk studies and site investigations.

1.6 Key parameters for assessment

1.6.1 Scope of the assessment

1.6.1.1 The approach to assessment was presented in the MHPGC Project Scoping Report and has been refined in consultation with relevant statutory and non-statutory consultees as detailed in **Section 1.3** and through the MHPGC Project Scoping Opinions received from the PINS, MD-LOT and the MMO.

1.6.1.2 Effects that are not considered likely to be of moderate/major significance have been scoped out of the assessment and these impacts will not be considered further. **Table 1.13** summarises the impacts considered as part of the assessment, while a summary of the impacts scoped out of the assessment is presented in **Table 1.14**.

Table 1.13: Impacts scoped into the assessment

Impact	MHPGC Project stage(s) where impact may occur	Potential impacts scoped into the assessment
Permanent loss of or damage to locally or nationally important geological features	Construction	Irreversible alteration or destruction of the geological features, reducing its scientific and educational value.
Temporary loss of access to geological features with statutory conservation designations	Construction Decommissioning	Temporary limitation of access, reducing opportunities for study, recreation, and enjoyment of the protected geological site.
Sterilisation of mineral resources due to permanent development (including landfall, onshore substation, LSS and buried cables) in or near existing or allocated mineral sites	Construction	Potential impacts to identified mineral resources in the MHPGC Project PEIR Red Line Boundary: Onshore due to permanent development and temporary sterilisation.
Temporary sterilisation of mineral resources due to construction activities such as presence of temporary construction compounds	Construction Decommissioning	

Impact	MHPGC Project stage(s) where impact may occur	Potential impacts scoped into the assessment
Release of contaminants to the ground impacting soil or groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored or stockpiled materials by run-off or windblown dust. Mobilisation of contamination by foundation construction (e.g., piling) during construction.	Construction Decommissioning	Potential for contamination of soils, human exposure via direct contact, ingestion or inhalation of dust/soil vapours, and potential pollution of groundwater receptors via migration and leaching. Surface water receptors with respect pollution prevention during construction, O&M and decommissioning have been considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR. This chapter considers surface water in relation to existing potential contamination sources. Ecosystem receptors have been considered in Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR.
Changes to the level of risk from contaminated land where the MHPGC Project interacts with existing land contamination (e.g. removal of vegetation, ground reprofiling, removal of hardstanding). Potential for buried cable routes to act as a preferential pathway for migration of mobile contaminants.	Operation Decommissioning	Changes in ground cover such as removing vegetations and ground reprofiling, or introduction of new receptors and pathways due to the MHPGC Project can alter the risk to contaminated land by increasing exposure pathways, disturbing contaminated soil, or reducing natural barriers, potentially leading to higher risks to human health and the environment (such as via surface water runoff and increased infiltration/ leaching).
Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination.	Operation Decommissioning	Cables will be present in the subsurface during operation and maintenance and will be left in situ at decommissioning. Both the onshore export cables and AC connection cables are not anticipated to be fluid filled or made from materials that could be hazardous if released into the environment.
Accumulation of mine gas within enclosed spaces at the green LSS option leading to potentially toxic and/or explosive atmospheres in enclosed spaces.	Operation	Introduction of new enclosed spaces including substation buildings which may enable mine gas ingress to these spaces. The green LSS option site has been identified as having a risk of mine gas being present and therefore new risks to human health and property could be introduced without appropriate mitigation.
The potential impacts of thermal emissions from buried high voltage cables on groundwater bodies.	Operation	Thermal emissions (i.e., heat as a pollutant) from the buried cables which may impact groundwater quality or quantity in existing groundwater abstractions.
Impacts on groundwater levels and flow, (e.g., at watercourse crossings, at excavations requiring dewatering).	Construction Decommissioning	Temporary alteration of groundwater levels and flow. Impacts to surface water resource, hydromorphology and flood risk have been considered in Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.
Potential impacts from dewatering to the Magnesian Limestone aquifer	Construction	Dewatering from the Principal Aquifer may alter groundwater levels (lowering these) and affect the groundwater quality which may impact local groundwater abstraction points and dependent receptors.

Table 1.14: Impacts scoped out of the assessment

Impact	Justification for scoping out of the assessment
Construction phase	
Landfall cable construction and associated earthworks resulting in a potential impact on groundwater levels	Cable installation for landfall will be via a trenchless technique. No likely significant impact is anticipated as any dewatering, i.e. within the entry pits, will be limited and temporary therefore resulting in minimal impact on groundwater levels.
Impacts on sand and gravel mineral safeguarding areas	Within the MHPGC Project PEIR Red Line Boundary: Onshore, MSAs are found for Glacial and River sand and gravels. BGS records show either no sand and gravel in bore holes within these MSAs, or clay deposits with some sands or silts within them. No records are available which show clean or extensive sands. In addition, the MSA areas are also all small, isolated areas and are therefore unlikely to be of a size which would make them of interest for commercial extraction even if sand and gravel was to be found. On the coast, within the MHPGC Project PEIR Red Line Boundary: Onshore between Nose's Point and Chourden Point, Blown Sand and Raised beach Deposits on the beach are safeguarded. However, the coast at this location is covered by the Durham Coast SSSI and SAC designations, meaning that approval to extract would be difficult to achieve. In addition, beach extraction is a largely historic activity and is now rarely seen as a sustainable enterprise, with sand extraction known to affect coastal processes. All of these MSAs are therefore considered to be non-viable in terms of commercial extraction. The MHPGC Project will therefore not have any impact on viable resources, and these MSAs can be scoped out.
Potential impacts from over-pumping to the Magnesian Limestone aquifer	Excessive abstraction from the Principal Aquifer may alter groundwater levels (lowering these) and affect the groundwater quality which may impact local groundwater abstraction points and dependent receptors. However, only localised dewatering will occur during construction and no groundwater abstractions will be required for water consumption during the project. Water will be tankered in / taken from mains. Therefore, a potential impact of the landfall and other works during construction due to over-pumping has been scoped out.
O&M phase	
Permanent loss of or damage to a locally or nationally important geological features.	The assessment of permanent loss of or damage to a locally or nationally important geological feature during operation and decommissioning has been scoped out on the basis that any loss of or damage to a locally or nationally important geological feature would occur during construction and is therefore scoped in for construction.
Temporary loss of access to geological features with statutory conservation designations.	The assessment of temporary loss of access to geological features with statutory conservation designations has been scoped out on the basis that loss of access is unlikely during operation. This matter is scoped in for construction and decommissioning.
Impact on sand and gravel mineral safeguarding areas	Within the MHPGC Project PEIR Red Line Boundary: Onshore, MSAs are found for Glacial and River sand and gravels. BGS records show either no sand and gravel in bore holes within these MSAs, or clay deposits with some sands or silts within them. No records are available which show clean or extensive sands. In addition, the MSA areas are also all small, isolated areas and are therefore unlikely to be of a size which would make them of interest for commercial extraction even if sand and gravel was to be found. On the coast, within the MHPGC Project PEIR Red Line Boundary: Onshore between Nose's Point and Chourden Point, Blown Sand and Raised beach Deposits on the beach are safeguarded. However, the

Impact	Justification for scoping out of the assessment
	coast at this location is covered by the Durham Coast SSSI and SAC designations, meaning that approval to extract would be difficult to achieve. In addition, beach extraction is a largely historic activity and is now rarely seen as a sustainable enterprise, with sand extraction known to affect coastal processes. All of these MSAs are therefore considered to be non-viable in terms of commercial extraction. The MHPGC Project will therefore not have any impact on viable resources, and these MSAs can be scoped out.
Sterilisation of mineral resources due to permanent development in or near existing or allocated mineral sites.	The assessment of sterilisation of mineral resources due to permanent development (including landfall, the LSS, and buried cables) in or near existing or allocated mineral sites during operation and decommissioning has been scoped out on the basis that permanent effects would occur during the construction phase and will be assessed in that section.
Accidental release of contaminants to ground during operation and maintenance of the above ground infrastructure including the LSS	The MHPGC Project will be designed and constructed to comply with industry good practice for pollution prevention, the above ground infrastructure including the LSS will be secure and only accessible to suitably trained and authorised workers, and all operations will be subject to the Health and Safety at Work Act (1974), and regulations made under this Act. Pollution control will be managed through measures in the Outline ODMP (CoT22).
Potential risks posed by the presence of coal mining features, including to likely infrastructure	Any potential risks posed by the presence of coal mining features will be addressed during the construction phase and are therefore not anticipated to be present during the O&M phase. The Geo-environmental PRA (Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR) (MM-071) assesses ground stability risks for the MHPGC Project and includes review of existing coal mining risk assessment information. Compliance with good practice in structural design including compliance with the Eurocodes and relevant British Standards is an embedded measure (CoT62) in Table 1.16, and assessment of ground stability risks is therefore not included in this chapter.
Potential impacts from over-pumping to the Magnesian Limestone aquifer	No long-term groundwater abstractions will be required for water consumption during the project. Also limited land disturbance will occur during the O&M phase, and it is unlikely for such activities to culminate in significant effects to the limestone aquifer.
O&M activities resulting in a potential impact on groundwater levels	O&M activities will not involve significant dewatering works and therefore no impact on groundwater levels is anticipated.
Decommissioning phase	
Permanent loss of or damage to a locally or nationally important geological features.	The assessment of permanent loss of or damage to a locally or nationally important geological feature during operation and decommissioning has been scoped out on the basis that any loss of or damage to a locally or nationally important geological feature would occur during construction and is therefore scoped in for construction.
Potential risks posed by the presence of coal mining features, including to likely infrastructure.	Any potential effects will be addressed during the design and proposals for construction, therefore risk is not anticipated to be present during the decommissioning phase.
Potential impacts from over-pumping to the Magnesian Limestone aquifer	It is not anticipated that groundwater from the bedrock aquifer will be abstracted during the decommissioning phase.
Decommissioning of the landfall cables and associated earthworks resulting in a potential impact on groundwater levels	Sub-surface infrastructure will be left in place in the decommissioning phase and no dewatering works are expected, therefore no impacts on groundwater levels are anticipated.

1.6.2 Maximum design scenario

- 1.6.2.1** The MDS for each impact identified in **Section 1.6** has been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The MDS presented in **Table 1.15** have been selected from the parameters provided in **Volume 1, Chapter 2: Project Description, of the PEIR** and methodology outlined in **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR**.

Table 1.15: MDS relevant for the assessment of potential impacts on geology, hydrogeology and ground conditions

Impact	Phase			MDS	Explanation
	C	O&M	D		
Permanent loss of or damage to a locally or nationally important geological features	✓	x	x	Construction Phase <u>Landfall</u> Landfall (trenchless drill) - Landfall trenchless drill installation method: HDD or Direct Pipe; - Maximum burial depth of trenchless drill (per bore): 80m bgl; - Maximum trenchless drill length: 2km; - Duration of trenchless drilling activity: 300 days; - Construction period for Landfall: 3.5 years. Landfall Infrastructure onshore (landward of MHWS) - Maximum width of trenchless drill area, west of Durham Coast Line: 400m; - Corridor length: 800m; - Number of trenchless drill entry points: 4 bores; - Material quantities associated with excavation: 130,000m³.	Construction Phase Maximum footprint of development, greatest number of cable trenches, jointing bays, link boxes etc, as well as maximum dimensions of open cut trenches, maximum excavation volumes through ground where these features are present will be the MDS to consider. The use of open cut trenching methods along the onshore export cable, AC connection cable, together with the maximum area of construction for the LSS represents the greatest potential for damage to designated geological features due to them resulting in surface excavations and the maximum surface disturbance footprint.
Sterilisation of mineral resources due to permanent development (including landfall, LSS and buried cables) in or near existing or allocated mineral sites	✓	x	x	Transition Joint Bays - Number of Transition Joint Bays (TJBs): 2; - Location of TJBs: Within 150m of landfall trenchless drill entry point; - Working Area for TJB (construction): 750m²; - Depth of TJB: 2.5m. Landfall construction compound - Number of main compounds: 1; - Dimension of main compound: 48,000m²; - Number of secondary compounds: 1; - Dimension of secondary compound: 900m²; - Number of access tracks: 2 from A192; - Construction access track widths: 10m; - Drilling mud: bentonite and/or polymer fluids.	Construction Phase Maximum footprint of development, as well as the maximum depth of trenches and excavations define the MDS as these would have the maximum effect on sterilisation of mineral resources.

Impact	Phase			MDS	Explanation
	C	O&M	D		
				<u>Onshore export cable</u> Installation of ducts and cables - onshore export cable (High-voltage Direct Current (HVDC)) 320kV HVDC circuit comprising of Fibre Optic and Conductor cables Assume ducts needed for cables. Dimensions of trench for grid connection export cable (High-voltage Alternating Current (HVAC)) – Blue LSS Number of export cables: 24 Length of cable route: 4,260m Assumed ducts needed for cables. Number of cable trenches: 4 Width of cable corridor (temporary including permanent): 100m Onshore cable area (temporary): 426,000m² Trench width at top per circuit: 4.8m Trench width at base per circuit: 2.8m Trench depth per circuit: 1.8m Depth of stabilised backfill: 450mm Number of cable route joint bays: 32 Number of link boxes: 32 Volume of material excavated per joint bay: 2,264m³ (<u>total = 18,112m³, assuming 4 circuits are jointed in a single excavation</u>) Construction land take for joint bay (surface area): 1,472m² (<u>total = 11,776m²</u>) Volume of material excavated per link box: 12.5m³ Construction land take for link box: 100m² (total = 3200m²) Volume of material excavated (link boxes): 400m^{3H} Dimensions of trench for onshore export cable (HVDC) – Blue LSS Number of export cables: 4 Length of cable route: 4.83km Width of cable corridor (temporary inc. permanent): 40m	

Impact	Phase			MDS	Explanation
	C	O&M	D		
				Number of cable trenches: 2 Onshore cable area (temporary): 193,200m² Trench width at top: 6.85m Trench width at base: 4m Cable trench depth: 1.8m Depth of stabilised backfill: 450mm Number of cable route joint bays: 12 Volume of material excavated per joint bay: 700m³ Construction land take per joint bay (surface area): 600m² Volume of material excavated per monitoring box: 18m³ Volume of material excavated (for monitoring boxes): 216m³ Construction land take per monitoring box: 64m² Construction land take for all monitoring boxes: 768m² Infrastructure Number of haul roads: 1 Haul road construction: geogrids and 500mm stone Haul road widths: 8m Haul road depth: 0.5 Dimensions of temporary culvert/bridge crossings for the haul road: 10 x 6 x 5 Number of main compounds: 2 Main compound dimensions: 7ha Total area of main compounds: 14ha Number of secondary construction compounds: 6 Dimensions per secondary construction compound: 10,000m² Total area of secondary construction compounds: 6ha. Trenchless Drill Crossings Major Crossings for the onshore export cable are understood to be A, B and Classified unnumbered roads (known as C roads) (including the A19 and B1432) and the Hesledon Moor East SSSI.	

