

# **NORTH YORKSHIRE POLYHALITE PROJECT – WOODSMITH MINE**

## ***INSTALLATION OF DIAPHRAGM WALL SHAFTS***

Bauer: YPM-BAU-MS-01

AMC: AMC UK Document No. 40-AMC-WS-10-SW-RA-0004

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PROJECT – WOODSMITH MINE

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Work Scope: Installation of diaphragm walls

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## 1. SCOPE OF WORKS

The scope of works to be constructed by Bauer Technologies Ltd. (BTL) for Associated Mining Construction UK (AMC UK) comprises the installation of three circular diaphragm wall shafts at the Woodsmith Mine site. This method statement describes the construction of these diaphragm walls including mobilisation and demobilisation of associated equipment. Following the completion of works, the diaphragm walls will be fully excavated and act as starting shafts for sinking of the final mine shafts.

All three shafts will be made up of 1200mm thick diaphragm walls which will be installed using trench cutters. The Production Shaft (PS) and Service Shaft (SS) each consist of a single large diameter diaphragm wall whilst the Mineral Transfer System shaft (MTS) is a single diaphragm wall shaft of relatively small diameter. The table below summarises the dimensions of all diaphragm walls. The site layout drawing can be found in Appendix A.

*Table 1: Summary of diaphragm wall shaft dimensions*

Diaphragm wall shaft description	Diameter (inner) [m]	Depth [m]	Panel length [m]	Panel width [m]	Number of panels [-]
Service Shaft	35.00	60.00	2.80	1.20	48
Production Shaft	32.00	60.00	2.80	1.20	44
MTS Shaft	8.25	60.00	2.80	1.20	14

Bauer's scope of works includes the detailed design of all diaphragm wall shafts based on soil investigation results provided by AMC UK. Bauer will further install guide walls for all diaphragm wall shafts including pre-excavation of rock to 3.5m below working platform level (refer to RAMS for Installation of Guide Walls - 40-AMC-WS-10-SW-RA-0006). Additionally, Bauer will mobilise all diaphragm walling equipment, a full workshop and provide a welfare and site office setup for Bauer staff and operatives (refer to RAMS for Mobilisation and Demobilisation - 40-AMC-WS-10-SW-RA-0007).



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## **2. SIGNIFICANT RISKS AND CONTROLS**

The following key risks have been identified for the diaphragm wall works. Risk mitigations have been planned in line with the full risk assessment for diaphragm wall construction (refer to Appendix B).

### **1) Risk: Slips, trips and falls**

**Controls:** Implement solid housekeeping procedures and maintain piling platforms and walkways. Provide adequate storage facilities for small tools and consumables as well as designated material storage/laydown areas. Provide waste segregation facilities. Ensure that all operatives wear safety footwear with adequate ankle protection. Clean up spillages on walkways immediately to avoid slippery surfaces. De-ice walkways as required during winter months.

### **2) Risk: Working platform failure causing rig/crane to overturn**

**Controls:** In advance of the works, Bauer has provided ground bearing pressure calculations for heavy plant. Sirius Minerals will design and install the working platform in line with the required loadings. This includes implementation of dewatering systems as required. Before offloading of any tracked plant, AMC UK will issue Bauer with a FPS Working Platform Certificate confirming suitability of the provided working platform for the specific plant items.

Subsequently, the Bauer site supervisor will inspect the condition of the piling platform before each shift. Inspections will be recorded on the supervisor's daily reports. Any defects will be reported to AMC UK immediately who will carry out maintenance as soon as possible.

The site supervisor will further ensure that empty bores will be backfilled with suitable material in order to avoid occurrence of soft spots in the working platform. Freshly cast panels will be protected and fenced off until the concrete has hardened.

### **3) Risk: Working at height / falls from height**

**Controls:** The need for working at height will be eliminated as much as practicable. Where working at height cannot be avoided, adequate edge protection will be made available wherever possible. Where use of edge protection is not practicable, alternative access systems will be provided (scaffold, MEWP or similar). As a last resort, fall arrest systems will be used (e.g. safety harness and lanyard).

