XLINKS' MOROCCO-UK POWER PROJECT

Outline Bentonite Breakout Plan

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Contents

Glossary

Term	Meaning
Alverdiscott Substation	The existing National Grid Electricity Transmission substation at Alverdiscott, Devon, which comprises 400 kV and 132 kV electrical substation equipment.
Alverdiscott Substation Connection Development	The development required at the existing Alverdiscott Substation Site, which is envisaged to include development of a new 400 kV substation, and other extension and modification works to be carried out by National Grid Electricity Transmission. This does not form part of the Proposed Development. However, it is considered cumulatively within the Environmental Impact Assessment as it is necessary to facilitate connection to the national grid.
Alverdiscott Substation site	The National Grid Electricity Transmission site within which the Alverdiscott Substation sits.
Applicant	Xlinks 1 Limited.
Bentonite	Bentonite is an inert mineral used as the primary base in drilling fluids.
Bipole	A Bipole system is an electrical transmission system that comprises two Direct Current conductors of opposite polarity.
Centre for Environment, Fisheries and Aquaculture Science	The United Kingdom government's marine and freshwater science expert agency.
Construction Traffic Management Plan	A document detailing the construction traffic routes for heavy goods vehicles and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures.
Converter Site	The Converter Site is proposed to be located to the immediate west of the existing Alverdiscott Substation site in north Devon. The Converter Site would contain two converter stations (known as Bipole 1 and Bipole 2) and associated infrastructure, buildings, and landscaping.
Converter station	Part of an electrical transmission and distribution system. Converter stations convert electricity from Direct Current to Alternating Current, or vice versa.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Earthworks	Covers the processes of soil-stripping, ground-levelling, excavation, and landscaping, as defined by the Institute of Air Quality Management.
Environmental Impact Assessment	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.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Horizontal Directional Drilling	Horizontal Directional Drilling is a method of installing underground pipelines, cables, and service conduit (or ducts) through trenchless methods to avoid obstacles and sensitive features (e.g. roads, watercourses, woodlands, etc.).
HVAC Cables	The High Voltage Alternating Current cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVAC Cable Corridors	The proposed corridors (for each Bipole) within which the onshore High Voltage Alternating Current cables would be routed between the Converter Site and the Alverdiscott Substation Site.
HVDC Cables	The High Voltage Direct Current cables which would bring electricity to the UK converter stations from the Moroccan converter stations.
Landfall	The proposed area in which the offshore cables make landfall in the United Kingdom (come on shore) and the transitional area between the offshore cabling

Term	Meaning
	and the onshore cabling. This term applies to the entire landfall area at Cornborough Range, Devon, between Mean Low Water Springs and the Transition Joint Bay inclusive of all construction works, including the offshore and onshore cable routes, and compound(s) at Landfall.
Lead Local Flood Authority	County councils and unitary authorities. Lead in managing local flood risks (i.e. risks of flooding from surface water, ground water and ordinary (smaller) watercourses).
Loss Circulation Material	Additives introduced to the drilling fluid when there are signs of inadvertent returns or the loss of drilling fluid.
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Onshore Infrastructure Area	The proposed infrastructure area within the Order Limits landward of Mean High-Water Springs. The Onshore Infrastructure Area comprises the transition joint bays, onshore HVDC Cables, converter stations, HVAC Cables, highways improvements, utility diversions and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses.
Onshore HVDC Cable Corridor	The proposed corridor within which the onshore HVDC Cables would be located.
Order Limits	The area within which all offshore and onshore components of the Proposed Development are proposed to be located, including areas required on a temporary basis during construction (such as construction compounds).
PLONOR	The OSPAR list of substances used and discharged offshore which are considered to Pose Little Or No Risk (PLONOR) to the environment.
Proposed Development	The element of the Xlinks Morocco-UK Power Project within the UK. The Proposed Development covers all works required to construct and operate the offshore cables (from the UK Exclusive Economic Zone to Landfall), Landfall, onshore Direct Current and Alternating Current cables, converter stations, and road upgrade works.
Protected species	A species of animal or plant which it is forbidden by law to harm or destroy.
Receptor	The element of the receiving environment that is affected.
Runoff	Runoff occurs when there is more water than land can absorb. The excess liquid flows across the surface of the land.
Transition joint bay	A transition joint bay is an underground structure at the landfall area where the offshore cables are jointed to the onshore cables.
Utility Diversions	Works required by statutory utility providers to re-route infrastructure around the Proposed Development.
Written Scheme of Investigation	A plan detailing the protocol for any archaeological investigation to be carried out prior to the construction of the Proposed Development, including procedures for field survey and watching briefs.
Xlinks Morocco-UK Power Project	The overall scheme from Morocco to the national grid, including all onshore and offshore elements of the transmission network and the generation site in Morocco (referred to as the 'Project').

