

## **OUTLINE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN**

### **Appendix 8: Outline Groundwater Management and Monitoring Plan**

#### **HyNet Carbon Dioxide Pipeline DCO**

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 –  
Regulations 8(1)(c)

Document Reference Number D.7.41

Applicant: Liverpool Bay CCS Limited

PINS Reference: EN070007

English Version

REVISION: A

DATE: July 2023

DOCUMENT OWNER: WSP UK Limited

PUBLIC

## QUALITY CONTROL

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<b>Document Reference</b>		<b>D.7.41</b>			
<b>Document Owner</b>		WSP UK Ltd			
<b>Revision</b>	<b>Date</b>	<b>Comments</b>	<b>Author</b>	<b>Checker</b>	<b>Approver</b>
A	July 2023	Deadline 5 submission	JC	DH	NM / CL

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**GROUNDWATER MANAGEMENT AND MONITORING REAC COMMITMENT**

# 1. INTRODUCTION

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## 1.1. PROJECT OVERVIEW

- 1.1.1. This document has been prepared on behalf of Liverpool Bay CCS Limited ('the Applicant') and relates to an application ('the Application') for a Development Consent Order (DCO) that has been submitted to the Secretary of State (SoS) for Energy Security and Net Zero under Section 37 of the Planning Act 2008 ('the PA 2008') (**Ref 1.1**). The Application relates to the Carbon Dioxide (CO<sub>2</sub>) pipeline which constitutes the DCO Proposed Development.
- 1.1.2. The DCO Proposed Development will form part of HyNet North West ('the Project'), which is a hydrogen supply and Carbon Capture and Storage ('CCS') Project. The goal of the Project is to reduce carbon dioxide (CO<sub>2</sub>) emissions from industry, homes and transport and support economic growth in the North West of England and North Wales. The wider Project is based on the production of low carbon hydrogen from natural gas. It includes the development of a new hydrogen production plant, pipelines, and the creation of CCS infrastructure. CCS prevents CO<sub>2</sub> entering the atmosphere by capturing it, compressing it and transporting it for safe, permanent storage.
- 1.1.3. The DCO Proposed Development is a critical component of the Project which, by facilitating the transportation of carbon dioxide, enables the rest of the Project to be low carbon. The hydrogen production and CO<sub>2</sub> capture and storage elements of the Project do not form part of the DCO Proposed Development and will be delivered under separate consenting processes.
- 1.1.4. A full description of the DCO Proposed Development is detailed in **Chapter 3 – Description of the DCO Proposed Development** of the Environmental Statement (ES), submitted at Deadline 4 [**REP4-029**].

## 1.2. PURPOSE OF THE DOCUMENT

- 1.2.1. This **Outline Groundwater Management and Monitoring Plan (OGMMP)** will act as a control plan which sets out indicative methods to avoid, minimise, and mitigate likely environmental effects during the construction stage of the DCO Proposed Development, as reported in the ES and the **Register of Environmental Actions and Commitments (REAC)** (document reference: **D.6.5.1**) submitted with the DCO Application. It includes the minimum protocols to be followed to implement these measures, in accordance with environmental commitments during the detailed design (that will be delivered by the Construction Contractor(s)), pre-construction, and construction stages.

- 1.2.2. Detailed Groundwater Management and Monitoring Plans (GMMP) will be produced by the Construction Contractor(s) in accordance with this outline plan and Requirement 5(2) of the draft DCO **[REP4-008]**.
- 1.2.3. This document should be read in conjunction with the **Dewatering Management Plan** (document reference: **D.7.44**).
- 1.2.4. This document outlines the requirements that will be contained within the Detailed Groundwater Management and Monitoring Plans, including:
- roles and responsibilities of key parties in relation to this plan;
  - a description of the site setting and summary of the hydrogeological conceptual model;
  - the proposed monitoring network, monitoring frequency and physical/chemical parameters to be measured (including laboratory method detection limits);
  - the methods to be used for monitoring and appropriate standards;
  - requirements for data management including quality assurance/quality control (QA/QC);
  - site-specific groundwater management requirements;
  - the methods used to assess data collected during construction (and potentially post construction) against baseline monitoring data;
  - an outline contingency action plan that outlines the steps to manage risks to groundwater (or other receptors) in the event of impacts arising/potentially arising;
  - outline reporting procedures (routine and incidents).