### **4) Risk: Fuel spillage**

**Controls:** Wherever possible, refuelling is to be carried out at least 5m-10m from access to surface water and open excavations that have a pathway to groundwater (exemption: cutter unit when cutter is submerged in panel excavation). Refuel plant with suction hose refuelling system where possible. If plant does not have suction hoses fitted, refuel with care using pump operated refuelling system. Provide double bunded diesel bowsers and use plant nappies/drip trays as proactive measure. Have spill kits available on major plant items and in designated spill response stations around the project. Preventative controls for oil and fuel spills caused by broken hoses, refuelling and maintenance include:



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- Service/repairs of equipment to be carried out on a hard standing.
- Proper maintenance of the equipment has to be documented in the maintenance reports.
- Daily pre-use equipment inspections have to be carried out by the machine operator and to be documented.
- Drip trays shall be placed below the machine in order to hinder oils/fluids from penetrating the platform.

Corrective controls for oil and fuel spills caused by broken hoses, refuelling and maintenance include:

- Immediate measures should be taken to contain the spill and prevent potential migration of contamination in accordance to the COSHH sheet.
- Oil spill response shall be carried out in accordance to the Environmental Emergency Preparedness Plan (40-AMC-WS-71-EN-PL-0005)
- Contaminated materials/soil have to be disposed in accordance with local regulations.

#### **5) Risk: Emergency response time**

**Controls:** Due to the remote location of the project, AMC UK will ensure that emergency services have been issued with the site coordinates and have been made aware of access routes and muster points. The AMC UK Construction Phase Health & Safety Plan (AMC UK Doc. No. 40-AMC-WS-71-PM-PL-0002) will outline the Emergency Procedures to be followed in case of incidents on site. The emergency procedures will be communicated to all personnel during the AMC Project Site Induction. First Aid will be supplied as per Section 7: First Aid Arrangements.

#### **6) Risk: Open excavations**

**Controls:** All open excavations will be fenced off using pedestrian barriers equipped with appropriate signage. Freshly cast panels will be protected, until the concrete has hardened or until the empty bore has been backfilled. During the nightshifts, adequate general and task lighting will be provided by AMC UK in order to ensure that all open excavations are clearly visible.

#### **7) Risk: Fatigue**

**Controls:** Schedule shift pattern with consideration to fatigue related occupational illness. Review shift pattern with operatives and change working times if required. Ensure, that adequate welfare facilities are available.

#### **8) Risk: Lifting operations/wind speed.**

**Controls:** Bauer will produce lift plans for all cranes and HIABs used on site. The personnel in charge of lifting operations will be competent and certified. All plant and lifting equipment will be subject to periodic thorough examination.

The slingers will inspect every load prior to lifting. Especially reinforcement cages will be checked for loose items which could drop to the ground during the lifting operation.



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Crane operators will lift in line with the applicable lift plans and the manufacturer's instructions. Operators will monitor the wind speed through anemometers and cease lifting operations for wind speeds exceeding 14 m/s (or as per crane manufacturer's instructions).

Crane operators will not lift over personnel. Operatives will use taglines to control loads during lifting operations.

#### **9) Risk: Plant pedestrian interface / High number of heavy plant**

**Controls:** All heavy plant movements will be supervised by qualified banksmen. All plant operators will be competent and certified. Site space proofing drawings will identify likely confined spaces around moving plant. Equipment and material positions have been simulated in these site layout drawings prior to mobilisation to site. During construction, the arrangement of heavy equipment on site will be constantly controlled by the BTL site supervisor.

Pedestrians and plant will be physically separated by implementing walkways as much as reasonably practical.

All movement of heavy equipment will be controlled by banksmen. All persons on site will be briefed during toolbox talks on how to move and work safely on site.

#### **10) Risk: Concrete spillage**

**Controls:**

- Concrete lorries not allowed to washout on site.
- Concrete wagons must not be allowed to empty their wagons of any excessive concrete on platform.

Any spillages to be cleaned/cleared immediately using the attending excavator

#### **11) Risk: Slurry losses**

**Controls:**

- Refer to the Slurry Management Plan (Bentonite) – AMC document number *40-AMC-WS-10-EN-PL-0002*

#### **12) Risk: Bentonite plant slurry spills**

**Controls:**

- Refer to the method statement for operation of slurry plant – AMC document number *40-AMC-WS-10-SW-RA-0005*



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### **3. PLANT & EQUIPMENT**

Refer to plant register in Appendix E.

