

Viking CCS Pipeline

9.31 Draft Bentonite Management Plan

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a Harbour Energy Company
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ONSHORE PIPELINE - BENTONITE BREAKOUT TECHNICAL NOTE

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1. PROJECT DESCRIPTION

The Viking CCS Pipeline ('the Proposed Development') comprises a new 24 " (609 mm) diameter onshore pipeline of approximately 55.5 km in length, which will transport Carbon Dioxide (CO₂) from the Immingham industrial area to the Theddlethorpe area on the Lincolnshire coast, where it will connect into the existing 36 " (921 mm) diameter offshore LOGGS pipeline.

The Proposed Development is an integral part of the overall Viking CCS Project, which intends to transport compressed and conditioned CO₂ received at a facility at Immingham to store in depleted gas reservoirs under the Southern North Sea. The offshore elements of the Viking CCS Project, including the transport of CO₂ through the LOGGS pipeline to the Viking gas fields under the North Sea, are subject to a separate consenting process.

The key components of the Proposed Development comprise:

- Immingham Facility;
- Approximately 55.5 km 24 inch (") onshore steel pipeline (including cathodic protection);
- Three Block Valve Stations;
- Theddlethorpe Facility;
- Existing LOGGS pipeline and isolation valve to the extent of the Order Limits at Mean Low Water Springs (MLWS);
- Permanent access to facilities;
- Mitigation and landscaping works;
- Temporary construction compounds, laydown, parking and welfare facilities;
- Temporary access points during construction.

Further details of each element of the Proposed Development are set out in Environmental Statement Volume II Chapter 3 Description of the Proposed Development (Application Document 6.2.3).

2. SCOPE OF THE DOCUMENT

This technical note is to summarise the application of 'Bentonite' in the trenchless pipeline construction, its potential risks and proposed mitigation measures for the HDD crossings on Viking CCS Onshore Pipeline.

3. DEFINITIONS AND ABBREVIATIONS

3.1 Abbreviations

Table 1 – Abbreviations

Abbreviation	Definition
CO ₂	Carbon Dioxide
BEIS	Business, Energy & Industrial Strategy
BGS	British Geological Survey
CCS	Carbon Capture and Storage

Abbreviation	Definition
CDM	The Construction (Design and Management) Regulations
CEFAS	The Centre for Environment, Fisheries and Aquaculture Science
DCO	Development Consent Order
FEED	Front End Engineering Design
HDD	Horizontal Directional Drilling
OSPAR	Oslo and Paris
PLONOR	Poses Little Or No Risk to the Environment

4. HORIZONTAL DIRECTIONAL DRILLING

4.1 General

Horizontal Directional Drilling (HDD) is a trenchless technology that allows installation of underground pipelines along a bore path with minimal impact on the surrounding area. The process starts with drilling a pilot hole from a designated entry point using an HDD drilling machine. This hole is gradually extended until it reaches the required length, and the drill head surfaces at the exit point. The operator guides the drill head using a tracking wire placed aboveground. Once the pilot hole is completed, it is enlarged in multiple stages using reamers until it reaches the required diameter for the pipeline. Finally, the pipe string, which is fabricated aboveground is pulled back through the borehole.

In HDD, drilling fluid is a critical component. It is injected into the hole to perform several functions, including the borehole stabilisation and transportation of the excavated spoils to the surface. The drilling fluid that resurfaces at the rig site will undergo recycling and will be reused.

The primary ingredient of this fluid is fresh water. To enable the water to carry out the tasks outlined in section 4.4, it is often necessary to alter its properties by incorporating a viscosifier. The viscosifier predominantly used is Bentonite, a mined naturally occurred clay.

4.2 Bentonite

Bentonite serves as the fundamental base of the drilling fluid. It is extracted from the earth, processed into a dried, finely ground powder, and then transported to the drilling site. At the site, the Bentonite powder is rehydrated in a temporary mix tank using fresh water.

Bentonite is chosen for its unique properties. It has excellent fluid loss control and suspension properties, which help to stabilise the borehole walls. Bentonite forms a thin, gel-like layer on the walls that prevents drilling fluids from seeping into the surrounding soil, which would destabilise the borehole. It also prevents water ingress into the borehole and thus becoming a transient route.

In addition to Bentonite, the drilling fluid incorporates carefully selected additives to manage its rheological properties. These additives ensure the fluid exhibits the desired characteristics under the varying conditions encountered during the drilling process.