### **1.3. OBJECTIVES**

- 1.3.1. The objective of the OGMMP (and subsequent site-specific detailed GMMPs) is to provide a framework for managing the risks associated with construction dewatering on groundwater quality and quantity and to detail any site-specific groundwater management provisions that may be required e.g., to afford protection to sensitive water-dependent habitats.
- 1.3.2. The GMMPs will be sufficiently developed from a technical and regulatory perspective prior to any dewatering activities occurring, to demonstrate compliance with relevant statutory regulatory requirements and other commitments agreed through the DCO process.
- 1.3.3. Annex A contains a list of all the commitments from the REAC (document reference: **D.6.5.1**) in relation to groundwater.

## **2. ROLES AND RESPONSIBILITIES**

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### **2.1. KEY ROLES AND RESPONSIBILITIES**

2.1.1. The design of the groundwater management and monitoring programme is the responsibility of the Construction Contractor(s).

### **2.2. RESPONSIBLE PARTIES**

2.2.1. The names and contact details of the responsible parties will be included in the GMMP.

## **3. CONCEPTUAL HYDROGEOLOGICAL MODEL**

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### **3.1. INFORMATION SOURCES**

3.1.1. The Information Sources used in the development of the conceptual hydrogeological model are as follows:

- British Geological Survey (BGS) GeoIndex online database.
- BGS 1:50,000 and or 1:25,000 Geological Map Sheets.
- DEFRA Magic Maps.
- Ground investigation results/information.

### **3.2. GEOLOGICAL SETTING**

3.2.1. This section will provide a brief description of the superficial and bedrock geology at the location of the proposed construction activity.

3.2.2. This will be based, where possible, on site-specific information obtained through targeted ground investigation and supplemented with published, publicly available information including BGS GeoIndex and historic borehole logs.

### **3.3. HYDROGEOLOGICAL SETTING**

3.3.1. This section will provide a description of the hydrogeological regime at the site, including aquifer designations, aquifer vulnerability, groundwater levels, flow direction and groundwater flow rates.

3.3.2. This section will include details of the locations of licensed and unlicensed water supplies, any groundwater source protection zones (SPZs), and details of any consultation held with regulatory authorities and/or licence/permit holders.

### **3.4. HYDROLOGICAL SETTING**

3.4.1. This section will provide a brief description of the hydrological setting including the distance and direction to rivers, streams, drainage ditches, flood zone information, and risk from fluvial and pluvial flooding, and groundwater flooding.

### **3.5. DESIGNATED OR SENSITIVE SITES**

3.5.1. This section will present the details of any groundwater dependent sites within 500 m of the site.

### **3.6. CONTAMINATED LAND**

3.6.1. Potentially contaminating land-use activities (e.g., historic landfills) have been previously recorded within the land required for the DCO Proposed Development, or in close proximity to it (refer to Chapter 11 - Land and



Soils [**REP4-045**]). These may present a risk to groundwater quality (or groundwater impacts beneath the site that have already been realised). A summary will be provided to add details of known contamination issues within the GMMP.

3.6.2. Where a contaminated land risk assessment (CLRA) has been undertaken a succinct summary of the key findings and outcomes will be provided by the Construction Contractor(s) in the GMMP.

### **3.7. POTENTIAL RECEPTORS**

3.7.1. Based on the preceding sections, the Construction Contractor(s) will include details of the receptors that have the potential to be impacted by construction activities. Examples include private and public water supplies, water dependent habitats.