Acronyms

Acronym	Meaning
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan

Acronym	Meaning
CoPA	Control of Pollution Act
DCO	Development Consent Order
EA	Environment Agency
EIA	Environmental Impact Assessment
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
OCNS	Offshore Chemical Notification Scheme
PLONOR	Pose Little or No Risk
SSSI	Site of Special Scientific Interest

Units

Units	Meaning
km	Kilometre
m	Metre
mph	Miles per hour

1 OUTLINE BENTONITE BREAKOUT PLAN

1.1 Introduction

Background

1.1.1 This document forms the Outline Bentonite Breakout Plan, which has been prepared for the United Kingdom (UK) elements of Xlinks' Morocco-UK Power Project (the 'Project'). For ease of reference, the UK elements of the Project are referred to as the 'Proposed Development.'

1.1.2 This document presents the strategy and outline measures to manage potential environmental impacts associated with the use of bentonite in trenchless crossing construction activities, including horizontal direction drilling (HDD).

1.1.3 The relevant local planning authorities are Torridge District Council, North Devon District Council and Devon County Council. Other relevant regulating authorities include the Environment Agency (EA) and the Marine Management Organisation (MMO).

1.1.4 The Applicant is committed to using bentonite as the primary drilling fluid of choice for the Proposed Development. Due to its chemical and physical properties, bentonite offers several significant benefits and is considered the best practice drilling fluid.

Purpose of the Outline Bentonite Breakout Plan

1.1.5 The draft Development Consent Order (DCO) (document reference 3.1) includes a requirement for the preparation of a final Bentonite Breakout Plan. This is secured under DCO Schedule 2, Requirement 7.

1.1.6 The final Bentonite Breakout Plan is to be prepared by the Principal HDD Contractor and submitted for approval to the relevant planning authority prior to the commencement of HDD construction activities, in consultation with relevant stakeholders. The final Bentonite Breakout Plan will also be agreed with the MMO in advance of relevant works.

1.1.7 The purpose of this Plan is to set out measures that would be implemented during trenchless cable crossing construction activities to ensure a consistent and effective approach to managing potential environmental impacts associated with the use of bentonite.

1.1.8 This is an outline document that is based on the design assessed in the Environmental Statement (ES) (see document reference 6.1.3).

1.1.9 This Outline Bentonite Breakout Plan incorporates legislative requirements, current standards, and best practice measures. However, compliance with this Strategy will not absolve Xlinks 1 Limited ('the Applicant'), Principal Contractor(s) or subcontractors from compliance with all legislation and byelaws relating to construction activities.

Scope of the Outline Bentonite Breakout Plan

1.1.10 This outline plan applies to the use of bentonite in trenchless cable crossing construction activities required for the Proposed Development.

1.1.11 For the purposes of impact assessment, HDD has been assumed for the major crossings detailed within Figure 3.7 (see Volume 1, Figures). This is the 'reasonable worst case' assumption of construction effects. However, contractors may select trenchless or trenched installation techniques at other minor features in order to minimise any disruption caused and thereby lessen any impacts identified as part of the EIA process.

1.1.12 Planned trenchless cable crossings via HDD (or other trenchless installation techniques) will include:

- The HDD at Landfall
- Kenwith Stream, situated just south of Rickard's Down and approximately 300 m north of Abbotsham.
- A39, at a section approximately 250 m southwest of the Abbotsham Cross roundabout and northwest of High Park Farm.
- An optional HDD at the site of known archaeological assets at Winscott Barton.
- A small stream, 290 m south of Jennetts reservoir and to the west of West Ashridge, which feeds into Jennetts reservoir.
- River Torridge, to the south of Bideford (to note, one HDD will cross both the River Torridge and A386).

1.1.13 The final Bentonite Breakout Plan would be developed in general accordance with the principles established in this Outline Bentonite Breakout Plan and would be agreed with the relevant authorities prior to commencing the relevant construction activities.