Impact	Phase			MDS	Explanation
	C	O&M	D		
				Trenchless drill methodology: HDD, micro-tunnelling (auger bore or direct pipe) Trenchless depth (excluding landfall): 30m Number of trenchless drill compounds: 6 (3 entry and 3 exit trenchless drill compounds) Dimensions of trenchless drill compounds: 6,000m² Total trenchless drill compound area: 36,000m² Drilling mud used: bentonite and/or polymer fluids Construction Access - Number of construction access tracks (excluding existing tracks): 6. <u>Onshore LSS</u> Construction period for LSS: 4.5 years Area of temporary construction footprint: 7ha Area of temporary works (laydown and storage): 3.5ha Number of buildings: 15 Width of main building/structure: 100m Length of main building/structure: 200m LSS Construction Description of foundations: raft or pile caps (suspended structure) or piled foundations and suspended structures Volume of excavation for foundations: 20,000m³ Cut and fill balance: 50,000m³ Material types and quantities associated to excavation: 14,000m³ topsoil, 65,000m³ other materials Estimated waste quantities: 50,000m³ Access - Temporary width of access including passing bays: 15m	

Impact	Phase			MDS	Explanation
	C	O&M	D		
				• Number of temporary accesses: 2 • Reinstatement of temporary land: 4 months	
Potential impacts from dewatering to the Magnesian Limestone aquifer	✓	x	x	Construction Phase <i>As per construction phase parameters set out within the above.</i>	Construction Phase The hydrogeology study area is located on a Principal Aquifer associated with the underlying bedrock and includes Groundwater SPZ1, SPZ2 and SPZ3. There are potable water abstraction points within the hydrogeology study area, which have the potential to be impacted by dewatering of the aquifer during construction excavation dewatering activities (although no - dewatering or abstraction of the Principal Aquifer is envisaged based on the parameters within the MDS).
Temporary loss of access to geological features with statutory conservation designations	✓	x	✓	Construction Phase <i>As per construction phase parameters set out within the above.</i> Decommissioning Phase Decommissioning is likely to operate within the parameters identified for construction (i.e., any activities are likely to occur within construction working areas and to require no greater amount or duration of activity than assessed for construction). The decommissioning activities associated with end of life are leaving the cables in place, to minimise / avoid environmental disturbance, with above ground components removed. After the LSS has been decommissioned, the deconstruction will take place in the inverted sequence of installation. All equipment and materials including foundations will be demolished and disposed of, in accordance with the latest relevant guidance. The site will be reinstated.	Construction Phase Maximum footprint of construction related temporary infrastructures/works, as well as depth through ground where these features are present will be the MDS to consider, as well as length of time of construction phase as these factors affect the extent and duration to which access is limited. Decommissioning Phase Decommissioning is likely to operate within the parameters identified for construction.
Temporary sterilisation of mineral resources due to construction activities such as presence of	✓	x	✓	After the LSS has been decommissioned, the deconstruction will take place in the inverted sequence of installation. All equipment and materials including foundations will be demolished and disposed of, in accordance with the latest relevant guidance. The site will be reinstated.	Construction Phase Maximum footprint of construction related temporary infrastructures/works, as well as depth through ground where these features are

Impact	Phase			MDS	Explanation
	C	O&M	D		
temporary construction compounds					present will be the MDS to consider, as well as length of time of construction phase. <u>Decommissioning Phase</u> Decommissioning is likely to operate within the parameters identified for construction.
Release of contaminants to the ground, groundwater impacting soil or groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored or stockpiled materials by run-off or windblown dust. Mobilisation of contamination by foundation construction (e.g., piling) during construction.	✓	x	✓		<u>Construction Phase</u> Fuels and chemicals will be stored at construction compounds. The maximum number of construction compounds represents the MDS scenario for the risk of release of contaminants due to accidental spills. The maximum number, area, material type and size of material stockpiles will define the MDS for potential release through runoff or windblown dusts. This is directly proportional to the volumes of excavation provided for the LSS and cable trenches and landfall. Foundation design for the LSS could be raft or pile. Piled foundations represent the MDS as bored foundation construction could create new contaminant migration pathways to deeper groundwater, if not appropriately designed and managed. Temporary dewatering of export trenches, joint bays and link boxes will be required where shallow groundwater is encountered. The trenchless methods will include the need for drilling fluid, likely to comprise materials such as bentonite and/or polymer fluids. Additional additives may be required to maintain drilling fluid properties. Water will be required for use within the drilling fluid, which will likely be extracted from the mains supply, or tankered in. <u>Decommissioning Phase</u> Decommissioning is likely to operate within the parameters identified for construction.

Impact	Phase			MDS	Explanation
	C	O&M	D		
Changes to the level of risk from contaminated land where the MHPGC Project interacts with existing land contamination (e.g. removal of vegetation, ground reprofiling, removal of hardstanding). Potential for buried cable routes to act as a preferential pathway for migration of mobile contaminants.	✓	x	✓	<u>Construction Phase</u> <i>As per construction phase parameters set out within the above.</i> <u>Decommissioning Phase</u> <i>As per decommissioning phase parameters set out within the above.</i>	<u>Construction Phase</u> Mobilisation of contamination largely relates to disturbance through construction activities associated with the creation of migration pathways created during construction, O&M and decommissioning. In terms of contamination to groundwater, trenchless methods represent the MDS as they go deeper below the ground, increasing the likelihood of hydraulically connecting with groundwater in aquifers. <u>Decommissioning Phase</u> Decommissioning is likely to operate within the parameters identified for construction.
Impacts on groundwater levels and flows during construction works for the MHPGC Project - groundwater within the Secondary Aquifer (A & undifferentiated) and Principal Aquifers	✓	x	✓		<u>Construction Phase</u> The MDS is the greatest number of cable trenches, jointing bays, link boxes and construction compounds, as well as maximum dimensions of trenches, as this represents the greatest potential for contamination of groundwater quality as a result of land disturbance. Mobilisation of contamination largely relates to disturbance through construction activities associated with the creation of migration pathways created during construction, O&M and decommissioning. In terms of contamination to groundwater, trenchless methods represent the MDS as they go deeper below the ground, increasing the likelihood of hydraulically connecting with groundwater in aquifers. <u>Decommissioning Phase</u> Decommissioning is likely to operate within the parameters identified for construction.

Impact	Phase			MDS	Explanation
	C	O&M	D		
Accumulation of mine gas within enclosed spaces at the green LSS option leading to potentially toxic and/or explosive atmospheres in enclosed spaces.	x	✓	x	<u>O&M Phase</u> <u>Onshore export cable</u> Installation of ducts and cables - onshore export cable (HVDC) 320kV HVDC circuit comprising of Fibre Optic and Conductor cables Dimensions of trench for grid connection export cable (HVAC) – Blue LSS Number of export cables: 24 Length of cable route: 4,260m Number of cable trenches: 4 Width of cable corridor (temporary including permanent): 100m Onshore cable area (temporary): 426,000m² Trench width at top per circuit: 4.8m Trench width at base per circuit: 2.8m Trench depth per circuit: 1.8m Depth of stabilised backfill: 450mm Number of cable route joint bays: 32 Number of link boxes: 32 Volume of material excavated per joint bay: 2,264m³ (total = 18,112m³, assuming 4 circuits are jointed in a single excavation) Construction land take for joint bay (surface area): 1,472m² (total = 11,776m²) Volume of material excavated per link box: 12.5m³ Construction land take for link box: 100m² (total = 3200m²) Volume of material excavated (link boxes): 400m³ Dimensions of trench for onshore export cable (HVDC) – Blue LSS Number of export cables: 4 Length of cable route: 4.83km Width of cable corridor (temporary inc. permanent): 40m Number of cable trenches: 2 Onshore cable area (temporary): 193,200m²	<u>O&M Phase</u> The LSS and some sections of the onshore export cable will run through former mining sites. Mine gas accumulation in buildings or enclosed spaces poses a risk to human health in relation to potential asphyxiation risks and gas explosion, and to property, in relation to explosion. The MHPGC Project could introduce new receptors and has the potential to introduce new mine gas migration pathways into enclosed spaces without avoidance of mine gas hazards or suitable mitigation being in place.

Impact	Phase			MDS	Explanation
	C	O&M	D		
				Trench width at top: 6.85m Trench width at base: 4m Cable trench depth: 1.8m Depth of stabilised backfill: 450mm Number of cable route joint bays: 12 Volume of material excavated per joint bay: 700m³ Construction land take per joint bay (surface area): 600m² Volume of material excavated per monitoring box: 18m³ Volume of material excavated (for monitoring boxes): 216m³ Construction land take per monitoring box: 64m² Construction land take for all monitoring boxes: 768m² <u>LSS</u> Typical duration of operation: 35 years Area of permanent footprint: 6.5ha Impermeable permanent area: 3.5ha SuDS area: 2,300m² SuDS volume: 3,500m³ Number of permanent accesses: 2 Permanent access width: 15m Permanent access points: 2 Activities anticipated during operation: Monthly day visit inspections; Quarterly detailed inspections/ non-intrusive work; Annual turnaround/shutdown.	
The potential impacts of thermal emissions from buried high voltage cables on groundwater bodies	x	✓	x	<u>O&M Phase</u> <i>As per O&M phase parameters set out within the above.</i> As stated in Section 1.3.2, consultation on the subject of thermal emissions from buried cables has been undertaken with EWG members. The parameters for this assessment will be reviewed at ES stage and discussed with stakeholders as part of the ongoing consultation process.	<u>O&M Phase</u> The MDS is the use of cables with the greatest thermal emissions to ground from buried cables, the largest diameter, number and lengths of cables, as well as deepest buried depth.

Impact	Phase			MDS	Explanation
	C	O&M	D		
Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination	x	✓	✓	<u>O&M Phase and Decommissioning Phase</u> <u>Onshore export cable</u> Leave cables in place, to minimise/ avoid environmental disturbance. Leaving the cables in place has little or no environmental impact whilst recovering them would disturb the local environment. <u>LSS</u> Deconstruction in the inverted sequence of installation, after the LSS has been decommissioned. All equipment and materials including foundations will be demolished and disposed of, in accordance with the latest relevant guidance. The site will be reinstated.	<u>O&M Phase and Decommissioning Phase</u> The MDS is that below ground infrastructure for the onshore export cable and the LSS will include some hazardous substance content in the form of metal cables potentially fluid filled within some cables, and insulating layers around the cables that provide weather, water and heat-resistant or flame-retardant properties, also plastics, which could release micro-plastics to the environment if damaged.
<i>C = construction; O&M = operations and maintenance; D = decommissioning</i>					

1.7 Commitments adopted as part of the MHPGC Project

- 1.7.1.1 As set out in **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** and **Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR** several measures have been adopted as part of the MHPGC Project to reduce the potential for impacts on geology, hydrogeology and ground conditions.
- 1.7.1.2 Embedded mitigation includes the following measures as identified in the Institute of Sustainability and Environmental Professionals (ISEP), formerly the Institute of Environmental Management and Assessment (IEMA), Guide to Shaping Quality Development (IEMA, 2015):
- Primary mitigation - measures included as part of the project design. IEMA describes these as “modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken”. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the DCO and marine licence, or both;
 - Tertiary mitigation - IEMA describes these as “actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects”.
- 1.7.1.3 Embedded mitigation measures that will form part of the final design (and are established legislative requirements/good practice, or both) have been taken into account as part of the initial assessment presented in **Section 1.8** (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures that the Applicant is committed to are considered in the assessment of effects.
- 1.7.1.4 Where an assessment identifies likely significant adverse effects, secondary mitigation measures may be applied. These are measures that could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as “actions that will require further activity to achieve the anticipated outcome” and may be imposed as part of the planning consent, or through inclusion in the ES. These include measures required to reduce the significance of environmental effects and may be secured through an environmental management plan. For secondary mitigation measures both pre-mitigation and residual effects are presented.
- 1.7.1.5 The embedded measures relevant to geology, hydrogeology and ground conditions are outlined in **Table 1.16**. As there is a secured commitment to implementing these measures, they are considered inherently part of the design of the MHPGC Project and have therefore been considered in the assessment presented in **Section 1.8**.