## **4. MONITORING STRATEGY**

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### **4.1. OVERVIEW OF PROPOSED MONITORING STRATEGY**

- 4.1.1. Groundwater monitoring will be used to assess the potential impact of construction on groundwater sensitive receptors at specific construction sites within the DCO Proposed Development.
- 4.1.2. Groundwater monitoring (supplementary to that which has previously undertaken) will take place prior to construction activities to establish baseline conditions, then during construction and post-construction.
- 4.1.3. The period required for baseline and post-construction monitoring will be agreed with the regulator(s) at the Detailed Design stage.
- 4.1.4. Baseline groundwater monitoring results obtained prior to the start of construction will be used to:
- a) understand the baseline groundwater conditions at each work site;
  - b) identify trends in water quality or water level; and
  - c) set compliance levels (e.g., Alert and Trigger Levels), where applicable, for groundwater quality indicator species and groundwater levels
- 4.1.5. Changes to the monitoring network may be required following additional ground investigation specific to the construction phase at individual sites and where existing monitoring locations become inaccessible.

### **4.2. MONITORING NETWORK**

- 4.2.1. The Construction Contractor(s) will include site-specific details, which will include details of groundwater monitoring points as relevant.
- 4.2.2. The number and location of monitoring locations will be based on a risk-based review of the site setting and it is recommended that this is agreed with the regulator prior to works commencing.
- 4.2.3. The monitoring network will be designed to comply with the minimum monitoring requirements of the regulator, defined through either permit conditions and/or local arrangements.
- 4.2.4. The design will follow a risk-based approach and take into consideration the site-specific construction activities, the vulnerability of groundwater resources, and the proximity of the site to designated or sensitive sites that may be sensitive to changes in either groundwater levels.
- 4.2.5. The groundwater monitoring network will comprise boreholes designed to monitor groundwater levels and groundwater quality within the relevant aquifers. The locations will be presented in a Drawing as part of the GMMP.

- 4.2.6. Details of the monitoring installations, together with any instrumentation installed within these (e.g., pressure transducer) will be provided in Table 2.

**Table 2: Details of Proposed Groundwater Monitoring Installations**

Location	BH ID	Response Zone			Data Logger	Ground Level (m AOD)
		Formation	Depth (m bGL)	Diameter (mm)		
<i>Coordinates</i> (on-site/offsite)	XX	(Geology of screened section)	XX - XX	XX	(If present & model if applicable)	XX

### 4.3. MONITORING PROGRAMME

- 4.3.1. The Construction Contractor(s) will develop a risk-based monitoring programme that will include field measurements and laboratory analysis. This will be agreed with regulators and details provided in the site-specific GMMP.
- 4.3.2. Typically, groundwater monitoring will be undertaken monthly during the baseline, construction, and post-construction stages. However, the frequency could be increased or reduced at any stage depending on the activities occurring and/or the results of the monitoring e.g., adverse trends appearing in the dataset.
- 4.3.3. Any changes to the agreed programme would need to be justified and reviewed and accepted by the regulator in advance of works.
- 4.3.4. The suite of parameters that should be measured will be based on an understanding of historical and current land-use; therefore, this may vary between sites. For example, in areas where the potential for contamination to exist occurs, then the results of a contaminated land risk assessment should be used to inform the selection of parameters.
- 4.3.5. The Construction Contractor(s) will develop a site-specific monitoring programme and suite of determinants, based on the outcome of baseline monitoring and agreement with the appropriate regulators.
- 4.3.1. Baseline monitoring is required to provide an initial characterisation of water quality and levels.
- 4.3.2. As far as is practicable within the overall construction schedule, the Construction Contractor(s) will incorporate the requirements for baseline groundwater monitoring into the construction programme per the duration of baseline monitoring agreed with the appropriate regulators.

#### **4.4. BOREHOLE INSPECTION AND MAINTENANCE**

- 4.4.1. Regular inspection and maintenance of monitoring boreholes will be conducted throughout the monitoring programme and will be included in the GMMP.

## 5. SAMPLING EQUIPMENT AND PROCEDURES

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- 5.1.1. The Construction Contractor(s) will provide all necessary updates to the following sections in the GMMP, which will be required to implement the monitoring programme at each site.
- 5.1.2. Groundwater will be sampled in general accordance with BS ISO 5667-11: 2009 “Water Quality – Sampling – Part 11: Guidance on sampling of groundwaters” (**Ref 1.2**)

## **6. SAMPLE COLLECTION AND TURNAROUND TIMES**

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- 6.1.1. The Construction Contractor(s) will provide the sample collection process and turnaround times in the GMMP depending on the specific circumstances agreed with the selected laboratory.