#### ***3.1. Dust and Emissions***

If there is nuisance dust caused by vehicular movement, the areas will be dampened by AMC UK. All pieces of plant are subject to regular maintenance to guarantee good mechanical condition. Operators will be briefed to switch off engines when idle.

#### ***3.2. Abnormal Loads***

After completion of mobilisation, construction materials will be transported to site using standard 20” rigid or 45” articulated lorries. Abnormal loads will only be required to come to site in the event of a major piece of equipment requiring replacement.

### **4. DIAHRAGM WALL CONSTRUCTION**

#### ***4.1. Guide Walls***

Prior to the diaphragm wall installation, guide walls will be constructed in accordance with the guide wall design and diaphragm wall panel layout delivered by Bauer. The guide walls provide:

- Accurate and consistent alignment of the diaphragm wall.
- Protection against instability of the upper soils just outside the excavation caused by fluctuating and agitating water or slurry during excavation.
- Improved trench stability near the ground surface, for jobsite traffic operating adjacent to the excavation.
- The reinforced concrete guide wall will be constructed cast-in-situ.

The guide wall construction is covered under a separate method statement and risk assessment (Installation of guide walls, AMC UK Document No. 40-AMC-WS-10-SW-RA-0006). Following the completion of the works, the guide walls will be fully removed by AMC UK.

#### ***4.2. Construction sequence***

The diaphragm walls will be installed in a primary/secondary panel sequence. The primary panels will be installed first into virgin ground. Primary panels can be single bite or multi bite panels which, depending on the shaft design, can be reinforced or unreinforced. After completion of at least two primary panels, the intermediate secondary panel will be installed. During excavation of the single bite secondary panel, the cutter overcuts the adjacent primary panels creating a clean construction joint.