Table 1.16: Embedded commitments relevant to geology, hydrogeology and ground conditions implemented as part of the MHPGC Project

Commitment number	Measure adopted	How the measure will be secured
CoT13	The Project Description (Volume 1, Chapter 2: Project Description, of the PEIR) sets out that the installation of the offshore export cables under Durham Coast SSSI and SAC will be undertaken by trenchless technologies. The exit pits associated with the trenchless technologies installation will be at least 100 m seaward of the eastern boundary of the Durham Coast SSSI and SAC.	Will be secured via dML condition
CoT16	An Onshore Decommissioning Plan will be developed prior to decommissioning. It will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention, protection of soils and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable.	Will be secured via DCO Schedule &/or Requirement
CoT17	Where practicable, the siting of the temporary and permanent footprint of the MHPGC Project will avoid areas of Flood Risk Zone 2 and 3, sensitive historic, cultural, ecological and other environmental receptors, both statutory and non-statutory, during the site selection process for the MHPGC Project.	Will be secured via DCO Schedule &/or Requirement
CoT18	An Outline Code of Construction Practice (CoCP) will be prepared and submitted with the application for development consent. A Detailed CoCP will be developed substantially in accordance with the Outline CoCP. The Outline CoCP will include (but is not limited to) measures to maintain and address: • flood protection and control measures; • water environment and drainage; • noise and vibration management measures; • air quality and dust management; • pollution prevention and management; • geology and ground conditions; • soil and materials management; • land use, tourism and recreational assets; • waste management.	Will be secured via DCO Schedule &/or Requirement
CoT21	An Outline Dust Management Plan (DMP) will form part of the Outline CoCP, which will be prepared and submitted as part of the application for development consent. A Detailed DMP will be developed substantially in accordance with the Outline DMP. The measures in the Detailed DMP will accord with guidance set out by the Institute of Air Quality guidance Management (IAQM, 2024) where appropriate and practicable, and will include measures for monitoring and reporting dust levels, and dust suppression and mitigation measures during construction.	Will be secured via DCO Schedule &/or Requirement

Commitment number	Measure adopted	How the measure will be secured
CoT23	An Outline Surface Water and Groundwater Management Plan (SWGMP) will form part of the Outline CoCP, will be submitted with the application for development consent. The Outline SWGMP will set out measures to protect surface water and groundwater during construction, covering surface water and drainage management measures, flood risk control measures, and management of foul water from construction compounds. A Detailed SWGMP will be developed substantially in accordance with the Outline SWGMP.	Will be secured via DCO Schedule &/or Requirement
CoT24	All aspects of the construction work will be in accordance with the Health and Safety at Work Act (1974) and regulations made under the Act, and the CDM Regulations 2015, together with any other applicable statutory health and safety requirements.	Will be secured via DCO Schedule &/or Requirement
CoT27	The onshore export cables and the AC connection cables will be completely buried underground for the entire length. No overhead pylons will be installed as part of the MHPGC Project.	Will be secured via DCO Schedule &/or Requirement
CoT29	Post-construction, the temporary working areas will be reinstated to pre-existing condition as far as reasonably practical, in line with best practice guidance.	Will be secured via DCO Schedule &/or Requirement
CoT33	An Outline Contaminated Land and Groundwater Discovery Strategy will form part of the Outline CoCP, which will be prepared and submitted with the application for development consent, to identify any suspected areas of contamination and any remedial measures which may be required. A Detailed Strategy will be developed substantially in accordance with the Outline Strategy and will identify the construction protocol for discovery of any currently unknown contamination and any remedial measures that may be required.	Will be secured via DCO Schedule &/or Requirement
CoT34	An Outline Pollution Prevention Plan (PPP) will form part of the Outline CoCP, which will be prepared and submitted with the application for development consent. A Detailed PPP will be developed substantially in accordance with the Outline PPP. This will include details of emergency spill procedures and good practice guidance such as the EA's Pollution Prevention Guidance notes (including Pollution Prevention Guidance notes 01, 05, 08 and 21) will be followed where appropriate, or the latest relevant available applicable guidance.	Will be secured via DCO Schedule &/or Requirement
CoT40	An Outline Soil Management Plan (SMP) will form part of the Outline CoCP, which will be prepared and submitted as part of the application for the development consent. A Detailed SMP will be developed substantially in accordance with the Outline SMP, in order to characterise and manage soil materials during construction. Soil types would be determined via site-specific survey work as set out in the Outline SMP.	Will be secured via DCO Schedule &/or Requirement

Commitment number	Measure adopted	How the measure will be secured
CoT43	An Outline Landscape and Ecological Management Plan (LEMP) will be prepared and submitted with the development consent application and will establish the mitigation and management measures relevant to terrestrial and intertidal ecology and conservation. It will include: - mitigation measures relating to protected or notable species and/or sensitive habitats; - appointment of an Ecological Clerk of Works (ECoW) where required; - details of mitigation planting at the onshore substation site including the number, location, species and details of management and maintenance of planting. A Detailed LEMP will be developed substantially in accordance with the Outline LEMP.	Will be secured via DCO Schedule &/or Requirement
CoT45	An Outline Site Waste Management Plan (SWMP) will form part of the Outline CoCP, which will be prepared and submitted with the development consent application. A Detailed SWMP will be developed substantially in accordance with the Outline SWMP, in consideration of the latest relevant available guidance.	Will be secured via DCO Schedule &/or Requirement
CoT46	An Outline Construction Fencing Plan will form part of the Outline CoCP, which will be prepared and submitted with the development consent application. All temporary working areas, including in relation to the Transition joint bays, onshore export cables, the preferred onshore LSS option, and the AC connection cables will be made clear through the use of signage and secured with appropriate fencing. A Detailed Construction Fencing Plan will developed substantially in accordance with the Outline Construction Fencing Plan.	Will be secured via DCO Schedule &/or Requirement
CoT47	An Outline Bentonite Breakout Plan will form part of the Outline CoCP, which will submitted as part of the application for the development consent. A Detailed Bentonite Breakout Plan will be developed substantially in accordance with the outline plan.	Will be secured via DCO Schedule &/or Requirement
CoT48	An Outline Biosecurity Protocol will form part of the Outline CoCP, which will be prepared and submitted as part of the application for the development consent. It will include measures such as the use of proven invasive species control and other biosecurity measures to avoid the spread of INNS and INNS contaminated materials. A Detailed Biosecurity Protocol will be developed substantially in accordance with the Outline Biosecurity Protocol.	Will be secured via DCO Schedule &/or Requirement
CoT49	An Outline Onshore Construction Method Statement (CMS) will form part of the Outline CoCP, which will be prepared and submitted as part of the application for development consent. A Detailed Onshore CMS will be produced substantially in accordance with the Outline Onshore CMS and will include details of cable installation and methodology.	Will be secured via DCO Schedule &/or Requirement
CoT50	An Outline Onshore Written Scheme of Investigation will be prepared and submitted as part of the application for the development consent. The Outline Onshore Written Scheme of Investigation will contain an Outline Pre- Commencement and Enabling Works Archaeology Execution Plan. The Outline Onshore WSI will be developed to provide details on the elements of archaeological survey, evaluation and mitigation that will be undertaken in advance for each stage of the MHPGC Project for any ground breaking works during construction.	Will be secured via DCO Schedule &/or Requirement

Commitment number	Measure adopted	How the measure will be secured
CoT51	An Onshore Crossing Schedule will be submitted with the application for development consent based on the refined design for the application. The following features will be crossed using trenchless techniques: - A, B and Classified unnumbered roads (known as C roads) (including the A19 and B1432); - all railway lines (including the section of railway line which runs between Seaham and Horden); - the Durham Coast SSSI and SAC; - Hesledon Moor East SSSI.	Will be secured via DCO Schedule &/or Requirement
CoT59	An Outline Landfall CMS will form part of the Outline CoCP, which will be prepared and submitted as part of the application for development consent. A Detailed Landfall CMS will be produced substantially in accordance with the Outline Landfall CMS and will include details of cable installation and methodology.	Will be secured via DCO Schedule &/or Requirement
CoT61	An Outline Spillage and Emergency Response Plan will form part of the Outline CoCP, which will be prepared and submitted as part of the application for development consent. It will set out the spill prevention practices that may be undertaken during construction for those activities that prevent the risk of a spillage. A Detailed Spillage and Emergency Response Plan will be developed in accordance with the outline plan.	Will be secured via DCO Schedule &/or Requirement
CoT62	A Design Principles will be produced and submitted as part of the application for development consent. It will focus on design elements associated with the onshore LSS fulfilling the requirement for 'good design', as prescribed in the National Policy Statements EN-1, EN-3 and EN-5.	Will be secured via DCO Schedule &/or Requirement

1.8 Assessment of impacts

1.8.1 Overview

- 1.8.1.1 This section includes the assessment of the impacts to geology, hydrogeology and ground conditions arising from the construction, O&M and decommissioning phases of the MHPGC Project. A summary of the effects is presented in **Table 1.18**.
- 1.8.1.2 In regard to potential impacts on land contamination receptors, the assessment is informed principally by the conclusions of the PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).
- 1.8.1.3 The PRA develops a preliminary conceptual site model and includes a risk assessment table. Most of the identified pollutant linkages (contaminant [source] – pathway – receptor linkages) are assessed as Low to Moderate/low risk. Moderate risks have been identified to future site users and buildings associated with the future development from risks due to potentially elevated concentrations of soil gas (methane and carbon dioxide). Moderate risks have also been identified to the Secondary A and Principal aquifers from historical tanks present in the west of the site associated with former combined mine. High risks have been identified to future site users and the future development associated with mine gas.

1.8.2 Construction phase: Geology receptors

Permanent loss of or damage to a locally or nationally important geological features

Receptor sensitivity

- 1.8.2.1 Designated geological sites within the Geology Study Area comprise:
- Durham Coast SSSI, located along the coastline in the east of the MHPGC Project PEIR Red Line Boundary: Onshore;
 - Nose's Point LNR in the northeast of the MHPGC Project PEIR Red Line Boundary: Onshore and to the immediate east of the landfall (between the landfall and Durham Coast SSSI);
 - Hawthorn Quarry SSSI is present in the geology study area immediately south of the MHPGC Project PEIR Red Line Boundary: Onshore in the southeast.
- 1.8.2.2 Based on the presence of the designations listed above, and with reference to **Table 1.8**, it is considered that the receptor sensitivity, of nationally and regionally important geological features within the geology study area (see **Section 1.4**), is high for the SSSIs and medium for the LNR.

Magnitude of impact

- 1.8.2.3 The permanent above ground development required for the MHPGC Project will avoid sensitive geological features, including statutory and non-statutory sites (CoT17) by design where practicable. Onshore works at the surface at landfall, associated with the TJBs and trenchless technique entry pits, will be located to the west of the railway and outside of the designated areas. As set out in **Volume 1, Chapter 2: Project Description, of the PEIR** and the MDS (**Table 1.15**), the offshore export cables will be installed using trenchless methods at the depth of up to 60m bgl (in the intertidal area) and up to 80m bgl (landward of MHWS), they will be jointed to the onshore export cable at TJBs.
- 1.8.2.4 The exact trenchless drill alignment will be finalised during detailed design but as per CoT13, the installation of the offshore export cables under Durham Coast SSSI and SAC will be undertaken by trenchless technologies. The exit pits associated with the trenchless technologies installation will be at least 100 m seaward of the eastern boundary of the Durham Coast SSSI and SAC. The trenchless method will direct impact on the designated sites.
- 1.8.2.5 The MHPGC Project will not directly impact the adjacent offsite Hawthorn Quarry SSSI.
- 1.8.2.6 With reference to **Table 1.9**, the magnitude of impact during the construction phase, in relation to the permanent loss of or damage to locally or nationally important geological features, is considered to be negligible.

Significance of effect

- 1.8.2.7 Overall, it is considered that the receptor sensitivity is **high** or medium and the magnitude of permanent loss of or damage to a locally or nationally important geological features is **negligible**. Therefore, the effect of permanent loss of or damage to a locally or nationally important geological features, during the construction phase, is considered to be **minor** for high sensitivity features and **negligible or minor** for medium sensitivity features, which is **not significant** in EIA terms.

Additional mitigation and residual effect

- 1.8.2.8 No additional mitigation measures are proposed. As above, the residual effect of permanent loss of or damage to a locally or nationally important geological features, during the construction phase, is considered to be minor, which is not significant in EIA terms.

Temporary loss of access to geological features with statutory conservation designations

Receptor sensitivity

- 1.8.2.9 Designated geological sites within the geology study area comprise:
- Durham Coast SSSI/ SAC, located along the coastline in the east of the MHPGC Project PEIR Red Line Boundary: Onshore;
 - Nose's Point LNR in the northeast of the MHPGC Project PEIR Red Line Boundary: Onshore, to the immediate east of the landfall (between landfall and the Durham Coast SSSI);
 - Hawthorn Quarry SSSI is present in the geology study area immediately south of the MHPGC Project PEIR Red Line Boundary: Onshore in the southeast.
- 1.8.2.10 Based on the presence of the designations listed above, and with reference to **Table 1.12**, it is considered that the receptor sensitivity, of nationally and regionally important geological features within the geology study area (see **Section 1.4**), is high for the SSSIs and medium for the LNR.

Magnitude of impact

- 1.8.2.11 The MHPGC Project will avoid surface disturbance to sensitive features, including statutory and non-statutory sites (CoT17) where practicable. Onshore works for the landfall will be located to the west of the railway and are outside the designated areas. As set out in **Volume 1, Chapter 2: Project Description, of the PEIR** and the MDS (**Table 1.15**), the cables will be installed using trenchless techniques at the depth of up to 60m bgl (in the intertidal area) and up to 80m bgl (landward of MHWS), they will be jointed to the onshore export cable at TJBs.
- 1.8.2.12 The exact trenchless drill alignment will be finalised during detailed design, but it will, at minimum, pass beneath the intertidal area (MHWS to MLWS) and Durham Coast SSSI, Nose's Point LNR and the railway line thereby avoiding, permanent loss or damage. The trenchless method will avoid direct impacts on the designated sites and the visible geological features, which will be retained for future observation and enjoyment.
- 1.8.2.13 The MHPGC Project will not directly impact the adjacent offsite Hawthorn Quarry SSSI.
- 1.8.2.14 Furthermore, the maximum period for the duration of the landfall installation and the construction of the onshore cable corridor and AC connection cables will be 3.5 years. The MHPGC Project will implement a CoCP through the construction phase (CoT18). As per CoT17, where practicable, siting of the permanent and temporary footprint of the MHPGC Project will avoid areas of Flood Risk Zone 2 and 3, sensitive historic, cultural, ecological and other environmental receptors, both statutory and non-statutory, during the site selection process for the MHPGC Project.
- 1.8.2.15 With reference to **Table 1.9**, it is considered that the magnitude of impact during the construction phase, in relation to the temporary loss of access to geological features, is considered to be negligible.

Significance of effect

- 1.8.2.16 Overall, it is considered that the receptor sensitivity is **high** or **medium** and the magnitude of the temporary loss of access to geological features with statutory conservation designations during the construction phase is **negligible**. Therefore, the effect of the temporary loss of access to geological features with statutory conservation designations during the construction phase is considered

based on **Table 1.10** to be **minor** for high sensitivity features and **negligible** or **minor** for medium sensitivity features, which is **not significant** in EIA terms.