## **7. QUALITY ASSURANCE/QUALITY CONTROL**

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- 7.1.1. The Construction Contractor(s) will be responsible for developing appropriate procedures to ensure data is representative of site conditions and has been managed appropriately. The Construction Contractor(s) will update this section to reflect the appropriate procedures and protocols in the GMMP.
- 7.1.2. Quality Assurance (QA) and Quality Control (QC) protocols will be implemented to demonstrate confidence in the data collected during the monitoring programme, with consideration of deviating samples resulting from long holding times, appropriate blank and duplicate sampling and analysis.
- 7.1.3. Data collection is to be comparable at all stages of monitoring to allow for meaningful analysis prior to, during and following construction.

## **8. ALERT AND TRIGGER LEVELS**

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- 8.1.1. This section will be completed by the Construction Contractor(s) where it is agreed with the regulators that there is a requirement to set compliance limits (Alert and Trigger levels) relating the groundwater levels and groundwater quality. This may be applicable for example, in areas where sensitive sites may be vulnerable to changes in groundwater levels.
- 8.1.2. The Construction Contractor(s) will agree an approach for setting these with the appropriate regulators.



## **9. CONTINGENCY ACTION PLAN**

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- 9.1.1. Should it be agreed with the regulators that compliance limits (Alert and Trigger levels) relating the groundwater levels and groundwater quality are required, a staged Contingency Action Plan (CAP) will be produced and implemented by the Construction Contractor(s). This would respond to potential risks to groundwater, surface water and other sensitive receptors in the event of a breach of Alert or Trigger Level.
- 9.1.2. Where risks are considered to be unacceptable, investigative, corrective or remediation measures will be initiated and a strategy to determine their - effectiveness implemented.

## **10. DATA MANAGEMENT AND REVIEW**

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### **10.1. DATA MANAGEMENT**

10.1.1. Following its collection, field and laboratory data should be saved in a consistent format on a central database, where it can be accessed by relevant staff and subject to appropriate QA/QC, data validation and subsequent data interrogation.

### **10.2. DATA VALIDATION**

10.2.1. A typical validation process may include the following:

- The results provided correspond with the agreed analytical schedule;
- The results are reported in the correct units;
- The laboratory technique and limits of detection meet the project requirements;
- The significance of QA/QC samples are evaluated;
- The results are within the expected range for any specific location; and
- The holding times for samples are not exceeded, but if they are, there are reasons provided.

## 11. GROUNDWATER MANAGEMENT

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### 11.1. OVERVIEW OF PROPOSED MANAGEMENT

- 11.1.1. Groundwater management is designed to meet the following objectives:
- Reduce the potential for drawdown of surrounding groundwater resources outside the site boundary;
  - Reduce the potential impacts on key receptors, including private and public water supplies, surface water (where baseflow from groundwater is an important component) and water dependent habitats e.g., groundwater dependent terrestrial ecosystems (GWDTEs);
  - Reduce the risk of groundwater flooding in the area of the site;
  - Prevent induced settlement to buildings and other structures, and,
  - Prevent the pollution of groundwater and/or surface water receptors.
- 11.1.2. Groundwater abstraction and discharges will be managed by the Construction Contractor(s) in accordance with the requirements of any licences, permits or consents issued by regulatory bodies, as detailed in the Other Consents and Licences document (document reference: **D.5.2**).
- 11.1.3. The Dewatering Management Plan will set out in full the arrangements for managing groundwater relating to dewatering activities. This will be based upon the Outline Dewatering Management Plan (document reference: **D.7.44**)

## **12. REPORTING**

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### **12.1. ROUTINE REPORTING**

- 12.1.1. Emissions monitoring and reporting requirements will be undertaken in line with specific licence, permit or consent conditions.
- 12.1.2. The results of routine groundwater/environmental monitoring will be reported in line with the requirements of the Detailed CEMP.
- 12.1.3. Results of breaches in any compliance levels will be reported in accordance with the CAP.