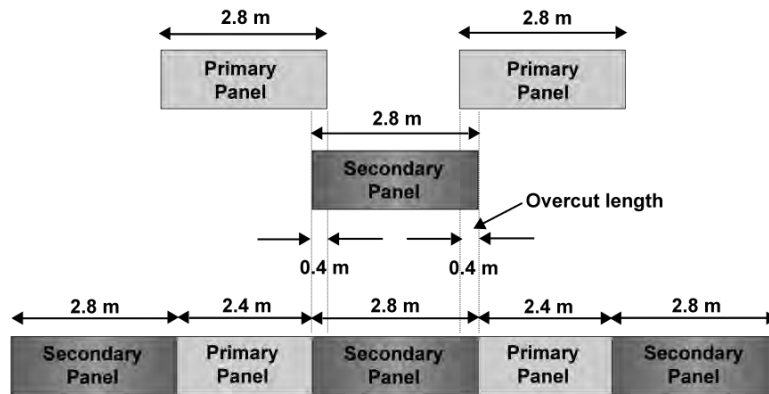


Figure 1: Example of panel sequence

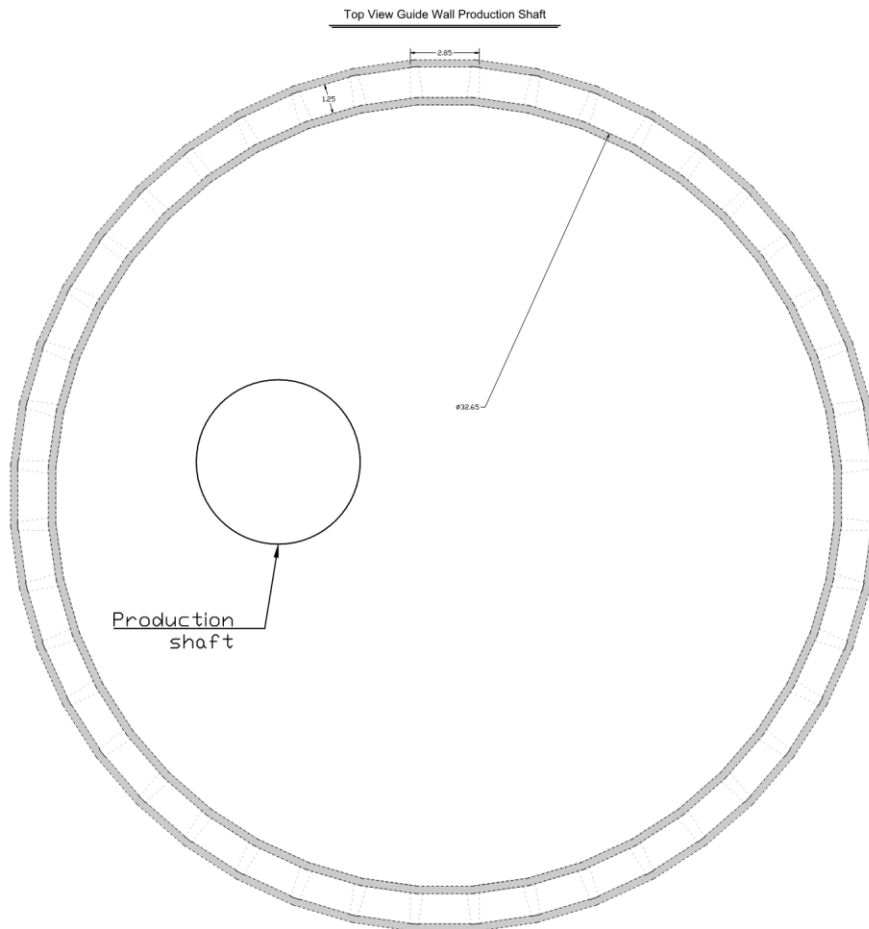


Figure 2: Example of panel layout



Construction of the diaphragm wall panels includes panel excavation, exchange/desanding of support fluid, installation of reinforcement, concreting and for low cut-off panels backfill of the empty bore. The typical construction sequence of the overlapping panel barrier wall is shown below. Note that the steps in this sequence may be adjusted as required depending on conditions encountered in the field.

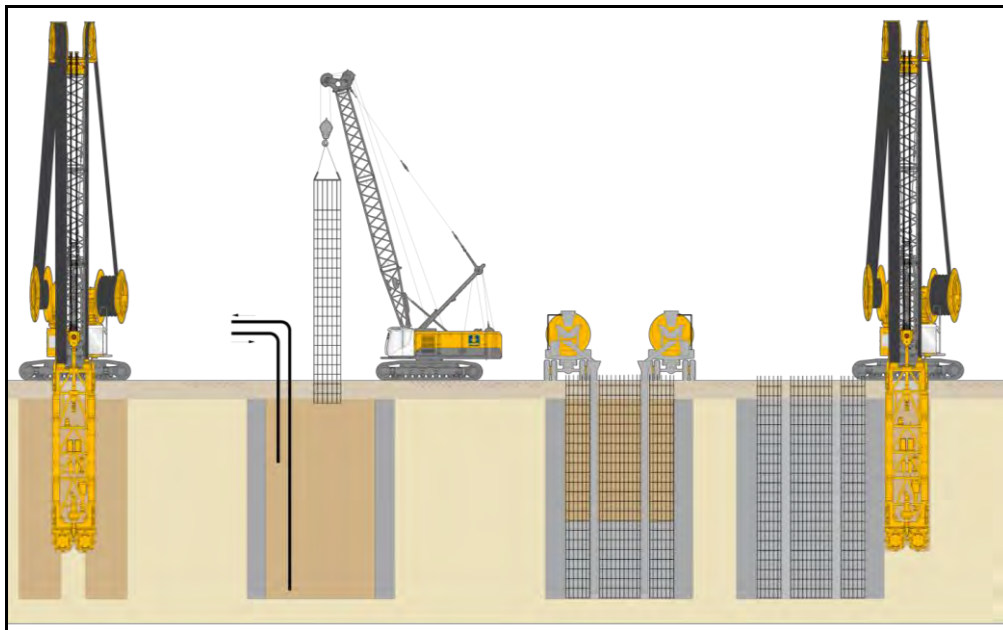


Figure 3: Sequence of diaphragm wall construction

#### 4.3. Panel excavation

Before excavation of a panel, the attending excavator will pre-excavate the panel to 3.5m below working platform level. The pre-trench will then be filled half way with support slurry. Subsequently, Bauer will install the cutter guide frame on the design panel location using the MC base carrier. The guide frame is sitting on the guide wall and locks itself in position by bracing its hydraulic legs in between the guide walls. Positioning of the frame needs to be set out and checked by the attending setting out engineer.