Implementation of the Outline Bentonite Breakout Plan

1.1.14 In the event that the Proposed Development is granted development consent, a final Bentonite Breakout Plan would be prepared by the Contractor in accordance with the principles established in this Outline Bentonite Breakout Plan and agreed with the relevant local planning authority and other relevant regulators prior to the commencement trenchless installation techniques.

1.1.15 The Contractor would be required to follow the final Bentonite Breakout Plan and implement the measures to control associated environmental impacts during construction.

1.1.16 During the construction process, the implementation of the measures within the final Bentonite Breakout Plan would be monitored to ensure the measures are implemented correctly and remain effective.

1.1.17 The final Bentonite Breakout Plan will link closely to the following management plans:

- Onshore Construction Management Plan

- Offshore Construction Management Plan
- Pollution Prevention Plan
- Site Resource and Waste Management Plan
- Community Liaison Plan

1.2 Project Description

Site Location

1.2.1 The onshore elements of the Proposed Development would be located within the Onshore Infrastructure Area (see **Figure 1-1**). The Onshore Infrastructure Area is wholly located within the local authority area of Torridge District Council (and Devon County Council at county level) in north Devon, and extends from the Alverdiscott Substation Site to the Landfall at Cornborough Range.

1.2.2 The offshore elements of the Proposed Development would be located wholly within the Offshore Cable Corridor (see **Figure 1-1** for interface with onshore area) with the Landfall HDD intended to effectively bypass the intertidal zone, the beach and the foreshore coastal cliffs. The Landfall HDD will extend to up to 1,800 m offshore (see **Figure 1-2**: Landfall HDD Location Plan).

Site Context

Landfall

1.2.3 The Landfall for the Proposed Development is located at Cornborough Range on the north Devon coast, to the south-west of Cornborough and approximately 4 km west of Bideford. This part of the Proposed Development lies within the North Devon Coast National Landscape and the Heritage Coast. The Mermaid's Pool to Rowden Gut geological SSSI is also situated along the coastline.

Onshore Infrastructure Area

1.2.4 The Onshore Infrastructure Area is in an area that is predominantly rural. The settlements of Abbotsham, Bideford, Ford, Littleham, Landcross, East-the-Water, Gammaton Moor, Woodtown and Stony Cross are situated close to the Onshore Infrastructure Area. The existing Alverdiscott Substation is located within the Onshore Infrastructure Area and there are existing 132 kV, 33 kV and 11 kV overhead lines that cross the Order Limits and connect to the existing Alverdiscott Substation.

1.2.5 The Onshore Infrastructure Area includes parts of the North Devon National Landscape and Kynoch's Foreshore Local Nature Reserve. The Taw-Torridge Estuary Site of Special Scientific Interest (SSSI) is also situated approximately 1.3 km north of the Onshore Infrastructure Area.

1.2.6 The River Torridge flows through the central extent of the Onshore Infrastructure Area, with other watercourses also present along the route, including Kenwith Stream and some unnamed ordinary watercourses.

1.2.7 The Flood Map for Planning (GOV.UK, 2019) indicates the Onshore Infrastructure Area is located within Flood Zones 1, 2 and 3. The majority of the Onshore HVDC

Cable Corridor is located within Flood Zone 1. Areas along the Onshore HVDC Cable Corridor within proximity to watercourses (including the River Torridge) are located within Flood Zones 2 and 3.