### **12.2. REPORTING POLLUTION INCIDENTS**

- 12.2.1. In the event of a pollution incident, then the Incident Procedures that will form part of the Detailed CEMP will be followed.

## 13. STAKEHOLDER ENGAGEMENT

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### 13.1. COMMUNICATION

13.1.1. Stakeholder communication and engagement will be undertaken regularly throughout the course of the DCO Proposed Development construction period. This will be detailed in the Stakeholder Communications Plan which will be in accordance with the Outline Stakeholder Communications Plan (document reference: **D.7.45**).

13.1.2. Technical engagement requirements and procedures will be incorporated into the Groundwater Management and Monitoring Plan.

13.1.3. The following regulating authorities and stakeholders will be engaged with during the production of the Groundwater Management and Monitoring Plan:

- Environment Agency
- Natural Resources Wales
- Canal and River Trust (when in the locality of their assets)
- Cheshire West and Chester Council
- Flintshire County Council

13.1.4. Contact details for the regulating authorities are:

- Environment Agency Incident (Hotline) 0800 80 70 60
- Natural Resources Wales Incident (Hotline) 0300 065 3000
- Canal and River Trust 0303 040 4040
- Cheshire West and Chester Council 0300 123 8123
- Flintshire County Council 01352 703 440

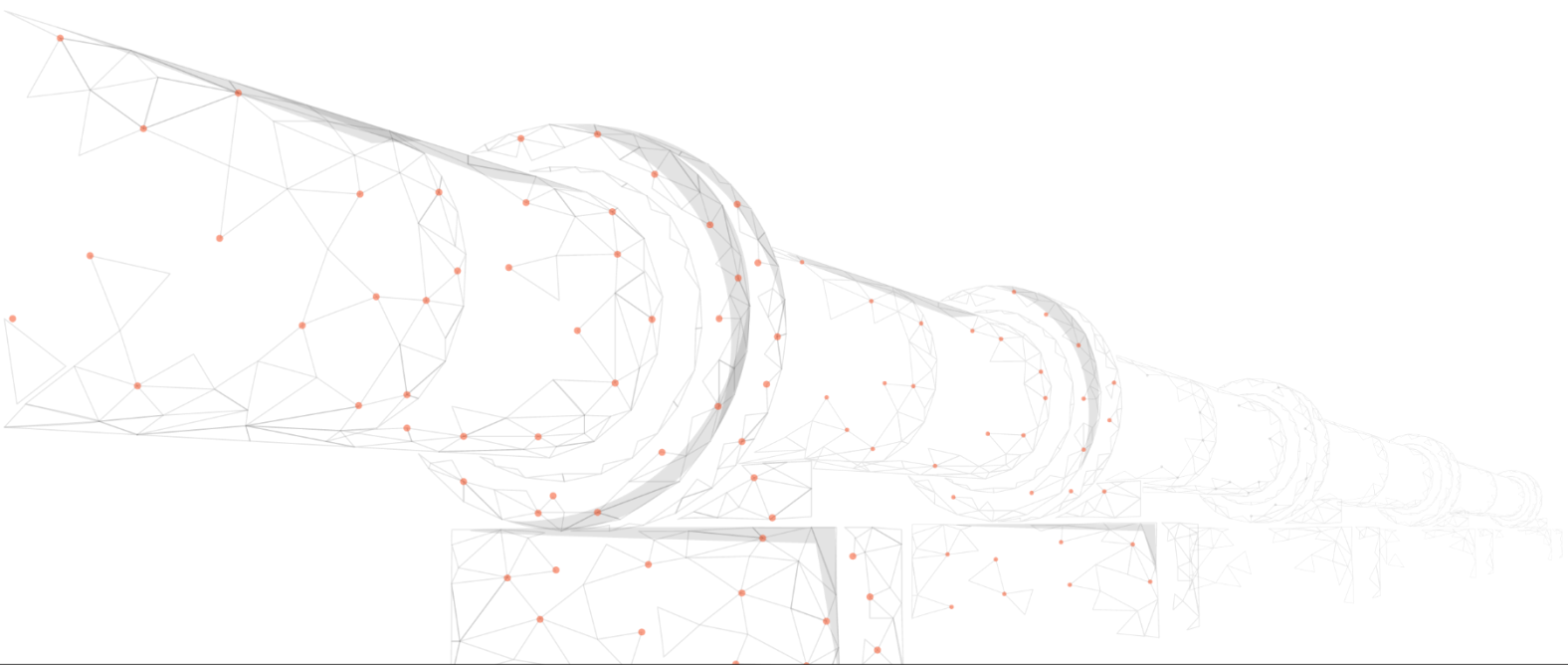
## 14. REFERENCES

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**Ref 1.1** HM Government (2008) The Planning Act 2008. Retrieved from <https://www.legislation.gov.uk/ukpga/2008/29/contents>

**Red 1.2** BS ISO 5667-11: 2009 “Water Quality – Sampling – Part 11: Guidance on sampling of groundwaters”

# Annexures



# Annex A

## **GROUNDWATER MANAGEMENT AND MONITORING REAC COMMITMENT**



<b>Unique ES Reference</b>	<b>Action/Commitment/Mitigation (including Monitoring Requirements)</b>	<b>Objective</b>	<b>Organisation/Individual Delivering Measure</b>
<b>D-WR-001</b>	Construction works will avoid the positioning of temporary material stockpiles near to watercourses and will ensure material stockpiles are located outside of the flood zone where practicable. Welfare facilities and stored equipment and materials to be located within the compounds so that areas of high flood risk are avoided.	To minimise the impacts on surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-002</b>	Construction works will ensure that a sufficient working area, as agreed by the Construction Contractor(s), is made available for effective sediment management for works within watercourses.	To minimise the impacts on surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-003</b>	Temporary stockpiles will be located a minimum of 10m from the top of bank of any watercourse, where practicable.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-004</b>	Where necessary temporary stockpiles will be protected by silt netting when not in use.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-005</b>	Surface water runoff from construction works within 10m of watercourses will be treated by use of a sediment trap where required.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-006</b>	Temporary drainage systems will be implemented near sensitive receptors to control	To minimise the impacts of surface water quality,	Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
	surface water runoff, to alleviate both flood risk and help to prevent sediment laden runoff entering the watercourse.	groundwater and flood risk.	