Bentonite has a neutral pH level (8-9) and grain size less than 60 microns

4.3 Classification of Bentonite

Bentonite is not classified as a physical, health, or environmental hazard according to GB-CLP Regulations UK SI 2019/720 and UK SI 2020/1567. It is classified as non-hazardous dangerous under Regulation EC 1272/2008 (CLP). Under regulation directive 67/548/EEC and 1999/45/EC, Bentonite does not require labelling as it is not hazardous.

Refer to Appendix A for Material Safety Datasheet of Bentonite.

4.4 Bentonite Uses

Drilling fluid, a composite primarily composed of Bentonite and fresh water, plays a pivotal role in Horizontal Directional Drilling (HDD) operations. Its functions, which are important to the success of the drilling process are as follows:

- **Powering the Mud Motor:** The drilling fluid is responsible for transmitting the necessary power to the downhole motor, also known as the mud motor. This power is essential for turning the drilling/ cutting head (known as the bit), thereby mechanically drilling the pilot hole.
- **Hydraulic Excavation:** The drilling fluid aids in the hydraulic excavation process. High velocity fluid streams, directed from jet nozzles on bits or reaming tools, erode the soil, effectively excavating the borehole.
- **Transportation of Spoil:** The spoil, which consists of excavated soil or rock cuttings, is suspended in the drilling fluid. This fluid stream, flowing in the annular space (the space between the borehole and the pipe), carries the spoil towards the surface along the borehole to the HDD entry point.
- **Friction Reduction:** The drilling fluid serves as a lubricant for the drill string during the drilling phases and for the fabricated pipe during the pullback phase. This reduces friction and facilitates smoother operations (i.e. reduces torque and pull loads).
- **Cooling and Cleaning of Cutters/Reamers:** The drilling fluid is instrumental in cooling and cleaning the cutters or reamers. High velocity fluid streams directed at the cutters remove any build-up of drilled spoil. Additionally, the fluid cools the cutters, preventing overheating.
- **Hole Stabilization:** The drilling fluid stabilizes the drilled or reamed hole, a critical aspect in HDD pipeline installation, especially since holes are typically in soft soil formations and are uncased. Stabilization is achieved by the drilling fluid forming a wall cake and exerting a positive pressure on the borehole wall. Ideally, the wall cake seals pores and creates a bridging mechanism to hold soil particles in place.
- **Creation of a Filter Cake:** The drilling fluid forms a filter cake against the wall of the borehole. This minimizes the risk of loss of drilling fluid and prevents the influx of groundwater into the borehole.

The use of bentonite has a number of additional environmental benefits:

- It is a natural material without any artificial chemicals;
- It is recyclable;

4.5 Bentonite Concentrations

The characteristics of drilling fluid, especially the viscosity, can be adjusted during the drilling phases by changing the structure of the composite. The drilling fluid is typically between 13 litres (30kg) and 35 litres (80kg) of dry Bentonite clay per cubic meter of water. While higher concentrations enhance cuttings recovery, they may slow down the

drilling operations which may not be ideal. The right concentration is selected to achieve a balance between efficient drilling and effective cuttings management based on soil/ground condition.

5. BENTONITE BREAKOUT RISK

5.1 General

HDD is a very common technique for the installation of pipe lines and the risks associated with it are well understood. Based on industry experience, carefully planned design and skilled execution by competent HDD contractor the risks of a bentonite breakout are minimised. The main risks associated with HDD are outlined below and risk mitigation is detailed further in Section 6

5.2 Hydro-fracture

Hydro-fracture, also known as “frac-out” or “surface breakout”, is an inadvertent return of drilling fluids to the surface along the HDD path. The surface breakout of drilling fluid (Bentonite) may occur close to the entry and exit points of an HDD primarily due to the drill being shallower

Infrequently, drilling fluid may break out of the bore in cases of highly fissured clay, gravels, or where large, interconnected fissures exist in the ground.

Drilling fluid breakout may also occur where manmade features, such as old soil investigation boreholes, are present. In the event of egress of drilling fluid from the bore, it is only likely to reach ground level where there is a continuous path available to the surface.