Additional mitigation and residual effect

- 1.8.2.17 No additional mitigation measures are proposed. As above, the residual effect of permanent loss of or damage to a locally or nationally important geological features, during the construction phase, is considered to be negligible to minor, which is not significant in EIA terms.

1.8.3 Construction phase: Minerals receptors

Sterilisation of mineral resources due to permanent development (including landfall, LSS and buried cables) in or near existing or allocated mineral sites

Receptor sensitivity

- 1.8.3.1 Hawthorn Quarry is identified by the County Durham Local Plan as an existing minerals site and an allocated site within the County Durham Local Plan and is therefore considered a high sensitivity resource. However, Hawthorn Quarry has not been worked since 1993 and although it formally has extant planning permissions for minerals extraction, it requires a ROMP application to be consented before works could recommence. A ROMP application was submitted to Durham County Council in 2017 and remains undetermined with the latest correspondence on the planning application file dating from 2019. Without the approval of the ROMP application, quarrying cannot take place. Hawthorn Quarry is located partly within the MHPGC Project PEIR Red Line Boundary: Onshore and the majority of the quarry (other than some land near its southern boundary) is within the 250m study area identified.
- 1.8.3.2 The County Durham Local Plan also identifies a 500m wide mineral safeguarding zone around Hawthorn Quarry, which lies within both the MHPGC Project PEIR Red Line Boundary: Onshore and within the 250m study area identified. All of the MHPGC Project PEIR Red Line Boundary: Onshore between the Durham Coast Rail Line and the B1432 Stockton Road is part of a Magnesian Limestone MSA. Both of these safeguarding areas are of medium sensitivity.

Magnitude of impact: Hawthorn Quarry: existing minerals site

- 1.8.3.3 The 2017 ROMP application describes a proposed working scheme for the quarry which presumably would have seen extraction take place from the late 2010s, until 2042 (the end date of the extant permissions for extraction purposes). The quarry would then be restored over the next two years. Working would take place within the existing site boundary and largely within the existing quarry void area (in the western half of the quarry), with the eastern half of the quarry (including the land at the landfall) continuing its historic use for overburden deposits. The proposed MHPGC Project access track would follow a current access track route through the overburden deposit area of the quarry.
- 1.8.3.4 If Hawthorn Quarry was to have its ROMP application approved and it was to recommence operations, any MHPGC Project works would need to take place far enough away from the quarry to avoid any potential impacts on the MHPGC Project from land stability or vibration due to quarry excavation and blasting operations. This would in turn mean that the quarry could excavate rock without being impacted by the MHPGC Project. The presence of MHPGC Project land within Hawthorn Quarry's overburden deposit area could mean less land is available for overburden deposits. However, as there is now less time available for extraction than there was at the time of the ROMP application, a more limited scheme of working would now have to occur due to the shorter time period now available for extraction. Given the land which is available within the overburden area of the quarry, it is expected that overburden deposition could be moved to areas of land which would not be affected by the MHPGC Project and therefore quarrying could continue with an amended quarry design. This is therefore considered to be a minor adverse magnitude of impact on quarry operations, as the overall viability of the quarry would not be affected.
- 1.8.3.5 However, given that the ROMP application has been undetermined since 2017, it is uncertain whether extraction will re-commence at Hawthorn Quarry.

Magnitude of impact: Hawthorn Quarry: allocated minerals site

- 1.8.3.6 Regardless of the position with the ROMP application, Hawthorn Quarry is also an allocated site for minerals extraction in the County Durham Local Plan. As the allocation does not provide any detail

on how the quarry could potentially be worked, the ROMP application provides the most realistic assumption on working methods, with extraction focussed on the historic void to the west and overburden deposition onto the east. As such the effect would be the same as for the existing quarry with a deliverable planning permission, i.e. a minor adverse magnitude of impact.

Magnitude of impact: Magnesian Limestone MSA

- 1.8.3.7 Due to the location and the extent of the Magnesian Limestone MSA, running from the B1432 in the west to the Durham Coast rail line to the east, and the location of Seaham to the north and wooded areas such as Hawthorn Dene Nature Reserve to the south, it is not possible to avoid the MSA. Therefore, several MHPGC Project activities will occur during the construction stage which will create permanent development within the Magnesian Limestone MSA.
- 1.8.3.8 The extent to which this permanent development will impact on the Magnesian Limestone MSA will depend on a number of factors including the final design of the MHPGC Project, how other developments in the area may already impact on the MSA and create sterilisation effects and information available on the mineral deposit itself. In establishing final design for DCO submission, the MHPGC Project will seek to minimise its impact on the MSA. However, due to the nature of an MSA it is expected that the MHPGC Project will result in some level of adverse effect, and at this stage it is assumed this would be significant.

Significance of effect

- 1.8.3.9 If Hawthorn Quarry is considered as an existing quarry with an extant and deliverable planning permission, then it is a high receptor sensitivity. A minor adverse magnitude of effect on its operational viability would result, creating a moderate impact which is considered to be significant in EIA terms. The same impact occurs on Hawthorn Quarry as an allocated site in the County Durham Local Plan.
- 1.8.3.10 These impacts from permanent development will then continue throughout the Operation and Maintenance phase of the MHPGC Project. As proposed and agreed in the Scoping process, these effects are therefore not assessed again in the following Operation and Maintenance section of this chapter.
- 1.8.3.11 The Magnesian Limestone MSA is considered to be a medium sensitivity receptor. Whilst the magnitude of change is not yet known, this is currently assumed to be a moderate or major adverse magnitude. This will result in a moderate or major adverse impact, which would be considered to be significant in EIA terms.

Additional mitigation and residual effect

- 1.8.3.12 Mitigation in relation to minerals resources can only take the form of prior extraction, where the mineral is extracted prior to the development of the proposed works. However, whilst this approach works well for shallow mineral deposits, it is not practicable for surface minerals that extend to depth. This is because the deep void that is left following prior extraction is rarely suitable for subsequent development. Prior extraction is therefore unlikely to be a proportionate or viable mitigation method for the MHPGC Project, especially given the outline form that a cable installation development takes. This will however be considered in more detail as the design for the MHPGC Project progresses, and it may also be possible to provide mitigation by detailed routing and siting work.

Temporary sterilisation of mineral resources due to construction activities such as presence of temporary construction compounds

Receptor sensitivity

- 1.8.3.13 Receptor sensitivity remains the same as for permanent impacts: a high sensitivity for Hawthorn Quarry if considered as an existing site with a deliverable planning permission and as an allocated site, and medium sensitivity for Hawthorn Quarry's minerals safeguarding zone and the other minerals safeguarding areas.

Magnitude of impact: Hawthorn Quarry: existing and allocated minerals site

- 1.8.3.14 No construction compounds or other temporary working areas are planned within Hawthorn Quarry. In addition, if any temporary working areas were to be located within the 500m safeguarding zone

from the quarry, these would need to be located so as not to impact on, or be impacted by, any potential quarrying operations.

Magnitude of impact: Magnesian Limestone MSA

- 1.8.3.15 Construction works within the MSA will require temporary construction compounds associated with the landfall works, the A19 trenchless crossing, and the onshore export cable route.
- 1.8.3.16 Temporary construction compounds associated with the cable route will not lead to additional sterilised resources as these will be within the cable corridor and impacts will already occur from the cable corridor itself.
- 1.8.3.17 The compounds relating to the landfall would require an area of 49,800m² and are located in an area with an estimated 45m thick seam of magnesian limestone resource. In a worst-case scenario they could be located outside of the 500m housing buffer which would see the temporary sterilisation of 2,241,000m³ of magnesian limestone resources.
- 1.8.3.18 The construction compound associated with the A19 trenchless crossing will have an area of 60,000m², and assuming a limestone thickness of 100m given the 105mAOD ground level, a worst-case scenario could temporarily sterilise 6,000,000m³ of limestone resource.
- 1.8.3.19 As with the impacts of permanent development occurring during the construction phase, the extent to which these temporary developments will impact on the Magnesian Limestone MSA will depend on a number of factors including the final design of the MHPGC Project, how other developments in the area may already impact on the MSA and create sterilisation affects and information available on the mineral deposit itself. However, due to the nature of an MSA it is expected that the MHPGC Project will result in some level of adverse effect on the MSA, but given these will be temporary impacts it is assumed that a minor adverse effect would occur.

Significance of effect

- 1.8.3.20 If Hawthorn Quarry is considered as an existing quarry with an extant and deliverable planning permission, then it has a **high** receptor sensitivity. A **negligible** adverse magnitude of effect on its operational viability would result, creating a **minor** impact which is considered to be **not significant** in EIA terms. The same impact occurs on Hawthorn Quarry as an allocated site in the County Durham Local Plan.
- 1.8.3.21 The Magnesian Limestone MSA is considered to be a **medium** sensitivity receptor and effects are assumed to have a **minor** adverse magnitude. This would result in a **minor** adverse impact, which is considered to be **not significant** in EIA terms.

Additional mitigation and residual effect

- 1.8.3.22 No additional mitigation measures are proposed.

1.8.4 Construction phase: Land contamination receptors

Release of contaminants to the ground impacting soil or groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored or stockpiled materials by run-off or windblown dust, mobilisation of contamination by foundation construction (e.g., piling)

Receptor sensitivity

- 1.8.4.1 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the construction phase and their sensitivity according to **Table 1.8** are as follows:
- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity;
 - Controlled Waters – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations

which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively.

- 1.8.4.2 For the assessment, it is assumed that during construction of the MHPGC Project, risks to site users, including site workers, visitors to the construction site, and construction/ground workers) will be controlled by adherence to legislation including the Construction (Design and Management) Regulations 2015 (CDM) and the Health and Safety at Work Act (1974) (CoT35) and these receptors are therefore not included in this assessment.
- 1.8.4.3 Potential impacts on groundwater abstractions, are assessed in **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**.
- 1.8.4.4 Surface water receptors with respect to pollution prevention during construction, have been considered in **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**.

Magnitude of impact

- 1.8.4.5 During construction, accidental spills or leaks could impact the shallow soils associated with made ground and superficial deposits. Infiltration and migration of contaminants at or near ground surface into groundwater may be limited by the likely low volumes of contaminants that could plausibly be released as well as attenuation of contaminants in the ground (vertically downwards and laterally). However, spills or leaks of contaminants could still pose a risk to the Secondary Aquifer, potentially resulting in impacts on groundwater quality in the aquifer.
- 1.8.4.6 The deeper, more sensitive Principal Aquifer, is protected by the overlying superficial formations of till extending across most of the MHPGC Project PEIR Red Line Boundary: Onshore. The till will restrict vertical migration of contaminants downwards (the Principal Aquifer outcrops in a small area of the MHPGC Project PEIR Red Line Boundary: Onshore (<5%). However, there is a risk that contaminants could infiltrate the ground and leach into the groundwater, potentially resulting in effects on the Principal Aquifer where the Magnesian Limestone outcrops or where excavations and piling increase the potential for pathways.
- 1.8.4.7 In relation to human health receptors, the exposure routes that could result in a health impact include direct contact with contaminants in soils due to leaks, spills or contaminant migration (e.g., as surface runoff, or leaching from stockpiles), inhalation of windblown dusts or fibres, ingestion of contaminants in surface or near surface soils, or inhalation of vapours from contaminants in the subsurface.
- 1.8.4.8 The release of contaminants can be effectively managed through compliance with the Health and Safety at Work Act and CDM (CoT24), implementation of good practice environmental management measures to be set out in the Outline CoCP (CoT18), a Contaminated Land and Groundwater Discovery Strategy (CoT33), the Outline Pollution Prevention Plan (CoT34), and an Outline DMP (CoT21).
- 1.8.4.9 In relation to materials management planning and stockpiled materials or excavated soils, the MHPGC Project is committed to the development of an Outline SWMP (CoT45). Through implementation of the Contaminated Land and Groundwater Discovery Strategy (CoT33), any excavated material suspected to be contaminated would be subject to appropriate segregation, containment, testing, and risk assessment, in accordance with LCRM (EA, 2025), and if necessary, would either be removed or treated for the MHPGC Project. These commitments will limit the potential for uncontrolled releases to occur and enable successful management of any contaminant releases to both ground, groundwater and surface water receptors and to ensure safe construction practices.
- 1.8.4.10 Construction work for the MHPGC Project is generally unlikely to interact directly with the Principal Aquifer given the shallow nature of the cable trenches (with the exception of piling, if required for the LSS foundations, which is considered below). As set out in the MDS (**Table 1.15**), the onshore export and AC connection cable trenches will be placed at a typical depth of 1.8m. As outlined in **Section 1.4**, the underlying anticipated geology comprises a variable thickness of Till (Superficial Deposits), recorded between 4.8m and 26.8m, above the Principal Aquifer. This limits the potential interaction between the existing land contamination, construction activities and the Principal Aquifer.

- 1.8.4.11 Rotary bored piles and shallow suspended structures are both considered for the LSS and foundation design. If piling is needed in areas affected by land contamination, a piling risk assessment will be undertaken, in accordance with CL:AIRE (2025) guidance where required.
- 1.8.4.12 With the implementation of the commitments, and with reference to **Table 1.109**, the magnitude of impacts from release of contaminants to groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored materials by run-off or windblown dust to groundwater, foundation construction activities, during the construction phase, is considered to be **negligible**.

Significance of effect

- 1.8.4.13 As the most sensitive receptor (the Principal Aquifer) has **very high** sensitivity, and the magnitude of impacts with the mitigation measures is **negligible**, the resulting effect on contaminated land receptors based on the matrix in **Table 1.10**, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.4.14 No additional mitigation measures are proposed.

1.8.5 Construction phase: Hydrogeology impacts

Impacts on groundwater levels and flow during construction works for the MHPGC Project - groundwater within the Secondary Aquifer (A & undifferentiated) and Principal Aquifers

Receptor sensitivity

- 1.8.5.1 The groundwater within the Secondary A Aquifer & Secondary undifferentiated Aquifer is present within the shallow subsurface. Based on the presence of the designated aquifer, and with reference to **Table 1.8**, the receptor sensitivity of the Superficial Aquifer (Secondary A Aquifer /undifferentiated) is considered to be **medium**.
- 1.8.5.2 The groundwater within the Principal Aquifer has been classified by the EA under the WFD as having poor chemical quality and good quantitative status, resulting in a poor overall status. The primary reason for the poor chemical classification is poor nutrient management from agriculture and rural land management.
- 1.8.5.3 Despite the current poor chemical status, the importance of the Principal Aquifer for regional water supply and ecological support means the sensitivity of this receptor, with reference to **Table 1.8**, is considered to be **very high**.