*Figure 4: Cutter unit and guide frame*

After completing the guide frame installation, Bauer will position the BC-40 cutter over the location and insert it into the pre-excavated and half-filled trench. The operator will set the cutter wheels in motion and start the centrifugal mud pump located above the wheels. He will now excavate the panel to final depth and add support fluid as required using a remote controlled feed pump. Management of the support slurry during the panel excavation will follow the Slurry Management Plan (*AMC UK Doc. No. 40-AMC-WS-10-EN-PL-0002*). During the excavation process, the cutter operator will monitor verticality and rotation of the cutter using the cutter inclination system. The operator will correct deviations from the design position using the hydraulic steering flaps. Upon completion of the panel, the cutter operator records a full verticality graph which will be part of the final panel construction report.

The excavated materials will be transported from the cutter to the desanding plant via the centrifugal mud pump and a system of 6" pipework. The desander will segregate solids from the slurry and send fresh/clean slurry back to the slurry storage. The installation and operation of the support slurry farm is described in a separate method statement (*RAMS: Slurry Plant, AMC UK Doc. No. 40-AMC-WS-10-SW-RA-0005*).

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*Figure 5: Example of support slurry farm*

Note: The middle cluster of tall silos will be tanks instead. The silos to the right are typical for storing dry bentonite.

#### 4.4. Desanding/exchange of support fluid

The support slurry in each panel will be de-sanded at the end of excavation to fulfil the specified criteria for commencement of the concreting. The support slurry will be pumped from the panel using the cutter internal mud pump located at the base of the excavation. Fresh slurry is fed into the top of the trench at the same flow rate. Once the return slurry fulfils the concreting requirements, desanding is completed. Depending on the amount of solids in suspension, Bauer may desand the slurry in circulation or directly replace the excavation mud with fresh slurry and circulate the excavation mud within the slurry plant. After completion of desanding, the cutter will be removed from the panel and the open trench will be covered using heavy grid or similar.