<b>D-WR-007</b>	Temporary cut-off drains will be used uphill and downhill of the Construction Compounds to prevent clean runoff entering and dirty water leaving the working area without appropriate treatment.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-008</b>	All drains within the construction works areas will be identified and labelled and measures implemented to those considered most at risk of polluting substances from entering them.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-010</b>	Areas with a greater risk of spillage (for example, vehicle maintenance and storage areas for hazardous materials) will be carefully sited (for example, away from drains or areas where surface waters may pond) and on an impermeable surface.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-011</b>	Emergency response plans will be developed, and spill kits made available on-site.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-012</b>	Measures to be put in place to prevent pollution from construction plant, vehicles and machinery including refuelling and lubricating in designated areas, on an impermeable surface, with appropriate cut-off drainage located away from watercourses; plant to be maintained in a good condition with wheel washing in place (avoiding vehicle cleaning near to existing	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
	watercourses), all refuelling would be supervised and carried out in a designated area. In the event of plant breakdown, drip trays would be used during any emergency maintenance and spill kits would be available on-site.		
<b>D-WR-013</b>	Fuels and potentially hazardous construction materials would be stored in bunds that have areas with external cut-off drainage; fuel would be stored in double skinned tanks with 110% capacity.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-014</b>	Construction plant will be checked regularly for oil and fuel leaks, particularly when construction works are undertaken in or near the existing waterbodies.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-015</b>	Waste fuels and other fluid contaminants will be collected in leak-proof containers prior to removal from the construction area to an approved recycling processing facility.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-016</b>	Oil absorbent booms will be made available at construction compounds and works areas and will be deployed as soon as possible in the event of a significant spillage.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-018</b>	Measures implemented to control spillage or pollution risks for site runoff or works within watercourses will be regularly inspected to ensure they are working effectively.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-019</b>	Concrete wash out will only take place at designated concrete washout areas.	To minimise the impacts of surface water quality,	Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
		groundwater and flood risk.	
<b>D-WR-020</b>	Avoid pumping or similar processes of concrete over or adjacent to open water where possible and such works will be closely observed to ensure the swift shut off any pumps if a spillage occurs.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-021</b>	Surface water run-off and excavation dewatering will be captured and settled out prior to disposal where practicable. The Construction Contractor(s) will ensure that any contaminants are to be suitably removed prior to disposal.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-022</b>	Temporary cofferdams will be used to exclude work areas from the waterbodies, thus reducing the risk of increased sediment loads or hazardous substances entering the main water flow.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-023</b>	Where works are within 10m of watercourses, sediment barriers will be provided between earth works and the construction zone and the watercourse to prevent sediment from washing into the river. Silt management will be considered not only for areas adjacent to the watercourse, but also up the valley sides to minimise fine sediment input to the watercourse. Where practicable, there will be no works within 8m of watercourses. This extends to 16m for transitional waters and tidal defences.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)