5.3 Loss to Ground

When drilling in ground with high permeability (e.g. peat) or voids (e.g. chalk) drilling fluid has the potential to be lost to the surrounding ground. However, under normal circumstances, this is not a common occurrence in HDD operations. The reason lies in the nature of the drilling fluid used, which is a thixotropic fluid with high viscosity. This means that the fluid is viscous when at rest, but flows easily when agitated or stressed. This high-viscosity fluid plays a crucial role in the drilling process. As the drill bores through the ground, the fluid effectively seals the wall of the drill hole. This sealing action prevents the fluid from escaping into the surrounding ground, thereby minimising the risk of fluid loss.

BENTONITE BREAKOUT RISK MITIGATION

5.4 Prevention

As previously stated HDD is a proven technique for pipeline installation with well understood risks. The following section outlines the methods for mitigating these risks.

5.4.1 HDD Design

Bentonite breakout mitigation starts with a suitable design of HDD drilling path. The site geology shall be reviewed by an HDD design specialist to ensure that the risk of hydro-fracture is minimised for the intended HDD drilling path.

The HDD alignment profile and soil geological layers will be assessed for the risk of breakout using hydro-fracture modelling.

The design of the drill profile is another critical factor in preventing fluid loss. The ground conditions will be carefully considered to understand its potential permeability and the drill profile will be designed to further reduce the risk of fluid loss to the ground. This careful planning and design process, combined with the use of high-viscosity drilling fluid, ensures the integrity of the drill operation while minimizing environmental impact.

There are several major crossings along the pipeline route that are planned to be constructed using HDD method based on early-FEED preliminary assessments. Locations, lengths, and underlying ground geology of these crossings are summarised in the following table. The underlying ground geology in this table is based on nearby British Geological Survey (BGS) records borehole data.

Table 2 – Viking HDD crossings locations.

Name/ Location	Crossed Feature	Approx. Length (m)	Geology
Childrens Ave (KP1.7)	Woodland	636	TA11NE1 borehole data indicates that a chalk layer encountered from a depth of 36m. The layers above the chalk, consist of chalk bearing and clay.
North Beck Drain (KP8.1)	Watercourse	540	TA11SE66 borehole data indicates that a chalk layer encountered from a depth of 23m. The layers above the chalk, consist of chalk bearing and clay.
Waithe Beck KP(20.3)	Watercourse	301	TA11SE66 borehole data indicates that a chalk layer encountered from a depth of 22m. The layers above the chalk, consist of clay and gravel.
Louth Canal/River Ludd KP(39.5)	Watercourse	544	TF38NW179 borehole data indicates that a chalk layer encountered from a depth of 20m. The layers above the chalk, consist of sand, clay, and chalk mixture.
Old Engine Drain / Great Eau (KP52.3)	Watercourse	384	TF48NE59 borehole data indicates that a chalk layer encountered from a depth of 25m. The layers above the chalk, consist of sand and clay.
NGT Site Development (KP55.0)	Watercourse	466	TF48NE14 borehole data indicates that a chalk layer encountered from a depth of 39m. The layers above the chalk, consist of sand and clay.

The HDD profile design will be finalised based on the results of the ground investigation. The drilling depth of HDDs shall be optimised to minimise the risk of the bentonite breakout.

5.4.2 Hydro-Fracture Assessment

A theoretical calculation of hydro-fracture for each HDD crossing will be produced by a competent contractor. This calculation will be graphed along the HDD crossing length as shown in below figure as an example.