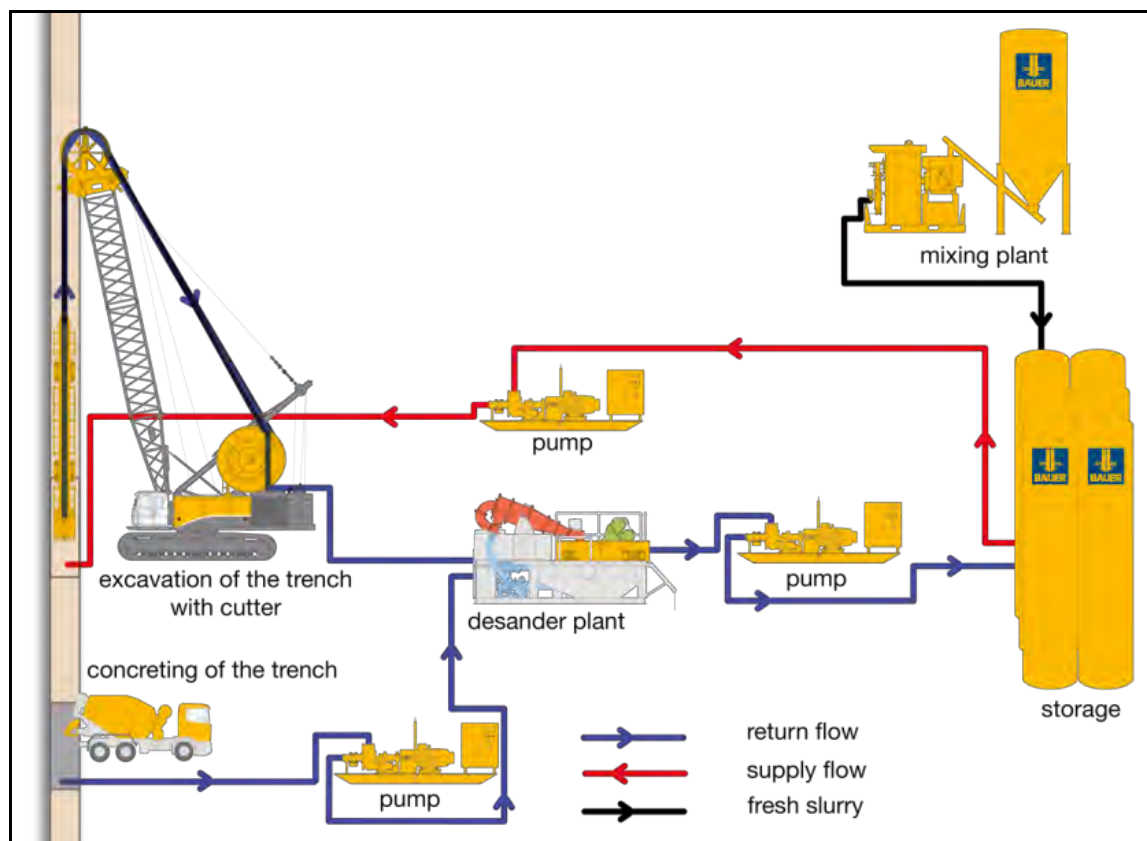


Figure 6: Schematic support fluid cycle for cutter d-wall

#### 4.5. *Cleaning of panel joints*

Secondary panels will be cut into primary elements to expose clean, fresh concrete surfaces on the adjacent elements. In order to minimize the risk of slurry cake buildup on the pre-cut concrete faces, the joints between secondary panels and primary elements will be cleaned prior to placement of tremie concrete. The cleaning tool consists of a large steel brush hung from a service crane. The brush will be fabricated to match the panel dimensions. The brush will be regularly cleaned and inspected. The bristles will be replaced as required.



Figure 7: Photos of typical panel joint brush

#### 4.6. *Installation of panel reinforcement*

Reinforcement cages will be delivered to agreed laydown areas in proximity to the shaft locations. Reinforcement cages will be pre-slung to allow offloading without the requirement of accessing the back of the vehicle.

All horizontal and vertical lifts of reinforcement cages will be under the control of a qualified lift supervisor and signaller/slinger. All lifts will be performed in accordance with the approved lift plans, which are briefed to all lifting personnel prior to the start of works. In order to prevent falling of rebar from the cage during the lift, all cages are subject to thorough inspections ensuring that all loose items are identified and removed prior to the lift taking place.

The panel covers will be removed to allow installation of the reinforcement cages. When working within the barriers around the uncovered panel, personnel will be secured against falling into the open trench by use of an inertia reel, either attached to the excavator arm (deadman switch needs to be engaged and engine must be turned off) or a certified fixed point at height.

The reinforcement cage will now be installed top the following sequence:

- Once delivered the cage section must be subject to a visual inspection for loose items prior to offloading as well as a more rigorous inspection once offloaded.

- Ensure all the cage sections have been inspected by the responsible site engineer. Once the section has been checked, the engineer will clearly label the cage section fit for use or not.
- The crawler crane will collect the cage sections from the cage storage area and lift them into vertical position using a single point lift. The bottom sections of the cages have to be designed stiff enough to rest on the ground without suffering plastic deformation. The crane will then travel with the cage to the panel location. Tag lines must be attached to the cage for greater control and stability.
- Ladder spacers will be prepared so that they can be fixed to the cage far face during lowering.
- The cage will then be lowered into the excavation under the control of the slinger/signaller. Line of sight and radio contact between signaller & crane operator will be maintained at all times.
- Panel covers will be placed over open sections of the excavation. Only when all the gaps have been covered operatives are allowed within the 2m exclusion zone without wearing fall protection to assist with the cage installation.
- The bottom cage section will be trapped off on the guide wall by use of the designed trapping beams, and disconnected from the lead crane.



*Figure 8: Photos of typical reinforcement installation*

- The next cage section will be lifted in the same manner, aligned and spliced/connected onto the trapped off section within the excavation.

- After connecting the two sections, the whole cage will be lowered into the excavation and trapped off again to allow the lifting and connecting of the next section, this process will be repeated until all the sections of the cage have been added.
- Where possible all terrain mobile elevated working platforms (MEWPs), operated by qualified personnel, are used to access all areas and will be used to facilitate splicing where the splice level cannot be reached from ground level. Where MEWPs cannot be used static platforms or similar must be used to safely access the splice.
- The complete cage will then be lowered and trapped off on top of the guide wall in its final position.