<b>Unique ES Reference</b>	<b>Action/Commitment/Mitigation (including Monitoring Requirements)</b>	<b>Objective</b>	<b>Organisation/Individual Delivering Measure</b>
<b>D-WR-024</b>	Silt fences, silt traps, filter bunds, settlement basins and/or proprietary units' will be used to treat sediment laden water generated on-site before discharge.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-025</b>	Sewage generated from site welfare facilities will be disposed of appropriately. This may be by discharge to the foul sewer network or by collection in septic tank for disposal off-site.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-026</b>	Works will be undertaken in compliance with the relevant sections of BS6031:2009 Code of Practice for Earthworks (British Standards, 2009) with respect to protection of water quality and control of Site drainage including washings, dewatering, abstractions, and surface water.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-027</b>	Clearance of vegetation on the channel banks, valley sides and riparian zone will be limited to the minimum practicable.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-028</b>	Where works are required on the watercourse banks, or in-channel, vegetation clearance will be restricted to the minimum required for the construction working area and should be undertaken only immediately prior to the commencement of those works, except for other circumstances where earlier clearance may be required due to the presence of protected species. Vegetation should be re-established as soon as practicable. If necessary, and where practicable, additional	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
	measures such as geotextiles (biodegradable and non-biodegradable), willow whips, mulching, brushwood mattresses etc. will be used to protect soils before vegetation has re-established, particularly on the watercourse banks.		
<b>D-WR-029</b>	The watercourse will be temporarily blocked and pumped over where practicable whilst the temporary crossing is constructed.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-030</b>	Where practicable, construction works will avoid works on watercourses during high flow events to reduce the risk of fine sediment release and minimise the increase to flood risk from dewatering / hydrostatic testing discharges. The Detailed Design construction programme will seek to target the construction activities involving watercourses for the drier summer months to reduce this risk, whilst taking into account the window for construction activities in relation to aquatic ecology and, in particular, the fish migratory season.	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-033</b>	All relevant consents will be sought from the Environment Agency and/or NRW for temporary discharges and in-stream works affecting Main Rivers.	To minimise the impacts of surface water quality, groundwater and flood risk.	The Applicant / Construction Contractor(s)
<b>D-WR-034</b>	A groundwater management and monitoring plan (GWMMP) will be implemented alongside a CEMP.	To set out the monitoring strategy of the shallow groundwater where any dewatering	Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
	<p>The GWMMP will consider: limits to the scale, depth and time of temporary dewatering by change of method or by division of works to reduce the zone of influence of dewatering; reduction in the use of damaging construction methods to aquifer physical properties such as consolidating; provision of (compensatory) discharges to Groundwater Dependant Terrestrial Ecosystems (GWDTEs) or use of water recycling during dewatering to support water level and flows where these may be reduced and provision of monitoring of water levels in nearby wells or surface water to enable/ identify further mitigation measures when needed.</p>	<p>activities are proposed, and to ensure all groundwater abstracted through construction is appropriately managed.</p>	
<p><b>D-WR-036</b></p>	<p>In areas of shallow groundwater, the use of temporary sheet-piles shall be considered as a hydraulic control measure to limit the ingress of water to the pipeline trench and act as mitigation to reduce the groundwater dewatering rate. If implemented sheet piles will then be removed as soon as practicable after their use.</p>	<p>To minimise the impacts of dewatering to groundwater receptors</p>	<p>Construction Contractor(s)</p>
<p><b>D-WR-037</b></p>	<p>Construction works will seek to minimise the loss of groundwater quantity from the water environment. Where practicable, water recycling practices, including re-use of hydrotest water, will be considered.</p>	<p>To minimise the impacts of surface water quality, groundwater and flood risk.</p>	<p>Construction Contractor(s)</p>