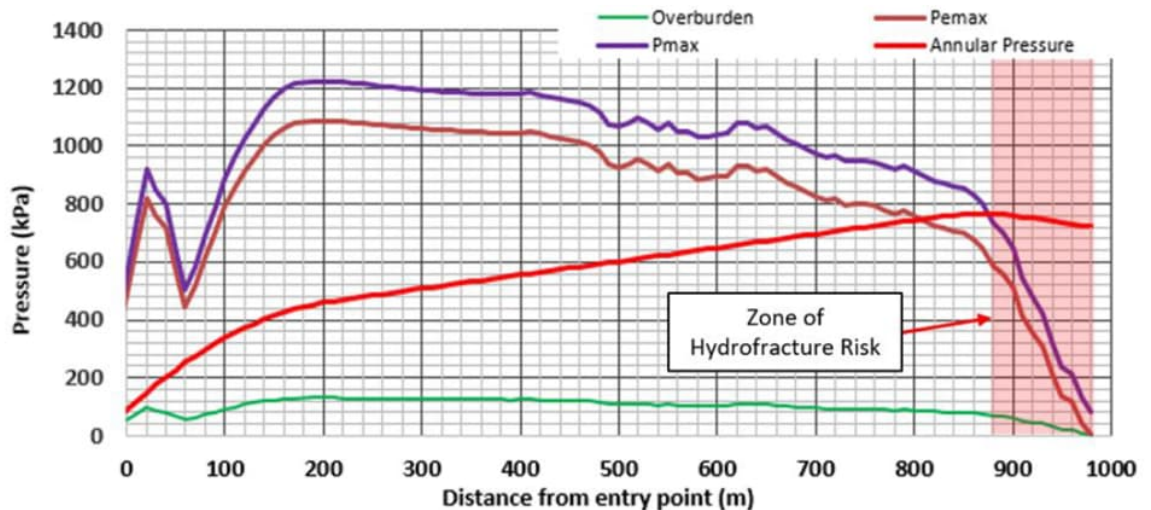


Figure 1 – Typical Hydro-fracture Assessment Results

The variation in pressures along the borehole is shown in above figure, where the permissible boreholes Maximum Allowable Effective Mud Pressure (P_{emax}) and Maximum Allowable Mud Pressure (P_{max}) are shown.

The Annular Pressure is a key profile during the HDD operation, since it relays the pressure in the borehole based upon the drill fluid return flow. This pressure varies as the borehole progresses and is the sum of the static head and friction (flow) head. Along the HDD bore, the annular pressure shall be maintained below P_{emax} in order to not exceed the allowable pressure and potential risk of a hydro-fracture breakout.

5.4.3 Annular Pressure Monitoring

An essential tool for monitoring the state of the borehole is Downhole Annular Pressure Monitoring. This tool, supplied as a standard add-on to the guidance equipment, measures the pressure in the borehole annulus in real-time. The actual value can be compared to limit values calculated from hydro-fracture analysis to avoid damaging the ground surrounding the HDD during borehole drilling.

By avoiding over-pressuring of the surrounding ground, the probability of surface breakout is significantly reduced. This approach ensures that risk has been controlled as far as reasonably practicable.

5.4.4 Drilling Procedure

A key step in preventing breakout is the efficient removal of cuttings from the borehole. Cuttings that are not removed form beds at the base of the borehole, reducing its cross-sectional area. This reduction leads to an increase in annular pressure, thereby increasing the risk of hydro-fracture. Furthermore, cuttings in the borehole can lead to increased drilling forces, especially torque, potentially causing equipment to break/ fail and become lost or stuck downhole. To mitigate these risks, the HDD operator will proactively ensure that cuttings are effectively removed, this will significantly reduce the risk of both breakout and equipment getting stuck.

During drilling, the bentonite volume returning to the entry pit will be monitored and any reduction in volume shall be investigated. Particular attention shall be paid to the area around the drilling head. During drilling, a team shall walk the drill alignment, checking for breakout throughout the operation. If detected, drilling shall be immediately stopped.

5.5 Detection

Bentonite breakouts are most likely to occur when the fluid is under pressure. Therefore, during drilling operations, the HDD site will be monitored by competent and experienced personnel. The area to be monitored will include a radius of 100m from the drilling head. The site shall be divided into manageable areas that will be checked regularly. Records shall be made of these inspections for tracking changes over time and identifying potential issues as early as possible.

Competent personnel will also be assigned to walk the drill alignment as far as reasonably practicable within the agreed site boundaries. This team will be responsible for checking and observing for any signs of breakout, such as changes in the ground surface or unusual fluid seepage. They shall report any findings, including the location and volume of bentonite exposure.

Throughout the drilling operation the drilling supervisor and the HDD operator shall work together to determine the ideal blend of water and bentonite (and other additives as maybe necessary) to optimise the drilling process in the ground conditions. The HDD drilling operator shall continuously monitor and adjust the flow and down hole fluid pressures and shall have sufficient experience to recognise a possible breakout.

2-way communication system (e.g. 2 Way Radio) for HDD construction site communication between the monitoring/ patrolling team(s), HDD rig operator and the bentonite breakout emergency response team. This is to ensure that the HDD rig operator stops drilling immediately and the emergency response team can be dispatched to the site, if a breakout is detected, to minimise any environmental impact.