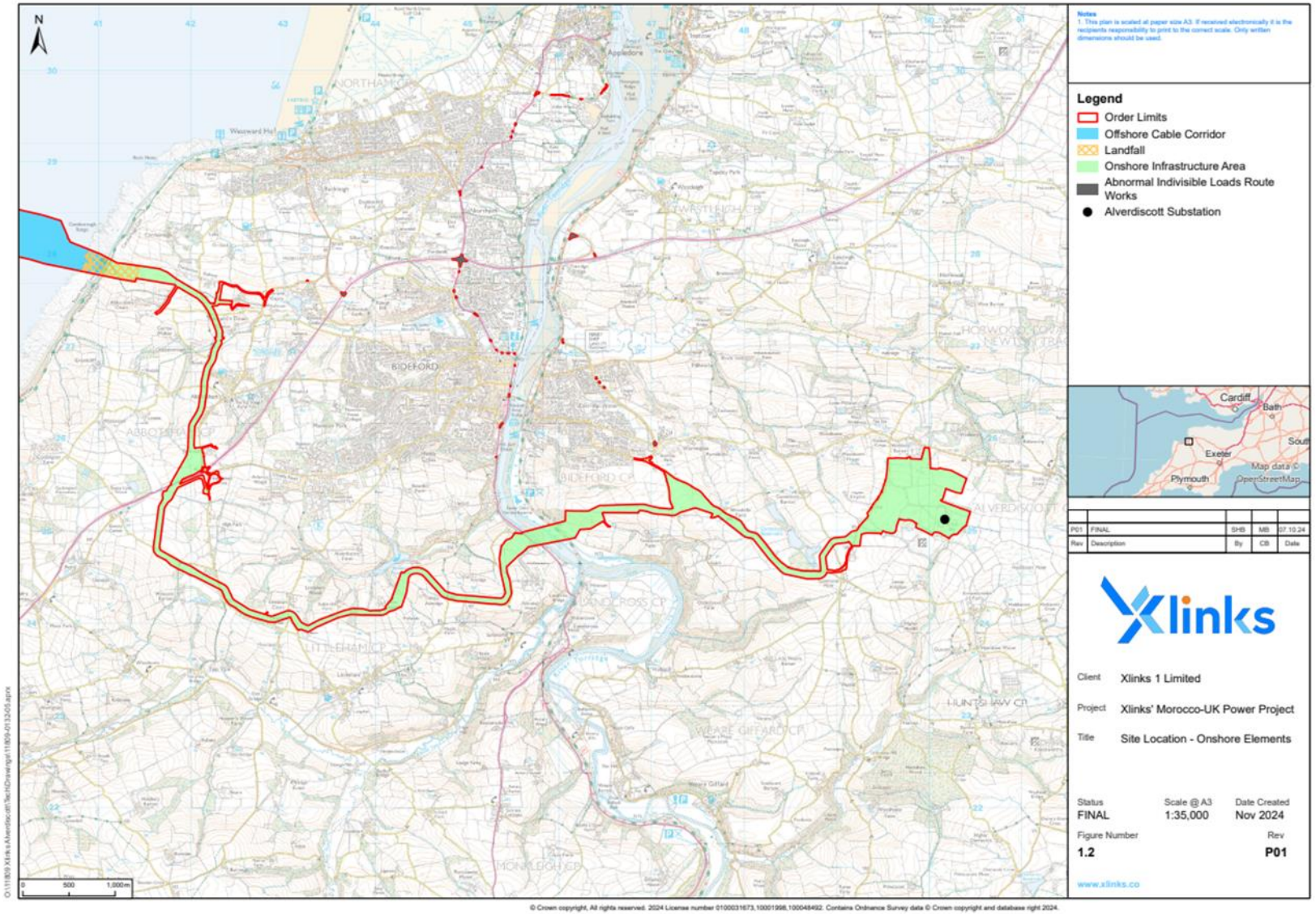

Figure 1-1: Site Location - Onshore Elements

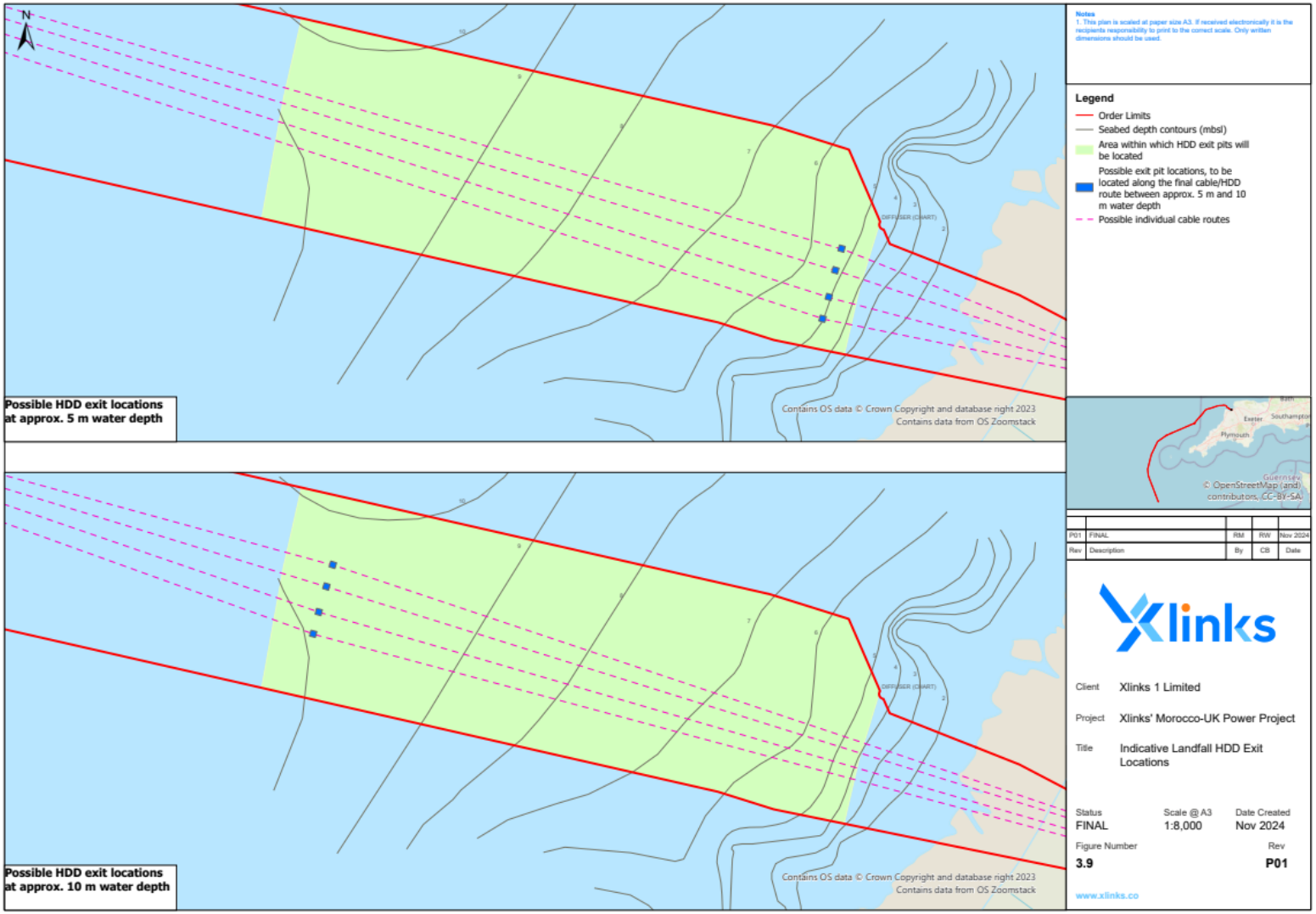

Figure 1-2: Landfall HDD Location Plan

2 BENTONITE

2.1 What is Bentonite?

2.1.1 Bentonite is an inert clay mineral used as a drill fluid. Due to its chemical and physical properties, bentonite has an exceptional water absorption capacity. As bentonite absorbs water it expands and forms a viscous, gel-like substance which acts as a highly effective sealant, stabilising boreholes and preventing fluid loss.

2.1.2 Bentonite drilling fluids used during the installation of trenchless cable crossings perform a number of functions. These functions include:

- Lubrication
- Cooling of cutting drilling tools
- Corrosion protection
- Removal of drill cuttings and transportation to the surface
- Collapse prevention
- Creation of filter cake to mitigate against the loss of drilling fluids and/or influx of groundwater

2.1.3 Using bentonite over other drilling fluids has the following benefits:

- Natural clay material, and chemically inert
- Recyclable
- On the PLONOR (Pose Little Or No Risk) list

2.1.4 Bentonite is delivered to site as a finely ground dry powder and is rehydrated at site using potable water.

Other Drilling Materials

2.1.5 Though the Applicant is committed to using bentonite as the primary drilling fluid for the Proposed Development, in certain circumstances, the use of other drilling materials may be required.

2.1.6 Following a breakout, if circulation and pressure cannot be maintained, the Contactor may introduce lost circulation material into the drilling system to assist in the closure of fractures/fissures and prevent further fluid loss. The choice of lost circulation material (fibre, flake or granular) will be dependent on the type of loss and substrate.

2.1.7 To confirm the effectiveness of the lost circulation material and the successful closure of fractures/fissures, Pure Bore, or similar, may be utilised. If circulation/pressure cannot be maintained, a grout plug, or similar, may be introduced into system.