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
<b>D-WR-038</b>	The groundwater abstraction at Croughton Road, Caughall, may be impacted slightly by the proposed dewatering for the entry and exit pits of the trenchless crossing. The overhead power lines are already acting as a constraint on the possible location of the pits situated between the proposed pit locations and the abstraction, meaning that the likelihood of impact is already very low. However, any impact to the abstraction will be sought to be avoided as far as reasonably practicable.	To minimise the risk of impact from dewatering on groundwater receptors	Construction Contractor(s)
<b>D-WR-039</b>	Trench breakers (clay plugs) will be placed at regular intervals along the Carbon Dioxide pipeline trench where required to avoid preferential flow pathways being created which could impact groundwater flows to receptors	To minimise the impacts of surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-050</b>	Where practicable, the alignment of the pipeline to be developed during detailed design will seek to minimise potential environmental impacts as far as practicable	To minimise the impacts on surface water quality, groundwater, hydromorphology and flood risk	Construction Contractor(s)
<b>D-WR-052</b>	A pre-works crossing point survey will be carried out to record channel and bank morphology and features, riparian zone structure, and collect photographic record, so that reinstatement is as close to baseline as practicable. Re-instatement works should be supervised by an appropriately qualified ECoW.	To minimise the impacts on surface water quality, groundwater, hydromorphology and flood risk	Construction Contractor(s)



Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
<b>D-WR-059</b>	The Groundwater Management and Monitoring plan will set out the monitoring requirements, establish a protocol for the assessment and response to monitoring data and provide methods to assess compliance with the conditions of development consents, environmental protection licences and legislation relating to groundwater and GWDTE.	To minimise the risk of groundwater flooding and impacts from dewatering to groundwater receptors	Construction Contractor(s)
<b>D-WR-067</b>	At the GWDTE at the River Gowy, the GWDTE is situated to the south of the NVC vegetation area which the pipeline will not encroach into. As the expected radius of influence from the dewatering does not extend into this area of GWDTE, there is no impact to it anticipated. Regardless, during detailed design, the final alignment will seek to avoid any impact on the GWDTE as far as reasonably practicable. This is expected to be achieved by the final alignment being situated to the north of the NVC vegetation area	To avoid any impact to the GWDTE	Construction Contractor(s)
<b>D-WR-071</b>	Groundwater level monitoring and permeability testing will be undertaken at the proposed AGI/BVS locations in order to collect required information on groundwater conditions to inform the detailed drainage design.	To minimise the impacts on surface water quality, groundwater and flood risk.	Construction Contractor(s)
<b>D-WR-072</b>	Prior to construction of the Proposed DCO Development, the Applicant will consult with Local Authorities for information relevant to	To inform further design and construction on the abstraction activities and	The Applicant / Construction Contractor(s)

Unique ES Reference	Action/Commitment/Mitigation (including Monitoring Requirements)	Objective	Organisation/Individual Delivering Measure
	unlicensed private groundwater abstractions. In the event that new information is forthcoming regarding previously unknown private abstractions, the Construction Contractor(s) would look to understand the potential impact and provide appropriate mitigation	provide appropriate mitigation.	
<b>D-WR-073</b>	Mitigating potential impacts to groundwater resulting from trenchless crossings will be based on site-specific assessment for locations where trenchless crossings are is the confirmed approach at detailed design.	To provide appropriate mitigation for trenchless crossing impacts	Construction Contractor(s)