Magnitude of impact

- 1.8.5.4 During the construction phase of the MHPGC Project, activities such as the installation of the onshore export cable and AC connection cable (including watercourse crossings) and associated earthworks could potentially interact with and impact groundwater levels and flows by reducing recharge, creating barriers to flow, and potentially introducing additional flow pathways.
- 1.8.5.5 As set out in the MDS (**Table 1.15**), the onshore export cable and AC connection cable trenches will be placed at a typical depth of 1.8m bgl. As outlined in **Section 1.4**, the underlying anticipated geology comprises a variable thickness of Till (Superficial Deposits), which has been recorded between 4.8m and 26.8m in thickness. Based on the MHPGC Project utilising trenched crossing methods at watercourses, i.e. the upper reaches of the Dalton Beck, the duration of in-channel works, and reinstatement will be limited and undertaken at an appropriate seasonal period to reduce impacts. Substantial interactions with groundwater are not expected and with mitigation no substantial lowering of the water table to facilitate construction is not anticipated. Construction along the cable route is likely to be completed in phases and should groundwater levels be affected, impacts are likely to be localised, short-term and temporary during construction phase activities only, and will not extend widely across the MHPGC Project PEIR Red Line Boundary: Onshore. Once construction is complete, the groundwater levels are expected to return to normal.
- 1.8.5.6 Relevant mitigation measures adopted for the MHPGC Project that will mitigate impacts include the commitment to the Outline CoCP (CoT18) and careful design and management of excavations to minimise groundwater disturbance, control and monitoring of dewatering activities, and appropriate

reinstatement of excavations to restore natural groundwater flow through the commitment to provide an Outline SWGMP (CoT23) and the requirements to comply with National Policy Statement EN-1, EN-3 and EN-5. Measures including phased construction and good practice handling and reinstating of soils will be included in the Outline SMP (CoT40) and this will also manage and reduce potential impacts on groundwater levels.

- 1.8.5.7 Any change in groundwater levels arising from subsurface obstructions to groundwater flow, i.e. sub-surface cable and building foundations, are likely to be limited given the relatively shallow depth of most excavations compared to the extent of any superficial groundwater bodies. In addition, above-ground infrastructure has the potential to affect surface runoff and infiltration rates, which could affect groundwater recharge, but again given the extent of any superficial groundwater bodies any impacts on recharge are expected to be minimal.
- 1.8.5.8 The Principal Aquifer is generally confined beneath superficial deposits of Till, which the construction activities are not likely to penetrate. Construction activities are unlikely to reach the water table in the Principal Aquifer, owing to its depth and the presence of the overlying Till, thereby limiting potential interaction between construction for the MHPGC Project and groundwater in the Principal Aquifer.
- 1.8.5.9 In the unlikely event of groundwater levels in the Principal Aquifer being affected, any impact is likely to be localised, short-term and temporary during construction phase activities only, and would not extend widely across the MHPGC Project. Once construction is complete, the groundwater levels are expected to return to normal.
- 1.8.5.10 Based on the adopted mitigation measures, and with reference to **Table 1.9**, the magnitude of impacts from onshore export cable and AC connection cable (including watercourse crossings) and associated earthworks resulting in a potential impact on groundwater levels and flows, during the construction phase, is therefore considered to be **negligible**.

Significance of effect

- 1.8.5.11 With the above measures in place, effects on groundwater levels would be localised, temporary, and reversible. Groundwater levels are expected to recover to baseline conditions following completion of construction.
- 1.8.5.12 Overall, it is considered that the highest receptor sensitivity is **very high** and the magnitude of impacts resulting in a potential impact on groundwater levels and flows is **negligible**. Therefore, the most significant effect of onshore export cable and AC connection cable (including watercourse crossings) and associated earthworks resulting in a potential impact on groundwater levels and flows, during the construction phase, is considered to be **minor**, which is **not significant** in EIA terms.

Additional mitigation and residual effect

- 1.8.5.13 No additional mitigation measures are proposed.

Potential impacts from dewatering to the Magnesian Limestone aquifer (Principal Aquifer)

Receptor sensitivity

- 1.8.5.14 The hydrogeology study area is located on a Principal Aquifer associated with the underlying bedrock and includes Groundwater SPZ1, SPZ2 and SPZ3. There are potable water abstraction points within the hydrogeology study area, which has the potential to be impacted by dewatering of the aquifer (although no over-pumping or direct abstraction of the Principal Aquifer is envisaged based on the parameters within the MDS).
- 1.8.5.15 Based on the above aquifer designation, and in reference to **Table 1.12**, the receptor sensitivity is considered to be very high.

Magnitude of impact

- 1.8.5.16 Dewatering of Magnesian Limestone aquifer (Principal Aquifer) may lead to short-term loss of regionally important water supply.
- 1.8.5.17 Based on the parameters within the MDS (**Table 1.15**), no over-pumping of the Magnesian Limestone Aquifer is anticipated during construction (or any other phases) of the MHPGC Project. Alongside implementation of measures including the SWGMP (CoT23), whereby good practices and control

and monitoring will be followed for any groundwater dewatering activities, the magnitude of the impact is minimised.

- 1.8.5.18 The Principal Aquifer is generally confined beneath superficial deposits of Till, which the construction activities are not likely to penetrate. Construction activities are unlikely to reach the water table in the Principal Aquifer, owing to its depth and the presence of the overlying Till, thereby limiting potential interaction between construction for the MHPGC Project and groundwater in the Principal Aquifer.
- 1.8.5.19 Based on the avoidance of over-pumping of the Magnesian Limestone aquifer, implemented good practices and monitoring of any groundwater dewatering activities, and in reference to **Table 1.9**, the magnitude of potential impacts from dewatering to the Magnesian Limestone aquifer, during the construction phase, is considered to be negligible.

Significance of effect

- 1.8.5.20 Overall, it is considered that the receptor sensitivity is **very high** and the magnitude of potential impacts from dewatering to the Magnesian Limestone aquifer, during the construction phase, is **negligible**. Therefore, the effect of potential impacts from dewatering to the Magnesian Limestone aquifer, during the construction phase, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.5.21 No additional mitigation measures are proposed.

1.8.6 Operation and maintenance phase: Land contamination receptors

Changes to the level of risk to contaminated land receptors where the MHPGC Project interacts with pre-existing land contamination, potential for subsurface cable routes to act as a preferential pathway for migration of mobile contaminants

Receptor sensitivity

- 1.8.6.1 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the construction phase and their sensitivity according to **Table 1.8** are as follows:
- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity.
 - Controlled water – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively.

Magnitude of impact

- 1.8.6.2 Most land within the MHPGC Project PEIR Red Line Boundary: Onshore is undeveloped agricultural land and is therefore expected to be generally free of contamination that could pose a significant risk to human health, the environment, or property. However, within the MHPGC Project PEIR Red Line Boundary: Onshore, there are areas where historical potentially contaminative land uses have taken place. These include coal mining, quarrying, infilling of land and refuse heaps (mainly associated with former mining or quarrying), railway land, former tanks, sludge beds, and substations. Within the land contamination study area there is also a historical landfill. The largest area of previously developed or brownfield land is in the northwest of the MHPGC Project PEIR Red Line Boundary: Onshore at the former Hawthorn Combined Mine. The former mine is adjacent to other industrial developments at Jade Business Park, resulting in the Green LSS Option being entirely within brownfield land that is potentially affected by land contamination.
- 1.8.6.3 Construction of the MHPGC Project will result in changes to the existing ground conditions, such as removal or capping of existing soil layers and replacement with engineered materials or imported soils, also construction of above and below ground infrastructure, including foundations for the substation, that could create new contaminant migration pathways, without suitable measures being

in place. There could also be potential for new underground cable routes to act as preferential pathways for contaminants to migrate in groundwater, without suitable measures being in place.

- 1.8.6.4 Construction work for the MHPGC Project is generally unlikely to interact directly with the Principal Aquifer given the shallow nature of the cable trenches (with the exception of piling, if required for the LSS foundations, which is considered above). As set out in the MDS (**Table 1.15**), the onshore export and AC connection cable trenches will be placed at a typical depth of 1.8m. As outlined in Section 1.4, the underlying anticipated geology comprises a variable thickness of Till (Superficial Deposits), recorded between 4.8m and 26.8m, above the Principal Aquifer. This limits the potential interaction between the existing land contamination, construction activities and the Principal Aquifer.
- 1.8.6.5 In relation to the potential for the MHPGC Project to introduce or increase land contamination risks to human health, environmental receptors, or property (including the built environment), and the potential for cable routes to provide preferential contaminant migration pathways, during operation, the main mitigation is the MHPGC Project's commitment to producing Design Principles. The Design Principles will fulfil the requirement for 'good design', as prescribed in the National Policy Statements EN-1, EN-3 and EN-5 (CoT62).
- 1.8.6.6 The design of the MHPGC Project is being informed by assessment of land contamination risks in accordance with LCRM (EA, 2025). This means that for the operational phase, the potential risks associated with land contamination will have already been controlled by ensuring that land required for the MHPGC Project is suitable for the proposed use. Assessments completed to date include the Geoenvironmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**).
- 1.8.6.7 At the Green LSS Option it is anticipated that some remedial work will be needed to ensure that the land is suitable for use. This is based on information available for the development of the Hawthorn Pit Substation on nearby land within the MHPGC Project PEIR Red Line Boundary: Onshore (see baseline in **Section 1.4**). There is potential for improvement in land condition in this area based on removal or treatment of existing contamination for the MHPGC Project, which could result in lower risks than are currently present for human health, and the environment, and a positive impact, however at present this is not confirmed.
- 1.8.6.8 With the mitigation measures, and with reference to **Table 1.9**, the magnitude of adverse impacts arising from changes to the level of risk to contaminated land receptors is considered to be negligible. There is also the potential for positive impacts at the Green LSS Option.

Significance of effect

- 1.8.6.9 As the most sensitive receptor (the principal aquifer) has **very high** sensitivity, and the magnitude of impacts with the mitigation measures is **negligible**, the resulting effect on contaminated land receptors based on the matrix in **Table 1.10**, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.6.10 No additional mitigation measures are proposed.

Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination

Receptor sensitivity

- 1.8.6.11 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the operation and maintenance or decommissioning and their sensitivity according to **Table 1.8** are as follows:
- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity.
 - Controlled water – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively.

- Controlled water – surface water receptors: Dalton Beck and a tributary of Hawthorn Burn are within the MHPGC Project PEIR Red Line Boundary: Onshore and are therefore considered to be of **high** sensitivity.

Magnitude of impact

- 1.8.6.12 By the operational phase, potential risks associated with land contamination would have already been controlled by ensuring that land required for the MHPGC Project is suitable for the proposed use in line with LCRM. However, the MHPGC Project includes the use of buried electrical cables as part of the onshore components. Both the onshore export cables and AC connection cables are not anticipated to be fluid filled with potential pollutants. At this point for a worst-case scenario, the assessment considers that cables will have some hazardous substance content, as required to ensure the effective and safe operation of the cables. This could include the metal cables, and potentially be fluid filled within some cables, and other materials in insulating layers around the cables to provide weather, water and heat-resistant or flame-retardant properties, also plastics, which could release micro-plastics to the environment if damaged.
- 1.8.6.13 As outlined in **Volume 1, Chapter 2: Project Description, of the PEIR**, there will be regular onsite maintenance of equipment. Faults would be identified through remote monitoring of performance and regular maintenance.
- 1.8.6.14 The cables being buried typically at 1.8m depth (**Table 1.15**) will protect them from damage during their normal operation and following decommissioning. In the unlikely event of damage to buried cables being suspected or identified, appropriate actions would be taken during operation to repair and replace cables as needed. Potential corrective works may include re-terminating joints, performing partial-discharge or other diagnostic tests and, if a cable fails, pulling in a replacement length or applying an alternative repair method. Appropriate chemical testing of soils and groundwater for relevant contaminants, if it appears that contaminants could have been released from damaged cables could be undertaken during such corrective works.
- 1.8.6.15 Relevant mitigation measures adopted for the MHPGC Project that will mitigate impacts include the commitment to Design Principles fulfilling the requirement for ‘good design’, as prescribed in the National Policy Statements EN-1, EN-3 and EN-5 (CoT62). This should include good practice in structural design and compliance with the Eurocodes and relevant British Standards. The design will account for the expected Ground Conditions and design loads, accounting for the effects of climate change. Materials selected for the cables and other buried equipment will be suitably resistant to weather and ground conditions and have sufficient anticipated lifespan to ensure that they are unlikely to significantly degrade during the operational phase.
- 1.8.6.16 With the mitigation measures, and with reference to **Table 1.9**, the magnitude of adverse impacts arising from changes to the level of risk to contaminated land receptors is considered to be negligible.

Significance of effect

- 1.8.6.17 As the most sensitive receptor (the principal aquifer) has **very high** sensitivity, and the magnitude of impacts with the mitigation measures is **negligible**, the resulting effect on contaminated land receptors based on the matrix in **Table 1.10**, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.6.18 No additional mitigation measures are proposed.

Accumulation of mine gas within enclosed spaces at the Green LSS Option Area leading to potentially toxic and/or explosive atmospheres in enclosed spaces

Receptor sensitivity

- 1.8.6.19 The mine gas risk identified in the Geo-environmental PRA desk study (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) relates to the location of the former Hawthorn Combined Mine within the MHPGC Project PEIR Red Line Boundary: Onshore, which includes the Green LSS Option. The identified receptors that may be impacted by mine gas during the operational phase of the MHPGC Project comprise:

- Human health receptors: Commercial occupants. Based on the future substation use at the Green LSS Option, human health receptors are considered to be of **medium** sensitivity.
- Property – the built environment in the form of buildings and associated structures for the Green LSS Option would be of **low** sensitivity.