5.6 Emergency Response (Breakout Management Plan)

A comprehensive Breakout Management Plan as part of its emergency response plan. This plan will conduct a thorough risk assessment for potential breakouts of drilling fluid (Bentonite). The Breakout Management Plan will incorporate the following measures:

- **Drilling Suspension Protocols:** Procedures will be in place to ensure immediate cessation of drilling operations if a breakout is reported. This is required to prevent further escalation of the situation.
- **Breakout Containment Strategies:** This could involve the use of containment booms, absorbent materials, or other specialized equipment.
- **Fluid Removal and Cleanup Procedures:** A comprehensive plan will detail the procedures for the safe and efficient response to a breakout ensuring minimal environmental impact.

Incident Recording and Reporting: A systematic process shall be established for recording and reporting of any potential breakout incidents. This shall include details of the probable incident, actions taken, and recommendations for potential future prevention.

APPENDIX - A

EXAMPLE BENTONITE MATERIAL SAFETY DATA SHEET

PRODUCT SAFETY DATA SHEET

This generic SDS is provided by MGS Ltd to give information to assist with material handling of the products listed which has been drafted in accordance with COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.



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SECTION 1: Identification of the substance / mixture and of the company / undertaking	
1.1 Product Identifier	
Product Name:	BERKBENT 163 Bentonite Powder
Chemical Name:	Bentonite
Cas No:	1302-78-9
EC No:	215-108-5
Registration No:	Exempt
1.2 Relevant identified uses of the substance or mixture and uses advised against	
Recommended Use:	Drilling and civil engineering applications
Restriction on Use:	Uses other than those recommended.
1.3 Details of the supplier of the Safety Data Sheet	
Name:	MGS Ltd
Address:	Rougham Industrial Estate, Bury St Edmunds, IP30 9ND
Country:	UK
Phone N°:	+44 1359 271167
E-mail:	info@mgs.co.uk
Website:	www.mgs.co.uk
1.4 Emergency telephone number	
Emergency telephone at the company	+44 7738 197 517
Available outside office hours:	Yes
Language of the phone service:	English
E-mail of competent person responsible	██████████@mgs.co.uk
National contact:	██████████
SECTION 2: Hazard Identification	
2.1 Classification of the substance or mixture	
The product is not classified as hazardous within the meaning of Regulation (EU) No 1272/2008.	
2.2 Label elements	
None	
2.3 Other hazards	
The product may have the following additional risks: Dustiness.	



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SECTION 3: Composition / Information on Ingredients				
3.1 Substances				
Chemical Name:	Bentonite			
CAS No:	1302-78-9			
EC No:	215-108-5			
Registration No:	Exempt			
Impurities or additives that affect the classification:				
Identifiers	Name	Concentrate	(*) Classification – Regulation (EC) No 1272 / 2008	
			Classification	Specific concentration limit
CAS No: 14808-60-7 EN No: 238-878-4	(1) Quartz (SiO ₂)	0 – 1%	-	-
3.2 Mixtures				
Not applicable				
SECTION 4: First Aid Measures				
4.1 Description of first aid measures				
Due to the composition and type of the substances present in the product, no particular warnings are necessary.				
Inhalation Take the victim into open air; keep them warm and calm. If breathing is irregular or stops, perform artificial respiration.				
Eye contact Remove contact lenses, if present and if it is easy to do. Wash eyes with plenty of clean and cool water for at least 10 minutes while pulling eyelids up and seek medical assistance. Don't let the person rub the affected eye.				
Skin contact Remove contaminated clothing.				
Ingestion Keep calm. NEVER induce vomiting.				
4.2 Most important symptoms and effects, both acute and delayed				
No known acute or delayed effects from exposure to the product.				