2.1.8 Other drilling material to support the effectives of drilling operations may also be required.

2.1.9 All other drilling materials to be used for the Proposed Development are to be detailed within the final Bentonite Breakout Plan and agreed with the relevant authorities.

2.1.10 Due to the offshore elements of the Proposed Development and the interaction with the marine environment, all other drilling materials used would be rated sliver or higher on the Offshore Chemical Notification Scheme (OCNS) list produced by Centre for Environment, Fisheries and Aquaculture Science (CEFAS). This will prevent the use of any substitutions in the drilling fluid and provide a strong baseline for permissible chemicals that have undergone rigorous environmental testing.

2.2 Drill Fluids and Cutting Management

2.2.1 The system for the handling of drilling fluids will consist of a generator, mix and recycling units, high pressure mud pumps, slurry pumps, holding tanks and mud reception pits.

2.2.2 Within the drilling fluid system, the bentonite would be mixed with water until the desired concentration values are achieved. The drilling fluid will then be pumped via a high-pressure pump to the borehole.

2.2.3 The drilling fluid will return to the surface via the entry point of the drill and transported to the recycling system. Recycled drilling fluid would be stored for reuse until required.

2.2.4 Cuttings/mud removed from the drill fluid through the recycling system would be subject to Waste Acceptance Criteria testing to determine the correct waste code. Cuttings will then be transported to an appropriately licensed disposal facility.

2.2.5 Excess drill fluid will similarly be disposed of at a licensed facility with the fluid being transported from site in tankers.

3 BENTONITE BREAKOUT

3.1 Loss of Drilling Fluid

3.1.1 Drilling fluid can be lost from the borehole through cracks, crevices, or porous formations to surface or voids. Loss of drilling fluid is known as a breakout. A breakout can be partial or complete.

3.1.2 Breakouts usually occur in areas of highly fissured clay, gravels or where there are large, interconnected fissures. Breakouts may also occur where manmade features are present.

3.1.3 If fluid is lost to the surface or ground, fluid levels in the mud tank and pressure will fall. These losses would be quickly identified through the monitoring of the system and pumping paused, allowing appropriate action to be taken.

3.1.4 Effective removal of the cuttings from the borehole is key in avoiding a breakout. If cuttings are not removed, they can decrease the cross-sectional area of the borehole, leading to an increase in annular pressure and the risk of breakout.

Loss to Surface (Onshore and Offshore)

3.1.5 Surface breakout usually occurs relatively close to the entry and exit point. This is due to the drill being shallow and not at the optimum drill depth.

3.1.6 In the event of loss of drilling fluid, it is only likely to reach the ground or marine surface where fissures provide a continuous path.

3.1.7 There is also a risk of bentonite drilling fluid entering the ocean when punching out of the seabed.

Loss to Ground

3.1.8 When drilling in ground with high permeability or voids drilling fluid can be lost to the ground (voids) and groundwater receptors.

3.2 Risk Mitigation

Design and Planning

3.2.1 To minimise the risk of a breakout, the designs for all HDDs and other trenchless crossings would be informed by ground investigations and feasibility studies.

3.2.2 Planning and rig operation are also important in minimising the risk of breakout, in addition to selecting a rig size that minimises the annular pressure.

3.2.3 A hydrofracture assessment would be undertaken to ascertain pressures required to cause an inadvertent drill fluid release.

3.2.4 Drilling fluid would be of sufficient viscosity and properties for the ground being drilled.

3.2.5 Control plan for punching out of the seabed to be developed by Principal HDD Contractors and included in final Bentonite Breakout Plan.

3.2.6 Contingency and emergency plans would be established and included within method statements.

Monitoring

3.2.7 During drilling phases, drilling activities would be subject to a watching brief by the Contractor.

3.2.8 For onshore activities and watercourse crossings, the drill alignment would be patrolled and inspected regularly for signs of breakout.

3.2.9 The drilling fluid system would be continuously monitored. The driller would monitor pumping pressures and the mud mixing operative will monitor system volumes for signs of losses.

3.2.10 The drilling team monitoring the site, the driller and the Site Manager/Drill Manager would be equipped with radios at all times. Drilling would be stopped immediately on any reports of breakout.

3.2.11 Monitoring records are to be maintained by the contractor at the time of construction.

Reporting

3.2.12 Reports and logs would be completed for drilling activities.

3.2.13 Detail design will dictate required reports and logs, in addition to the information to be included and the frequency of reporting.