Magnitude of impact

- 1.8.6.20 The Green LSS Option Area (and some cable route) is in a former coal mining area. Former coal mining sites pose significant hazards including voids/ ground instability and potential for mine gas migration and accumulation.
- 1.8.6.21 Mine gases pose significant hazards to human health and property due to their toxicity and asphyxiation hazards, and the risk of flammable gas explosion.
- 1.8.6.22 Relevant commitments for the MHPGC Project that will avoid or mitigate impacts from mine gas include the commitment to Design Principles fulfilling the requirement for ‘good design’, as prescribed in the National Policy Statements EN-1, EN-3 and EN-5. Part of this commitment includes implementing good practice in structural design and compliance with the Eurocodes and relevant British Standards (CoT62 in **Table 1.16**), also compliance with LCRM (EA, 2025) in relation to land contamination assessment, which is implicit in the MHPGC Project’s commitment to ‘good design’, as prescribed in the National Policy Statements EN-1, EN-3 and EN-5 (CoT62 in **Table 1.16**).
- 1.8.6.23 At the time of writing the PEIR, the mine gas risk requires further detailed risk assessment, in accordance with CL:AIRE (CL:AIRE, 2021), as recommended in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**). This includes consideration of coal mining hazards including mine gas.
- 1.8.6.24 Based on the PRA for mine gas, undertaken within the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**), there is a recommendation for ground investigation where required.

Significance of effect

- 1.8.6.25 Further information is required to confirm the appropriate mitigation measures for mine gas risks associated with the Green LSS Option. However, it is considered that these risks can be appropriately managed through design and mitigation to reduce the magnitude of impact and avoid significant effects. The assessment will be refined as further site-specific information becomes available and appropriate mitigation measures are developed.

Additional mitigation and residual effect

- 1.8.6.26 None currently including pending further investigation and assessment.

1.8.7 Operation and maintenance phase: Hydrogeological receptors

Potential impacts of thermal emissions from buried high voltage cables on groundwater bodies

Receptor sensitivity

- 1.8.7.1 The hydrogeology study area is underlain by the permeable superficial formations (localised Secondary A Aquifer, Secondary undifferentiated aquifer over most of the study area) and deeper highly permeable bedrock formations which form a Principal Aquifer.
- 1.8.7.2 The deeper, more sensitive Principal Aquifer, is protected by the overlying superficial formations of till which will restrict vertical migration of contaminants downwards (the Principal Aquifer outcrops in a small area <5%). The Principal Aquifer is the identified receptor for impacts from thermal emissions from the MHPGC Project interaction with existing contamination during the O&M phase.
- 1.8.7.3 Based on the Principal Aquifer designation discussed above, and with reference to **Table 1.12**, the receptor sensitivity due to its importance as a regional groundwater resource within the Geology, Hydrogeology and Ground Conditions Study Area is considered to be Very High.

Magnitude of impact

- 1.8.7.4 The onshore cables themselves are designed to carry large power volumes required without overheating and damaging the cable. The MDS indicate that the cables will be generally laid in narrow, shallow trenches that are unlikely to be in contact with the water table in either the Superficial A or Principal Aquifers. However, in places, the cable could be routed through groundwater, such as when it passes surface water courses.
- 1.8.7.5 From the EA's draft guidance for thermal emissions indicates there could be a potential risk of impact to the receptor where cables are within Groundwater SPZ1. Other factors considered within the EA's guidance, but are not applicable, include: the cables are not within 50m of a groundwater fed wetland; 50m from a groundwater abstraction; 50m from an historic or active landfill; or 50m from a site classified as contaminated land (under Part 2A of the EPA 1990).

Significance of effect

- 1.8.7.6 Interactions with groundwater are currently expected to be limited, with any heat dissipation anticipated to be localised to the areas immediately surrounding the onshore cables. On this basis, significant effects on groundwater quality or temperature during the O&M phase are not anticipated. The assessment will be further refined at the ES stage as additional design information becomes available and following continued consultation with the Environment Agency.

Additional mitigation and residual effect

- 1.8.7.7 No additional mitigation measures are currently proposed, however, this will be subject to further assessment as part of the ES.

1.8.8 Decommissioning phase: Geology receptors

Temporary loss of access to geological features with statutory conservation designations

Receptor sensitivity

- 1.8.8.1 Designated geological sites within the geology study area comprise:
- Durham Coast SSSI/SAC, located along the coastline in the east of the Geology and Ground Conditions Study Area;
 - Nose's Point LNR in the northeast of the Geology and Ground Conditions Study Area and to the immediate east of the landfall (between landfall and Durham Coast SSSI);
 - Hawthorn Quarry SSSI is present in the Geology and Ground Conditions Study Area immediately south of the MHPGC Project PEIR Red Line Boundary: Onshore in the southeast.
- 1.8.8.2 Based on the presence of the designations listed above, and with reference to **Table 1.8**, it is considered that the receptor sensitivity, of nationally and regionally important geological features within the geology study area (see **Section 1.4**), is high for the SSSIs and medium for the LNR.

Magnitude of impact

- 1.8.8.3 As outlined in the MDS (**Table 1.15**), decommissioning is likely to operate within the parameters identified for construction (in the extent of working area and duration) and the onshore export and AC connection cables will be left in place during the decommissioning works.
- 1.8.8.4 The permanent above ground development required for the MHPGC Project will avoid sensitive geological features, including statutory and non-statutory sites (CoT17) by design.
- 1.8.8.5 An Onshore Decommissioning Plan will be developed prior to decommissioning (CoT16), which will include details relevant to soil and land reinstatement, identification of sensitive receptors, avoidance of unnecessary disturbance and application of working methods to prevent damage or obstruction of exposed geological features. The MHPGC Project is committed to avoiding direct disturbance to sensitive geological features, including statutory and non-statutory sites (CoT17) by design.
- 1.8.8.6 Based on the MDS and the adopted mitigation measures, and with reference to **Table 1.9**, the magnitude of temporary loss of access to geological features with statutory conservation designations, during the decommissioning phase is considered to be negligible.

Significance of effect

- 1.8.8.7 Overall, it is considered that the receptor sensitivity is **high** or **medium** and the magnitude of impacts from decommissioning is **negligible**. Therefore, the effect on temporary loss of access to geological features with statutory designations during the decommissioning phase, is considered to be **minor** for high sensitivity features and **negligible** or **minor** for medium sensitivity features, which is **not significant** in EIA terms.

Additional mitigation and residual effect

- 1.8.8.8 No additional mitigation measures are proposed.

1.8.9 Decommissioning phase: Minerals receptors***Temporary sterilisation of mineral resources due to decommissioning activities such as presence of temporary compounds***Receptor sensitivity

- 1.8.9.1 Receptor sensitivity remains the same as noted in the Construction Phase assessments: a high sensitivity for Hawthorn Quarry if considered as an existing site with a deliverable planning permission and as an allocated site, and a medium sensitivity for Hawthorn Quarry's minerals safeguarding zone and the other minerals safeguarding areas.

Magnitude of impact

- 1.8.9.2 During decommissioning it is understood that all below ground elements of the MHPGC Project will be left in situ to avoid disturbance from extraction and removal works. The only decommissioning works taking place will therefore be in relation to above ground structures, none of which are located within the minerals receptor areas identified: Hawthorn Quarry and its safeguarding zone, and the Magnesian Limestone MSA. It is therefore assumed that there will be no need for temporary compounds or other temporary decommissioning works in the vicinity of these minerals receptors.
- 1.8.9.3 Within the minerals resource receptor areas, all below ground elements will therefore be left in situ. This will not create any impacts on Hawthorn Quarry or its safeguarding area, as no MHPGC Project infrastructure will directly affect the quarry area, nor its ability to extract.
- 1.8.9.4 Within the Magnesian Limestone MSA the cable route will largely be within top or subsoils and therefore will not have had an impact on the underlying magnesian limestone. If any of this land was to be considered for magnesian limestone extraction in the future, the cable could be removed during soil stripping operations during any future extraction project. This would not affect the limestone resource and present a negligible adverse impact on the viability of extraction operations. Where cable is at greater depths, within the trenchless crossing excavations at landfall and the Stockton Road/A19 crossing point, limestone will already have been disturbed at the construction phase. No further effects would therefore result from the proposals to leave cables in situ during decommissioning.

Significance of effect

- 1.8.9.5 The decommissioning phase effects will range from no impact on Hawthorn Quarry, to a negligible adverse effect, on the Magnesian Limestone MSA which has a medium sensitivity. This would result in a negligible adverse impact, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.9.6 No additional mitigation measures are proposed.

1.8.10 Decommissioning phase: Land contamination receptors

Release of contaminants to the ground, groundwater or surface water due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored materials by run-off or windblown dust

Receptor sensitivity

1.8.10.1 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the construction phase and their sensitivity according to **Table 1.8** are as follows:

- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity.
- Controlled water – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively.

For the assessment, it is assumed that during decommissioning of the MHPGC Project, risks to site users, including site workers, visitors to the construction site, and construction/ ground workers, will be controlled by adherence to legislation including the Construction (Design and Management) Regulations 2015 (CDM) and the Health and Safety at Work Act (1974) (CoT-024), and these receptors are therefore not included in this assessment.

Magnitude of impact

- 1.8.10.2 According to the MDS (**Table 1.15**), decommissioning is likely to operate within the parameters identified for construction (in the extent of working area and duration). The onshore export and AC connection cables will be left in place but other associated infrastructure including above-ground components will be removed. De-construction of the onshore LSS will follow the reverse order of construction, once it has been taken out of service. All electric equipment will be removed, and any waste arising disposed of in accordance with relevant regulations and where applicable any legislative requirements at the time. Foundations will be broken up and the site re-instated, or alternately re-purposed for another use. . It is considered that should groundwater quality be affected, it is likely to be localised, short-term and temporary during the decommissioning phase activities only, and not extend widely across the MHPGC Project.
- 1.8.10.3 It is anticipated that land contamination identified during the pre-construction stage would have been assessed and, if necessary mitigated, prior to MHGPGC Project construction, and the subsequent decommissioning. Management controls for land contamination for the construction phase, are likely to be appropriate for the decommissioning phase. It is not anticipated that the decommissioning works would reach the depth of the water table in the Secondary Aquifer or the depth of the water table in the Principal Aquifer.
- 1.8.10.4 During decommissioning, accidental spills or leaks could impact the shallow soils associated with made ground and superficial deposits. Infiltration and migration of contaminants at or near ground surface into groundwater and surface water may be limited by the likely low volumes of contaminants that could plausibly be released as well as attenuation of contaminants in the ground (vertically downwards and laterally). However, spills or leaks of contaminants could still pose a risk to the Secondary Aquifer, potentially resulting in impacts on groundwater quality in the aquifer.
- 1.8.10.5 The deeper, more sensitive Principal Aquifer, is protected by the overlying superficial formations of till extending across most of the MHPGC Project PEIR Red Line Boundary: Onshore. The till will restrict vertical migration of contaminants downwards (the Principal Aquifer outcrops in a small area of the MHPGC Project PEIR Red Line Boundary: Onshore (<5%). However, there is a risk that contaminants could infiltrate the ground and leach into the groundwater, potentially resulting in effects on the Principal Aquifer where the Magnesian Limestone outcrops. No piling is expected to be required at decommissioning.

- 1.8.10.6 In relation to human health receptors, the exposure routes that could result in a health impact include direct contact with contaminants in soils due to leaks, spills or contaminant migration (e.g., as surface runoff, or leaching from stockpiles), inhalation of windblown dusts or fibres, ingestion of contaminants in surface or near surface soils, or inhalation of vapours from contaminants in the subsurface. Decommissioning activity could expose contamination that would otherwise be beneath structures and foundations.
- 1.8.10.7 The MHPGC Project is committed to the development of an Onshore Decommissioning Plan (CoT6), which will include pollution prevention measures such as proper storage and containment protocols, emergency response procedures, and regular inspections, the likelihood and severity of such events are significantly reduced.
- 1.8.10.8 Therefore, the magnitude of release of contaminants to the ground, groundwater or surface water due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored materials by run-off or windblown dust to groundwater receptors, during the decommissioning phase, is considered to be negligible.

Significance of effect

- 1.8.10.9 Overall, it is considered that the receptor sensitivity is **medium** to **very high** and the magnitude of impacts through release of contaminants considered to be **negligible**. Therefore, the effect of release of contaminants, during the decommissioning phase, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.10.10 No additional mitigation measures are proposed.

Changes to the level of risk to contaminated land receptors where the MHPGC Project interacts with existing land contamination

Receptor sensitivity

- 1.8.10.11 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the construction phase and their sensitivity according to **Table 1.8** are as follows:
- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity;
 - Controlled water – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively;
 - Controlled water – surface water receptors: Dalton Beck and a tributary of Hawthorn Burn are within the MHPGC Project PEIR Red Line Boundary: Onshore and are therefore considered to be of **high** sensitivity.
- 1.8.10.12 For the assessment, it is assumed that during decommissioning of the MHPGC Project, risks to site users, including site workers, visitors to the construction site, and construction/ground workers) will be controlled by adherence to legislation including the Construction (Design and Management) Regulations 2015 (CDM) and the Health and Safety at Work Act (1974) (CoT-024) and these receptors are therefore not included in this assessment.

Magnitude of impact

- 1.8.10.13 According to the MDS (**Table 1.15**), decommissioning is likely to operate within the parameters identified for construction (in the extent of working area and duration). The onshore export and AC connection cables will be left in place but other associated infrastructure including above-ground components will be removed. Within the LSS areas, the suspended structures associated with the LSS foundations will be removed, whilst it is assumed that the piles will remain in-situ. It is considered that should groundwater quality be affected, it is likely to be localised, short-term and

temporary during the decommissioning phase activities only, and not extend widely across the MHPGC Project.