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<p>4.3 Indication of any immediate medical attention and special treatment needed</p> <p>In case of doubt or when symptoms of feeling unwell persist, get medical attention. Never administer anything orally to persons who are unconscious.</p>
<p>SECTION 5: Fire Fighting Measures</p>
<p>5.1 Extinguishing media</p> <p>Suitable extinguishing media Extinguisher powder or CO₂. In case of more serious fires, also alcohol-resistant foam, and water spray.</p> <p>Unsuitable extinguishing media: Do not use a direct stream of water to extinguish. In the presence of electrical voltage, you cannot use water or foam as extinguishing media.</p>
<p>5.2 Special hazards arising from the substance or mixture</p> <p>Fire can cause thick, black smoke. As a result of thermal decomposition, dangerous products can form carbon monoxide, carbon dioxide. Exposure to combustion or decomposition products can be harmful to your health.</p>
<p>5.3 Advice for fire fighters</p> <p>Use water to cool tanks, cisterns, or containers close to the heat source or fire. Take wind direction into account.</p> <p>Fire protection equipment. According to the size of the fire, it may be necessary to use protective suits against the heat, individual breathing equipment, gloves, protective goggles or facemasks, and boots.</p>
<p>SECTION 6: Accidental Release Measures</p>
<p>6.1 Personal precautions, protective equipment, and emergency procedures</p> <p>For exposure control and individual protection measures, see section 8.</p>
<p>6.2 Environmental precautions</p> <p>Product not classified as hazardous for the environment, avoid spillage as much as possible.</p>
<p>6.3 Methods and material for containment and cleaning up</p> <p>The contaminated area should be immediately cleaned with an appropriate de-contaminator. Pour the decontaminator on the remains in an opened container and let it act until no further reaction is produced.</p>

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<p>6.4 Reference to other sections</p> <p>For exposure control and individual protection measures, see section 8. For later elimination of waste, follow the recommendations under section 13.</p>
<p>SECTION 7: Handling & Storage</p>
<p>7.1 Precautions for safe handling</p> <p>The product does not require special handling measures, the following general measures are recommended. For personal protection, see section 8.</p> <p>In the application area, smoking, eating, and drinking must be prohibited. Follow legislation on occupational health and safety.</p> <p>Never use pressure to empty the containers. They are not pressure-resistant containers. Keep the product in containers made of a material identical to the original.</p>
<p>7.2 Conditions for safe storage, including any incompatibilities</p> <p>The product does not require special storage measures.</p> <p>As general storage measures, sources of heat, radiation, electricity and contact with food should be avoided. Keep away from oxidising agents and from highly acidic or alkaline materials.</p> <p>Store the containers between 5 and 35° C, in a dry and well-ventilated place. Store according to local legislation. Observe indications on the label.</p> <p>The product is not affected by Directive 2012/18/EU (SEVESO III).</p>
<p>7.3 Specific end use(s)</p> <p>Rheological Additive Absorbent Binder Water retention Retention aid Sealant Technological Additive for Animal Feed</p>

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SECTION 8: Exposure Controls / Personal Protection					
8.1 Control parameters					
Name	CAS No.	Country	Limit value	ppm	mg/m ³
Quartz (SiO ₂)	14808-60-7	European Union [1]	Eight hours		0,1
			Short term		
		United Kingdom [2]	Eight hours		0,1
			Short term		
		Éire [3]	Eight hours		0,1
			Short term		
		United States [4] (Cal/OSHA)	Eight hours		0.05 respirable dust, 0.3 (Total Dust)
			Short term		
		United States [5] (NIOSH)	Eight hours		Potential occupational carcinogens 0.05 respirable dust, lowest feasible concentration (LFC).
			Short term		
		United States [6] (OSHA)	Eight hours		(Total Dust) 30 mg/m ³ /(%SiO ₂ +2)
			Short term		

1. According both Binding Occupational Exposure Limits (BOELVs) and Indicative Occupational Exposure Limits (IOELVs) adopted by Scientific Committee for Occupational Exposure Limits to Chemical Agents (SCOEL).

2. According Limit Value (IOELV) list in 2nd Indicative Occupational Exposure adopted by Health and Safety Executive.

3. According Code of Practice for the Safety, Health, and Welfare at Work (Chemicals Agents) Regulations adopted by Health and Safety Authority (HSA).

4. California Division of Occupational Safety and Health (Cal/OSHA) Permissible Exposure Limits (PELs).

5. According Compendium of Policy Documents and Statements adopted by National Institute for Occupational Safety and Health(NIOSH).

6. According Occupational Health and Safety Standards and US Code of Federal Regulations adopted by US

7. Occupational Safety and Health Administration (OSHA).

The product does NOT contain substances with Biological Limit Values.
Follow workplace regulatory exposure limits for all types of airborne dust (e.g. total dust, respirable dust, respirable quartz, respirable cristobalite).