Training

3.2.14 All construction staff involved in HDD and other trenchless crossing construction activities will receive training on their responsibilities for minimising the risk to the environment and implementing the measures set out in the final Bentonite Breakout Plan.

3.2.15 The Principal Contractor(s) will ensure that contractors employ an appropriately qualified and experienced workforce. The Principal Contractor(s) will also be responsible for identifying the training needs of their personnel to enable appropriate training to be provided. Training will include daily site briefings and toolbox talks to provide the necessary knowledge on health, safety and environmental topics, and the relevant environmental control measures pertinent to the activities being undertaken that day.

4 BENTONITE BREAKOUT RESPONSE

4.1.1 Should a bentonite breakout occur the following response plans would be implemented.

Onshore breakout response (land, including intertidal):

1. The drilling activity will be immediately stopped.
2. The exact breakout location identified, where possible.
3. Where practical and safe to do so, the breakout fluid will be contained using straw bales, sandbags, and/or silt fencing.
    a. Any intertidal response to be authorised by the MMO.
4. Relevant Principal Contractor personnel to be notified (i.e. environmental team, Site Manager).
5. In the event of a breakout within the landfall area, Torridge District Council will be notified and the site of the breakout secured using herras fencing until the breakout is cleared.
6. In the event of a breakout within the intertidal area, the MMO, Environment Agency, and Natural England will be notified.
    a. No vehicular access to the intertidal area without prior agreement of these agencies.
    b. Any rapid intertidal response to be authorised by the MMO.
7. Where appropriate, absorbent granules will be used to increase the viscosity of the breakout fluid to form a thick clay that can easily be removed from surface.
    a. Any rapid intertidal response to be authorised by the MMO – preference may be to rely on tidal flushing.
8. In cases where large volumes of breakout fluid require recovery, a suction pump and hose will be utilised to remove the fluid from the ground. Recovered fluid will be recycled.
    a. Any rapid intertidal response to be authorised by the MMO.
9. Any remaining deposits will be removed using minimally invasive techniques.
    a. Any intertidal response to be authorised by the MMO.

Onshore breakout response (water):

1. The drilling activity will be immediately stopped.
2. The exact breakout location identified, where possible.
3. Where practical and safe to do so, depending on the breakout volume and depth of the watercourse, the breakout fluid will be contained using straw bales, sandbags, silt fencing, silt curtains and/or booms.
4. Relevant Principal Contractor personnel to be notified (i.e. environmental team, Site Manager).

5. Principal Contractor to notify the EA, and where relevant, the lead local flood authority.
6. Once contained, a site-specific clean-up response to be deployed, in consultation with the EA, and where relevant, the lead local flood authority.

Offshore (subtidal) breakout response:

1. The drilling activity will be immediately stopped.
2. The exact breakout location identified, where possible.
3. Relevant Principal Contractor personnel to be notified (i.e. environmental team, Site Manager).
4. Principal Contractor to notify the MMO.
5. Pump lost circulation material and wait for the material to seal fracture/fissure.
6. Pump a mixture of 'Pure Bore' or similar to determine closure of the fracture/fissure and if circulation/pressure can be maintained.
7. If circulation/pressure cannot be maintained, above process (5 and 6) to be repeated.
8. If the fracture/fissure cannot be sealed, dependent upon the rate of fluid loss and the geology, a grout plug or similar will be pumped at the end of the bore, or the drilling assembly will be withdrawn for a distance and a new profile drilled to avoid the area. This site-specific response will to be deployed in consultation with the MMO.

4.1.2 Prior to the deployment of clean-up and site-specific responses the following factors would be taken into consideration:

- Local geology and soils
- Access requirements and rights/permissions
- Habitats and ecology
- Other environmental constraints.

4.1.3 Where relevant, rapid responses would be developed and agreed with the relevant regulating authorities.

4.1.4 During a breakout, fast efficient reporting is essential. Emergency contact details would be included in Method Statements and available onsite.

4.1.5 A breakout report would be completed as soon as reasonably practicable after the breakout by the Principal HDD Contractor. An investigation led by the Principal Contractor into the breakout would also commence.

4.1.6 In exceptional cases, and where deemed necessary by the Principal Contractor, the Applicant or the relevant regulating authority, drilling activities at the relevant site would be halted until an investigation into the breakout is complete and a procedure/method for restarting the drill agreed.