- 1.8.10.14 The design of the MHPGC Project is being informed by assessment of land contamination risks in accordance with LCRM (EA, 2025). This means that by the operational phase, the potential risks associated with land contamination will have already been controlled by ensuring that land required for the MHPGC Project is suitable for the proposed use, which lowers the risk of encountering contamination at decommissioning.
- 1.8.10.15 The MHPGC Project is committed to the development of an Onshore Decommissioning Plan (CoT6), which will include) including pollution prevention measures such as proper storage and containment protocols, emergency response procedures, and regular inspections, the likelihood and severity of such events are significantly reduced.
- 1.8.10.16 Furthermore, it is not anticipated that the decommissioning works would reach the depth of the water table in the Secondary Aquifer or the depth of the water table in the Principal Aquifer.
- 1.8.10.17 Based on the MDS and the measures outlined above, the magnitude of adverse impacts arising from changes to the level of risk to contaminated land receptors during the decommissioning phase, is considered to be **negligible**.

Significance of effect

- 1.8.10.18 As the most sensitive receptor (the Principal Aquifer) has **very high** sensitivity, and the magnitude of impacts with the mitigation measures is **negligible**, the resulting effect on contaminated land receptors based on the matrix in **Table 1.10**, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.10.19 No additional mitigation measures are proposed.

Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination

Receptor sensitivity

- 1.8.10.20 Receptors identified in the Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) with the potential to be impacted by land contamination during the operation and maintenance or decommissioning phases and their sensitivity according to **Table 1.8** are as follows:
- Human health receptors: Off-site neighbouring residential and commercial occupants. Due to the presence of residential receptors, human health receptors are considered to be of **high** sensitivity;
 - Controlled water – groundwater receptors: Groundwater: Localised Secondary A and Secondary undifferentiated Aquifers over most of the study area, and highly permeable bedrock formations which form a Principal Aquifer which is used for public water supply. These are considered to be **medium** and **very high** sensitivity receptors, respectively;
 - Controlled water – surface water receptors: Dalton Beck and a tributary of Hawthorn Burn are within the MHPGC Project PEIR Red Line Boundary: Onshore and are therefore considered to be of **high** sensitivity.

Magnitude of impact

- 1.8.10.21 According to the MDS (**Table 1.15**), decommissioning is likely to operate within the parameters identified for construction (in the extent of working area and duration).
- 1.8.10.22 The onshore export and AC connection cables will be left in place but other associated infrastructure including above-ground components will be removed.
- 1.8.10.23 Buried electrical cables present in the subsurface between the offsite equipment and connecting to equipment within the LSS are likely to have some hazardous substance content, as required to ensure the effective and safe operation of the cables. This could include the metal cables, potentially fluid filled cables, and other materials in insulating layers around the cables to provide weather, water

and heat-resistant or flame-retardant properties,, which could release micro-plastics to the environment if damaged.

- 1.8.10.24 The Onshore Decommissioning Plan (CoT16) should address any known issues with damaged cables will be addressed to remove or replace these and investigation undertaken, in accordance with LCRM, with appropriate chemical testing of soils and groundwater for relevant contaminants, if it appears that contaminants could have been released from damaged cables.
- 1.8.10.25 The typical cable burial depth of 1.8m (**Table 1.15**) will protect them from damage during their normal operation and then during and after decommissioning.
- 1.8.10.26 Relevant mitigation measures adopted for the MHPGC Project that will mitigate impacts include the requirements prescribed in the National Policy Statements EN-1, EN-3 and EN-5. Part of this commitment will include good practice in structural design and compliance with the Eurocodes and relevant British Standards (CoT62 in **Table 1.16**). The design will account for the expected Ground Conditions and design loads, accounting for the effects of climate change. Materials selected for the cables and other buried equipment will be suitably resistant to weather and ground conditions and have sufficient anticipated lifespan to ensure that they are unlikely to significantly degrade during the operational phase.
- 1.8.10.27 For the decommissioning phase, the likelihood of the cables being located above the water table will lower the potential for leaching of contaminants from cable infrastructure left in situ.
- 1.8.10.28 The MHPGC Project is committed to developing an Onshore Decommissioning Plan (CoT16) to decommissioning which will include measures that are in accordance with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable.
- 1.8.10.29 With the mitigation measures, and with reference to **Table 1.9**, the magnitude of adverse impacts arising from changes to the level of risk to contaminated land receptors is considered to be negligible. Potential for positive impacts at the Green LSS Option will be reviewed for the ES once ground investigation data is available.

Significance of effect

- 1.8.10.30 As the most sensitive receptor (the principal aquifer) has **very high** sensitivity, and the magnitude of impacts with the mitigation measures is **negligible**, the resulting effect on contaminated land receptors based on the matrix in **Table 1.10**, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.10.31 No additional mitigation measures are proposed

1.8.11 Decommissioning phase: Hydrogeology receptors

Decommissioning of MHPGC Project (including watercourse crossings) and associated earthworks resulting in a potential impact on groundwater and levels and flow – Secondary Aquifer (A & undifferentiated) and Principal Aquifers

Receptor sensitivity

- 1.8.11.1 Groundwater within the Secondary A Aquifer & Secondary undifferentiated Aquifer is present within the shallow subsurface in some locations but has a lower sensitivity than the Principal Aquifer.
- 1.8.11.2 The deeper, more sensitive Principal Aquifer, is protected by the overlying superficial formations of till which will restrict vertical migration of contaminants downwards (the Principal Aquifer outcrops in a small area <5%). The identified receptor from the decommissioning of the MHPGC Project and (including watercourse crossings) associated earthworks is the Principal Aquifer.
- 1.8.11.3 With reference to **Table 1.8** and based on the presence of the aquifers and their designations within the Geology, Hydrogeology and Ground Conditions Study Area, the receptor sensitivity of the Superficial Aquifer (Secondary A Aquifer) and Principal Aquifer (due to its importance as a regional groundwater resource) is considered to be **medium** and **very high** respectively.

Magnitude of impact

- 1.8.11.4 According to the MDS (**Table 1.15**), decommissioning is likely to operate within the parameters identified for construction (in the extent of working area and duration). The onshore export and AC connection cables will be left in place but other associated infrastructure including above-ground components will be removed. Within the LSS areas, the suspended structures associated with the LSS foundations will be removed, whilst it is assumed that the piles will remain in-situ. Thus, potential for interactions that could impact groundwater levels and flows by reducing recharge, creating barriers to flow, and potentially introducing additional flow pathways is lower than for the construction phase.
- 1.8.11.5 It is considered that any interactions with the Secondary Aquifer, if any, would likely to be localised, short-term and temporary during the decommissioning phase activities, and not extend widely across the MHPGC Project. Moreover, it is anticipated that physical disturbance of the aquifer would be limited. Once decommissioning is complete, the groundwater levels are expected to return to normal.
- 1.8.11.6 The Principal Aquifer is generally confined beneath superficial deposits of Till, which the decommissioning activities are not likely to penetrate. Therefore, these activities are unlikely to reach the water table in the Principal Aquifer, owing to its depth and the presence of the overlying Till, thereby limiting potential interaction between decommissioning for the MHPGC Project and groundwater in the Principal Aquifer.
- 1.8.11.7 In the unlikely event of groundwater levels in the Principal Aquifer being affected, any impact is likely to be localised, short-term and temporary during decommissioning activities only, and would not extend widely across the MHPGC Project.
- 1.8.11.8 Similar mitigation measures adopted during the construction phase for the MHPGC Project, will be adopted during decommissioning including a careful design and management of excavations to minimise groundwater disturbance, control and monitoring of dewatering activities, and appropriate reinstatement of excavations to restore natural groundwater flow (CoT29).
- 1.8.11.9 An Onshore Decommissioning Plan will be developed prior to decommissioning (CoT16), which will include details relevant to soil and land reinstatement, pollution prevention and protection of groundwater. This will ensure safeguarding of the groundwater resources during the decommissioning phase.
- 1.8.11.10 Based on the MDS and the embedded mitigation measures, the magnitude of MHPGC Project resulting in a potential impact on groundwater levels and flow, during the decommissioning phase in the Secondary Aquifer (A & undifferentiated) and Principal Aquifers is considered to be **negligible**.

Significance of effect

- 1.8.11.11 Overall, it is considered that the highest receptor sensitivity is **very high** and the magnitude of impacts is **negligible**. Therefore, the effect of decommissioning of the MHPGC Project resulting in a potential impact on groundwater levels and flow in the Secondary Aquifer (A & undifferentiated) and Principal Aquifers, is considered to be **minor**, which is not significant in EIA terms.

Additional mitigation and residual effect

- 1.8.11.12 No additional mitigation measures are proposed.

1.9 Cumulative effects

1.9.1 Cumulative effects assessment methodology

- 1.9.1.1 The Cumulative Effects Assessment (CEA) considers the impacts associated with the MHPGC Project together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter, are based upon the results of a screening exercise (**Volume 1, Annex 4.3: Cumulative Screening and Location Plan, of the PEIR**). Each project or plan has been considered on a case-by-case basis for screening in or out of the geology, hydrogeology and ground conditions CEA based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.
- 1.9.1.2 The geology, hydrogeology and ground conditions CEA methodology has followed the methodology set out in **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR**. Tiers have been allocated reflecting the current stage of the other projects and plans within the planning and development process. This tiered approach is adopted to provide a clear assessment of the MHPGC Project alongside other projects and plans:
- Tier 1 includes projects, plans and activities at the following stages:
 - Under construction;
 - Permitted application;
 - Submitted application;
 - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an on-going impact.
 - Tier 2 includes projects, plans and activities at the following stage:
 - Scoping report has been submitted and is in the public domain.
 - Tier 3 includes projects, plans and activities at the following stages:
 - Scoping report has not been submitted and is not in the public domain;
 - Identified in the relevant Development Plan;
 - Identified in other plans and programmes.
- 1.9.1.3 The specific projects and plans screened into the geology, hydrogeology and ground conditions CEA are outlined in **Table 1.7**.
- 1.9.1.4 For geology receptors, the ZOI has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 250m buffer bounded at MHWS, for the land contamination CEA the ZOI has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 500m buffer bounded at MHWS, and for hydrogeology CEA, the ZOI has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 1km buffer bounded at MHWS. The minerals CEA considers other projects and developments that could impact cumulatively on specific mineral resources within the mineral study area.

Table 1.17: Projects and plans screened into the geology, minerals, land contamination, and hydrogeology CEAs

Reference	Project / Plan name	Type	Tier and status	Approximate distance from MHPGC Project (km)	Construction timeframe
DCC3	Land West of Units 1-3 Admiralty Way Seaham, Erection of a petrol filling station and drive thru' coffee outlet (Class E)	Commercial	1 – consented	0	Under construction
DCC4	EGL1 Visitor Centre	Commercial	1 – in planning – application submitted	0	
DCC5	Croup Hill Solar Farm	Renewable energy	1 – consented	0	Detail not available
DCC6	Seaham Garden Village - 1500 dwellings	Residential	1 – consented	0	Under construction, due to be complete 2030
DCC7	Phase 2 Jade Business Park	Commercial	1 – consented	0	Detail not available
DCC8	Transport hub and active travel scheme	Transport	1 – consented	0	Under construction, due to be complete April 2027
DCC9	Temporary installation of a battery energy storage system	Renewable energy	1 – in planning – application submitted	0	Detail not available
DCC10	Battery Energy Storage System	Energy	1 – in planning – application submitted	0	12 month construction programme
DCC11	Eastern Green Link 1, Converter Station	Energy	1 – consented	0	Under construction, works to be complete in 2029
DCC12	81 homes and a convenience store	Mixed residential/ commercial	1 – in planning – application submitted	0	Detail not available
DCC13	149 homes, Land East of Seaham Garden Village	Residential	1 – in planning – application submitted	0	Detail not available
DCC1	Electric Vehicle Charging Hub	Commercial	1 - consented	0.73	Detail not available
DCC2	Land To The West of Elemore View 50 dwellings	Residential	1 – in planning – application submitted	0.73	Detail not available

1.9.2 Maximum design scenario – cumulative effects assessment

- 1.9.2.1 The MDSs for the CEA have been selected as those having the potential to result in the greatest potential effect on an identified receptor or receptor group in relation to the CEA. The MDSs have been based on the MHPGC Project alone (**Table 1.15**), as well as publicly available information on other third-party projects and plans that have been screened into the CEA.

1.9.3 Cumulative effects assessment

- 1.9.3.1 A description of the significance of cumulative effects upon geology, hydrogeology and ground conditions receptors arising from each identified impact is given below.

Land contamination CEA

Construction, O&M, and Decommissioning phases

- 1.9.3.2 For land contamination receptors, the ZOI for the CEA to assess the potential for direct and indirect cumulative effects has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 500m buffer bounded at MHWS. This accounts for shared receptors that could experience an effect due to the MHPGC Project and other developments.
- 1.9.3.3 A Geo-environmental PRA (**Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR**) has been completed for the MHPGC Project PEIR Red Line Boundary: Onshore. Localised potential contamination sources have been identified, as detailed in the baseline in **Section 1.4**.
- 1.9.3.4 There are five consented developments within the MHPGC Project PEIR Red Line Boundary: Onshore and a further six applications that may be consented. The consented developments include a petrol station, solar farm, garden village, industrial units, transport hub, and a converter station. For these, and the remaining developments that have not yet been approved, UK legislation and planning policy requires all developments to be suitable for their proposed use, including that risks to land contamination receptors have been appropriately managed and the sites should not be capable of being determined as Part 2A contaminated land.
- 1.9.3.5 In addition, during preparatory works and construction work for other development it can reasonably be assumed that good and standard construction practices and actions would be undertaken by developers and their contractors to meet existing legislative requirements under CDM Regulations (2015) and the Health and Safety at Work Act (1974). This should result in the risk of pollution incidents being low, and in the event that unexpected contamination was found during construction of the 'other developments', this would be contained to manage immediate risks to human health and the environment and then managed in line with the EA guidance LCRM, which applies throughout the UK.
- 1.9.3.6 Given the similar potential contamination sources and contaminated land receptors, in the ZOI for the land contamination CEA, and the likelihood of similar measures to the MHPGC Project being in place to mitigate potential effects so that the other developments do not result in significant effects on a receptors, it is unlikely that there will be any effects from the MHPGC Project that could act cumulatively with effects from the other developments to result in significant cumulative effects on land contamination receptors.