A European Binding OEL (Occupational Exposure Limit) for respirable crystalline silica dust is set at 0.1 mg/m³ in the Directive(EU) 2017/2398, measured as an 8-hour TWA (Time Weighted Average)



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8.2 Exposure controls		
Measures of a technical nature:		
Provide adequate ventilation, which can be achieved by using good local exhaust-ventilation and a good general exhaust system.		
Concentration:	100 %	
Uses:	This material should only be used for industrial purposes	
Breathing protection:		
PPE:	Particle filter mask	
Characteristics:	«CE» marking, category III. Made of filtering material, it covers nose, mouth, and chin.	
EN Standards:	EN149	
Maintenance:	Check for any tears, defects, etc. before use. Since it is disposable individual protection equipment, it should be replaced after use.	
Observations:	Does not protect worker unless properly adjusted and face fitted. Follow the manufacturer's instructions regarding suitable use of the equipment.	
Filter Type Needed:	P2	
Hand protection:		
PPE:	Protective gloves	
Characteristics:	«CE» marking, category II.	
EN Standards:	EN 374-1, EN 374-2, EN 374-3, EN 420	
Maintenance:	Keep in a dry place, away from any source of heat, and avoid exposure to sunlight as much as possible.	
Observations:	Gloves should be of the appropriate size and fit the user's hand well, not being too loose or too tight. Always use with clean, dry hands.	
Type Needed:	PVC (polyvinyl chloride). Breakthrough time 48 mins. Material thickness 0.35mm.	
Eye protection:		
PPE:	Protective goggles against particle impacts.	
Characteristics:	«CE» marking, category II. Eye protector against dust and smoke.	
EN Standards:	EN 165, EN 166, EN 167, EN 168	
Maintenance:	Visibility through lenses should be ideal. Therefore, these parts should be cleaned daily. Protectors should be disinfected periodically following the manufacturer's instructions.	
Observations:	Some signs of wear and tear include yellow colouring of lenses, superficial scratching of the lenses, scraping etc.	
Type Needed:	Tight-fitting, eye enclosing.	

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Skin protection:	
PPE:	Work footwear.
Characteristics:	«CE» marking, category II. EN ISO 13287
EN Standards:	EN 20347
Maintenance:	This product adapts to the first user's foot shape. That is why, as well as for hygienic reasons, it should not be used by other people.
Observations:	Work footwear for professional use includes protection elements aimed at protecting users against any injury resulting from an accident.
Type Needed:	Relevant to the conditions used in.
	
SECTION 9: Physical and Chemical Properties	
9.1 Information on basic physical and chemical properties	
<p>Appearance: Powder Colour: Cream to greyish / white Odour: Odourless Odour threshold: N.A./N.A. pH:10-11 (10%) Melting point:>1550 °C Boiling Point: N.A./N.A. Flash point: N.A./N.A. Evaporation rate: N.A./N.A. In flammability (solid, gas): Non-flammable Lower Explosive Limit: N.A./N.A. Upper Explosive Limit: N.A./N.A. Vapour pressure: N.A./N.A. Vapour density: N.A./N.A. Relative density:2.7 Solubility: Insoluble Lip solubility: Insoluble Hydro solubility: Insoluble Partition coefficient (n-octanol/water): N.A./N.A. Auto-ignition temperature: N.A./N.A. Decomposition temperature: N.A./N.A. Viscosity: N.A./N.A. Explosive properties: Non explosive Oxidizing properties: N.A./N.A. N.A./N.A.= Not Available/Not Applicable due to the nature of the product</p>	
9.2 Other information	
<p>Pour point: N.A./N.A. Blink: N.A./N.A. Kinematic viscosity: N.A./N.A. N.A./N.A.= Not Available/Not Applicable due to the nature of the product</p>	

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SECTION 10: Stability and Reactivity
10.1 Reactivity The product does not present hazards by their reactivity.
10.2 Chemical stability Unstable in contact with: Acids.
10.3 Possibility of hazardous reactions Neutralization can occur on contact with acids.
10.4 Conditions to avoid Avoid contact with acids.
10.5 Incompatible materials Avoid the following materials: Acids.
10.6 Hazardous decomposition products No decomposition if used for the intended uses.

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SECTION 11: Toxicological Information

11.1 Information on toxicological effects

There is no tested data available on the product. Repeated or prolonged contact with the product can cause the elimination of oil from the skin, giving rise to non-allergic contact dermatitis and absorption of the product through the skin.

Splatters in the eyes can cause irritation and reversible damage.

- (a) acute toxicity
Not conclusive data for classification.
- (b) skin corrosion/irritation
Not conclusive data for classification.
- (c) serious eye damage/irritation.
Not conclusive data for classification.
- (d) respiratory or skin sensitisation
Not conclusive data for classification.
- (e) germ cell mutagenicity
Not conclusive data for classification.
- (f) carcinogenicity
Not conclusive data for classification.
- (g) reproductive toxicity
Not conclusive data for classification.
- (h) STOT-single exposure
Not conclusive data for classification.
- (i) STOT-repeated exposure
Not conclusive data for classification.
- (j) aspiration hazard
Not conclusive data for classification.

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SECTION 12: Ecological Information				
12.1 Toxicity				
Name	Ecotoxicity			
	Type	Test	Kind	Value
Bentonite CAS No: 1302-78-9 EC No: 215-108-5	Fish	LC50	Fish	19000 mg/l (96 h) [1]
				[1] Sprague, J.B., and W.J. Logan 1979. Separate and Joint Toxicity to Rainbow Trout of Substances Used in Drilling Fluids for Oil Exploration. Environmental Pollution 19(4):269-281 (Author Communication Used)
	Aquatic invertebrates			
	Aquatic plants			
12.2 Persistence and degradability				
There is no information available on the degradability of the substances present. No information is available regarding the degradability. No information is available about persistence and degradability of the product.				
12.3 Bio accumulative potential				
No information is available regarding the bioaccumulation.				
12.4 Mobility in soil				
No information is available about the mobility in soil. The product must not be allowed to go into sewers or waterways. Prevent penetration into the ground.				
12.5 Results of PBT and vPvB assessment				
No information is available about the results of PBT and vPvB assessment of the product.				
12.6 Other adverse effects				
No information is available about other adverse effects for the environment.				

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SECTION 13: Disposal Considerations
13.1 Waste treatment methods
<p>Do not dump into sewers or waterways. Waste and empty containers must be handled and eliminated according to current, local/national legislation.</p> <p>Follow the provisions of Directive 2008/98/EC regarding waste management.</p> <p>Waste classification according to the European Waste Catalogue:</p> <p>01 WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS</p> <p>01 04 wastes from physical and chemical processing of non-metalliferous minerals 01 04 09 waste sand and clays</p> <p>Method of treatment according to Directive 2008/98/EC:</p> <p>Disposal</p> <p>D13 Blending or mixing prior to submission to any of the operations numbered D 1 to D 12</p>
SECTION 14: Transportation Information
<p>Transportation is not dangerous. In case of road accident causing the product's spillage, proceed in accordance with point 6.</p>
14.1 UN number
<p>Transportation is not dangerous.</p>
14.2 UN proper shipping name
<p>ADR: Transportation is not dangerous.</p> <p>IMDG: Transportation is not dangerous.</p> <p>ICAO/IATA: Transportation is not dangerous.</p>
14.3 Transport hazard class(es)
<p>Transportation is not dangerous.</p>
14.4 Packing group
<p>Transportation is not dangerous.</p>

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14.5 Environmental hazards
Transportation is not dangerous.
14.6 Special precaution for user
Transportation is not dangerous.
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Transportation is not dangerous.
SECTION 15: Regulatory Information
15.1 Safety, health, and environmental regulations / legislation specific for the substance or mixture
<p>The product is not affected by the Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.</p> <p>Product classification according to Annex I of Directive 2012/18/EU (SEVESO III): N/A</p> <p>The product is not affected by Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.</p> <p>The product is not affected by the procedure established Regulation (EU) No 649/2012, concerning the export and import of dangerous chemicals.</p> <p>Kind of pollutant for the water (Germany): Not dangerous. (Auto classified according to the AwSV Regulations)</p>
15.2 Chemical safety assessment
No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

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SECTION 16: Other Information

It is recommended that the product only be employed for the purposes advised.

Abbreviations and acronyms used:

AwSV: Facility Regulations for handling substances that are hazardous for the water.
 CEN: European Committee for Standardization.
 EC50: Half maximal effective concentration.
 PPE: Personal protection equipment.
 LC50: Lethal concentration, 50%.
 LD50: Lethal dose, 50%.
 WGK: Water hazard classes.

Key literature references and sources for data:

Regulation (EU) 2015/830.
 Regulation (EC) No 1907/2006.
 Regulation (EU) No 1272/2008.

Disclaimer:

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty guarantee or representation is made to its accuracy, reliability of completeness. It is the user's responsibility to satisfy themselves as to the suitability of such information for their own particular use.

MSDS Reference: [REDACTED]