Geology CEA

Construction, O&M, and Decommissioning phases

- 1.9.3.7 For geology (geodiversity) receptors, the ZOI for the CEA to assess the potential for direct and indirect cumulative effects has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 250m buffer bounded at MHWS. This accounts for shared receptors that could experience an effect due to the MHPGC Project and other developments.
- 1.9.3.8 Effects on geological receptors would be most likely to occur where designated features are within the MHPGC Project PEIR Red Line Boundary: Onshore. The 250m buffer ensures that potential impacts on adjacent/ nearby offsite receptors are also considered. The MHPGC Project is not expected to permanently impact any geology receptors by avoidance. In regard to temporary effects such as loss of public access to features due to construction of buildings or other structures in or

around the geological features, there could be potential for other developments to impact cumulatively on a geology receptor if construction took place at the same time or consecutively.

- 1.9.3.9 There are five consented developments within the MHPGC Project PEIR Red Line Boundary: Onshore and a further six applications that may be consented. The consented developments include a petrol station, solar farm, garden village, industrial units, transport hub, and a converter station. These have been reviewed and as the planning boundaries for the other developments do not include or adjoin the designated geological sites that may be impacted by the MHPGC Project, it is unlikely that there will be any effects from the MHPGC Project that could act cumulatively with effects from the other developments to result in significant cumulative effects on geology receptors.

Hydrogeology CEA

Construction, O&M, and Decommissioning phases

- 1.9.3.10 For hydrogeology receptors, the ZOI for the CEA to assess the potential for direct and indirect cumulative effects has been defined as the MHPGC Project PEIR Red Line Boundary: Onshore, with a 1 km buffer bounded at MHWS. This accounts for shared receptors that could experience an effect due to the MHPGC Project and other developments.
- 1.9.3.11 Effects on hydrogeological receptors would be most likely to occur where primary aquifers are within the MHPGC Project PEIR Red Line Boundary: Onshore. The 1 km buffer ensures that potential impacts on adjacent/ nearby offsite receptors are also considered. The MHPGC Project is not expected to permanently impact any hydrogeological receptors by avoidance. In regard to temporary effects such as groundwater quality, there could be potential for other developments to impact cumulatively on a hydrogeological receptor if construction took place at the same time or consecutively.

There are six consented developments within the MHPGC Project PEIR Red Line Boundary: Onshore and a further seven applications that may be consented. The consented developments include a petrol station, solar farm, garden village, industrial units, transport hub, an electric vehicle charging hub, and a converter station. These have been reviewed for impacts on groundwater quantity within the **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR** where there is the potential for cumulative additional impacts on groundwater quality as a result of activities associated with MHPGC Project and other projects that are under construction, in operation or with planned decommissioning. From this assessment it is unlikely that there will be any effects from the MHPGC Project that could act cumulatively with effects from the other developments to result in significant cumulative effects on hydrogeological receptors.

Mineral Resources CEA

- 1.9.3.12 There are no developments identified within Hawthorn Quarry or the 500m safeguarding zone identified in the County Durham Local Plan (as shown on **Figure 1.6**) from the cumulative effects assessment short list, so no cumulative effects can take place on the quarry as either an existing quarry or a safeguarded site. The only potential cumulative effects identified for the construction phase are on the Magnesian Limestone Minerals Safeguarding Area which are considered in **Section 1.9.3** below.

Construction: Impact on the Magnesian Limestone Minerals Safeguarding Area

Receptor sensitivity

- 1.9.3.13 As a minerals safeguarding area, i.e. an area of mineral that is identified as a potentially viable minerals resource, but does not have a specific policy allocation promoting minerals extraction or a valid planning permission, the receptor is considered to be a medium sensitivity receptor.

Magnitude of cumulative impact

- 1.9.3.14 Two Tier 1 projects have been identified that have an impact on the Magnesian Limestone MSA, the Seaham Garden Village development and the residential proposal on Land East of Seaham Garden Village. All other projects across Tiers 1, 2 and 3 are outside of the MSA. Both developments are within the MSA boundary, with the Garden Village development having been approved and is under construction, and the planning application for residential development at Land East of Seaham Garden Village under determination. In the determination of the Garden Village application (Committee Report for planning application DM/18/00829/OUT), the Local Planning Authority

identified that the project would result in a significant sterilisation of a high-grade mineral resource (in excess of 60 million tonnes of minerals from direct sterilisation (equivalent to approximately 24,000,00m³)). It was also noted that the development could sterilise minerals resource outside of the proposed development's boundaries, as residential development would usually prevent minerals extraction within 250m of residential properties and blasting operations within 500m. This would effectively lead to large extents of the Magnesian Limestone MSA being sterilised, including parts of the landfall, much of the HVDC cable route and part of the B1432/A29 trenchless crossing compound. The proposed residential development at Land East of Seaham Garden Village, if approved, would have a similar effect: directly sterilising parts of the MSA within its boundaries, and indirectly sterilising land within 500m, including more of the landfall. Despite the sterilisation identified, the determination for the Garden Village development considered that the benefits that would be realised in terms of housing provision and economic benefits, clearly outweighed the sterilisation of minerals and other negative impacts.

Significance of cumulative effect

- 1.9.3.15 It has been identified that the MHPGC Project could create a moderate or major adverse magnitude of effect on the Magnesian Limestone MSA as a standalone development, the Garden Village development creates a major adverse magnitude of effect on this receptor and the proposed residential development at Land east of Seaham Garden Village would also likely create a major adverse magnitude of effect on the MSA if it is approved. In cumulative terms, the impact would therefore be a major adverse magnitude of effect on a medium sensitivity receptor, resulting in a major adverse and significant impact. However, in context, the Garden Village development will directly and indirectly (via its 500m buffer zone) sterilise around 70% (by area) of the Magnesian Limestone MSA, with the proposal on Land East of Seaham Garden Village sterilising approximately a further 3%. (if it is approved). The most substantial impact on the MSA would therefore be from the Garden Village development which is an existing impact. The cumulative impact of the MHPGC Project on top of this existing impact would therefore be, in relative terms, comparatively small. As noted earlier within this chapter, MHPGC will seek to develop within the previously sterilised envelope where possible.

Additional mitigation and residual effect

- 1.9.3.16 As noted in **Paragraph** Error! Reference source not found., no additional mitigation is considered to be available due to the impracticalities of utilising prior extraction for this type of development proposal.
- 1.9.3.17 Therefore, the residual effect on the Magnesian Limestone MSA, during the construction phase, is considered to be major, which is significant in EIA terms, but should be viewed in the context of the existing impacts from the Garden Village development.

O&M phase

- 1.9.3.18 There are no developments identified in the cumulative effects assessment short list that would impact on Hawthorn Quarry, as either an existing quarry or a safeguarded site during the O&M phase. The only potential cumulative effects identified for the O&M phase are on the Magnesian Limestone Minerals Safeguarding Area. These effects would however be a continuation of those identified in the Construction phase, so the cumulative effects would remain as major adverse on a medium sensitivity receptor. The cumulative effect of impacts on the Magnesian Limestone MSA with Tier 1 projects and plans, during the O&M phase, is considered to be major adverse, which is significant in EIA terms, but should be viewed in the context of the existing impacts from the Garden Village development.

Decommissioning phase

- 1.9.3.19 There are no developments identified in the cumulative effects assessment short list that would impact on Hawthorn Quarry, as either an existing quarry or a safeguarded site during the decommissioning phase. The only potential cumulative effects identified for the decommissioning phase are on the Magnesian Limestone Minerals Safeguarding Area. These effects would however be as a result of the Garden Village and Extension developments, which are permanent developments and would continue through the MHPGC Project decommissioning phase. The MHPGC Project itself would only result in negligible and not significant effects during this phase,

meaning it would not add noticeably to the Garden Village and Extension effects. On a medium sensitivity receptor, a negligible magnitude of cumulative effect would occur. Therefore, the cumulative effect of impacts on the Magnesian Limestone MSA with Tier 1 projects and plans, during the decommissioning phase, is considered to be negligible, which is not significant in EIA terms.

1.10 Transboundary effects

- 1.10.1.1 A screening of transboundary impacts has been carried out and any potential for significant transboundary effects with regard to geology, hydrogeology and ground conditions from the construction, O&M and decommissioning phases of the MHPGC Project upon interests of other states has been assessed as part of the PEIR.
- 1.10.1.2 There are no potential transboundary impacts from geology, hydrogeology and ground conditions, including contamination, from the MHPGC Project. This is due to any likely significant effects being experienced locally, rather than a wider geographic scale.

1.11 Inter-related effects

- 1.11.1.1 Inter-related effects are the combined impact of multiple aspects of the MHPGC Project on a single receptor. These are as follows:
- **Project lifetime effects:** Assessment of the scope for effects that occur throughout more than one phase of the MHPGC Project (construction, O&M and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases;
 - **Receptor led effects:** Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor.
- 1.11.1.2 For Geology, Hydrogeology and Ground Conditions, the following potential impacts have been considered within the inter-related assessment:
- potential project lifetime effects for permanent and temporary loss or damage to geological features and designations, temporary sterilisation of mineral resources, release of contaminants, changes to land contamination risk, potential new sources of contamination, accumulation of mine gas, thermal emissions from existing buried cables, impacts on groundwater levels and impacts from dewatering on the Magnesian Limestone aquifer,
 - potential for receptor-led effects where ground disturbance, excavation and dewatering activities and accidental pollution events lead to changes in groundwater conditions, increased sediment mobilisation or contaminant pathways that could overlap with flood risk and water resources receptors and ecological receptors. Similarly, changes to soil resources and underlying geological receptors, as a result of soil stripping, handling and storage, may occur along with potential for interactions with Human Health, Land Use, Tourism and Recreation, and Traffic and Transport due to temporary construction disturbance.
- 1.11.1.3 Inter-related effects are assessed within **Volume 4, Chapter 5: Inter-related Effects, of the PEIR** with no likely significant inter-related effects anticipated.

1.12 Summary

1.12.1 Summary of effects

- 1.12.1.1 This chapter has assessed the potential impacts on geology, hydrogeology and ground conditions from the construction, O&M and decommissioning phases of the MHPGC Project.
- 1.12.1.2 **Table 1.18** presents a summary of impacts and confirms the residual effects.

1.12.2 Summary of secondary mitigation and monitoring

- 1.12.2.1 **Table 1.18** presents a summary of the secondary mitigation and monitoring proposed.

Table 1.18: Summary of potential impacts and residual effects

Impact	Sensitivity of receptor	Magnitude of impact	Significance of effect	Secondary mitigation and monitoring	Residual effect
Construction phase					
Permanent loss of or damage to a locally or nationally important geological features	High or Medium	Negligible	Minor or Negligible or Minor (not significant)	N/A	Minor or Negligible or Minor (not significant)
Temporary loss of access to geological features with statutory conservation designations	High or Medium	Negligible	Minor or Negligible or Minor (not significant)	N/A	Minor or Negligible or Minor (not significant)
Sterilisation of mineral resources due to permanent development (including landfill, LSS and buried cables) in or near existing or allocated mineral sites	Hawthorn Quarry: High	Minor	Moderate	N/A	Moderate (significant)
	Magnesian Limestone MSA: Medium	Moderate / Major	Moderate / Major	N/A	Moderate / Major (significant)
Temporary sterilisation of mineral resources due to construction activities such as presence of temporary construction compounds	Hawthorn Quarry: High	Negligible	Minor	N/A	Minor (not significant)
	Magnesian Limestone MSA: Medium	Minor	Minor	N/A	Minor, (not significant)
Release of contaminants to the ground impacting soil or groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored or stockpiled materials by run-off or windblown dust, mobilisation of contamination by foundation construction (e.g., piling)	Very high	Negligible	Minor	N/A	Minor (not significant)
Impacts on groundwater levels and flow during construction works for the MHPGC Project - groundwater within the Secondary Aquifer (A & undifferentiated) and Principal Aquifers	Very High	Negligible	Minor	N/A	Minor (not significant)
Potential impacts from over-pumping to the Magnesian Limestone aquifer (Principal Aquifer)	Very High	Negligible	Minor	N/A	Minor (not significant)
O&M phase					

Impact	Sensitivity of receptor	Magnitude of impact	Significance of effect	Secondary mitigation and monitoring	Residual effect
Changes to the level of risk to contaminated land receptors where the MHPGC Project interacts with pre-existing land contamination, potential for subsurface cable routes to act as a preferential pathway for migration of mobile contaminants	Very High	Negligible	Minor	N/A	Minor (not significant)
Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination	Very High	Negligible	Minor	N/A	Minor (not significant)
Accumulation of mine gas within enclosed spaces at the Green LSS Option Area leading to potentially toxic and/or explosive atmospheres in enclosed spaces	Medium	Assessment to be undertaken at the ES stage as further design information becomes available.	Assessment to be undertaken at the ES stage as further design information becomes available.	N/A	Assessment to be undertaken at the ES stage as further design information becomes available.
Potential impacts of thermal emissions from buried high voltage cables on groundwater bodies	Very High	Assessment to be undertaken at the ES stage as further design information becomes available.	Assessment to be undertaken at the ES stage as further design information becomes available.	N/A	Assessment to be undertaken at the ES stage as further design information becomes available.
Decommissioning phase					
Temporary loss of access to geological features with statutory conservation designations	High or Medium	Negligible	Minor or Negligible or Minor (not significant)	N/A	Minor or Negligible or Minor (not significant)
Temporary sterilisation of mineral resources due to decommissioning activities such as presence of temporary compounds	Hawthorn Quarry: High	No impact	No impact	N/A	No impact
	Magnesian Limestone MSA: Medium	Negligible	Negligible	N/A	Negligible (not significant)

Impact	Sensitivity of receptor	Magnitude of impact	Significance of effect	Secondary mitigation and monitoring	Residual effect
Release of contaminants to the ground impacting soil or groundwater due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored materials by run-off or windblown dust	Very high	Negligible	Minor	N/A	Minor (not significant)
Changes to the level of risk to contaminated land receptors where the MHPGC Project interacts with existing land contamination	Very High	Negligible	Minor	N/A	Minor (not significant)
Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination	Very High	Negligible	Minor	N/A	Minor (not significant)
Decommissioning of MHPGC Project (including watercourse crossings) and associated earthworks resulting in a potential impact on groundwater and levels and flow – Secondary Aquifer (A & undifferentiated) and Principal Aquifers	Very High	Negligible	Minor	N/A	Minor (not significant)

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