#### 4.7. Concreting

When cage trapping has been completed, the concreting platform will be placed on the panel. Subsequently, the panel will be cast to the following procedure:

- The tremie string will be built by a slinger/signaller using one of the service cranes.
- A lifting cap will be used to build the string as it ensures the string hangs straight for ease of assembly and it allows more height clearance.



Figure 9: Photo of tremie string assembly

- All the tremie joints (male and female) will be cleaned, rubbers inspected and installed (male joint only) and grease applied before making the connection.
- When installing the tremie wires, both ends of the tremie wire are to be fed into the wire slot in the tremie coupling, ensuring the wire is pushed in so it is flush and there is no loop protruding. This will ensure it does not get caught and therefore pulled out.
- Once the maximum number of tremie sections (dependent on crane jib length) or the desired tremie length has been assembled, the string will be lifted to and lowered into the panel. The string will be trapped off using the purpose built tremie fork, releasing the tremie lifting cap and allowing the rest of the string (if required) to be built in the same manner.
- If the tremie string is incomplete and requires extending, the extension will be assembled in the same manner as detailed above, lifted to the string already trapped in the panel and connected over the panel by using a tremie wire.
- Once the tremie construction is complete, it can be lowered down the panel and again trapped off (using the tremie fork) at the top of the string.
- A vermiculite sock plug or plastic/foam ball will be inserted in the tremie pipe prior to any concrete being placed.
- The tremie hopper will be lifted by the service crane and placed onto the tremie string and then connected using a tremie wire, ensuring the joint is clean.
- As concrete mixers arrive on site, the engineer/technician will check the ticket to ensure that the correct concrete mix has been batched and perform the required tests to ensure the concrete quality.



Figure 10: Photo of concrete discharge





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- Each concrete load will be flow tested as per the BS EN 12350-5. If failure occurs (average diameter below lower limit), the concrete will be rejected.
- During concreting, sets of concrete cubes are taken for compressive strength testing as detailed in the applicable ITP for concrete testing.
- Concrete will be discharged into the tremie hopper at a slow steady rate while it is pushing the vermiculite plug and support slurry out of the tube. When and only when the string of tremies is full of concrete (charged) can it be lifted off the toe of the panel, this will ensure there is a sufficient volume and force when the concrete is released to scour the toe of the panel and cover the toe of the tremie. As soon as the concrete level starts dropping within the tremie, continue discharging the concrete at a steady rate to maintain momentum.
- After every load of concrete has been discharged, the concrete level will be checked and recorded.
- Removal of tremie sections: Tremie sections are removed from the top as required. The string will be lifted until the required joint is exposed and trapped off on the guide wall, this will allow the exposed section to be disconnected and returned to the tremie rack for cleaning.
- When concreting, the rising support fluid will be pumped back to the slurry plant for cleaning and storage.
- As the concrete rises it contaminates the support fluid at the interface between the two materials; this contaminated slurry will be collected separately, pumped into a skip and disposed of as per Site Waste Management Plan (SWMP) Woodsmith Mine Site - Phase 4 (*AMC UK Doc. No. 40-AMC-WS-71-EN-PL-0006*). When pumping into the skip a swan neck must be used, attached to the skip, to stop the hose from whipping.
- For primary panels, concrete up to 3.5m below platform level in anticipation of secondary panel excavation. For secondary panels, allow minimum over pour as per applicable standards to ensure good quality concrete at cut-off level.
- All empty concrete trucks shall be washed out at the on-site batching plant. The water will be treated and re-used/disposed of in accordance with the Concrete Batch Plant Operation RAMS.
- Empty bores will be backfilled by AMC UK as required.



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## **5. HEALTH AND SAFETY LEGISLATION**

All works are to be carried out in accordance with this method statement and the following documents:

- AMC UK Construction Phase Health & Safety Plan Woodsmith Mine Site - Phase 4 – Diaphragm Wall Construction (40-AMC-WS-71-PM-PL-0002)
- AMC UK Environmental Management Plan (EMP) Woodsmith Mine Site - Phase 4 – Diaphragm Wall Construction (40-AMC-WS-71-EN-PL-0004)
- AMC UK Environmental Emergency Preparedness Plan (EPPP) Woodsmith Mine Site - Phase 4 –Diaphragm Wall Construction (40-AMC-WS-71-EN-PL-0005)
- AMC UK Site Waste Management Plan (SWMP) Woodsmith Mine Site - Phase 4 – Diaphragm Wall Construction (40-AMC-WS-71-EN-PL-0006)
- Bauer Health and Safety Plan (40-AMC-WS-10-HS-PL-0001)
- Bauer Environmental Plan (40-AMC-WS-10-EN-PL-0001)
- Bauer Slurry Management Plan (40-AMC-WS-10-EN-PL-0002)
- Bauer H&S Policy (Appendix C)
- Risk Assessment (Appendix B)
- COSHH Assessments (Appendix D)
- All relevant regulations, HSE Guidance Notes, Environmental Agency Guidance Notes, Codes of Practice, National and International Standards.

## **6. COSHH**

*The Control of Substances Hazardous to Health Regulations, 2002*, (C.O.S.H.H. Regulations), requires that an assessment is undertaken of health risks created by work involving substances hazardous to health. These refer to the use of chemicals on a site and state that the precautions to be taken are recorded on a Substance C.O.S.H.H. Record.

The C.O.S.H.H. Assessment Record is based on information obtained from a data sheet received from the substance supplier.

A copy of all the Company's Substance Identification Records are held on site and are shown in Appendix D.

## **7. FIRST AID ARRANGEMENTS**

The First Aid arrangements for the site are detailed in the AMC CPHSP. In addition, Bauer will provide first aid kits and at least three first aiders per shift.



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## **8. PERSONAL PROTECTIVE EQUIPMENT**

- High Visibility Clothing (EN 471)
- Eye Protection (EN 166F)
- Hearing Protection (EN 352)
- Safety Helmets (EN397 MM, LD)
- Protective Gloves (EN 388)
- Safety Harness for working at height
- Protective Footwear (EN 345 P) – Safety boots must have steel mid sole.

All Personal Protective Equipment will be replaced as required during the contract. Safety harnesses will be stored appropriately and inspected on a regular basis as part of the lifting gear inspection regime.

## **9. ENVIRONMENTAL PROTECTION**

All works to be compliant with the AMC UK Environmental Management Plan (EMP) Woodsmith Mine Site - Phase 4 – Diaphragm Wall (40-AMC-WS-71-EN-PL-0004).

- Noise: The noise generated during diaphragm wall construction is monitored by AMC.
- Vibration: There is no risk of vibration that will affect the local community
- Dust: Dust suppression will be implemented by AMC (e.g. dampening of dusty areas)
- Ground and Surface Water: Refer to the AMC UK Environmental Management Plan (40-AMC-WS-71-EN-PL-0004) and Slurry Management Plan (Bentonite) (40-AMC-WS-10-EN-PL-0002) for monitoring, controls and mitigation.

## **10. MANUAL HANDLING**

Mechanical plant is provided as far as possible to reduce manual handling to a minimum. Due to the nature of the work, cranes will be mainly used for most lifting operations and moving of plant and equipment.

Manual handling will be limited to the carrying of light steel parts, pipework, small lifting equipment such as shackles etc.

## **11. ACCIDENTS, INCIDENTS AND RIDDOR**

The arrangements for Reporting of Injuries, Diseases and Dangerous Occurrences under the regulations are as detailed in the company safety manual, a copy of which will be held by the site supervisor. The ultimate responsibility for reporting/investigating is held by the BTL Health & Safety Manager. In the unfortunate event of any accident or near miss, the BTL Health & Safety Manager will be informed immediately and he in turn would forward details to the AMC Health & Safety Manager and if necessary, the HSE. This also applies to environmental incidents.



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## **12. EXISTING SERVICES / HAZARDS**

No existing services have been notified to BTL by AMC UK.

In the event that previously unknown services are discovered within excavations taken out prior to commencement of the d-walling operation, all disused pipes or ducts should be plugged off to prevent the entry of concrete during construction.

A signed Permit to Dig must be issued by AMC UK to Bauer prior to commencement of any excavation works.

## **13. MANOEUVRING RIGS AROUND THE SITE**

A firm, dry, level all weather hard standing shall be provided as a stable working platform for the heavy plant to work off and installed to the Building Research Establishment (BRE) Specification, 'Working platforms for tracked plant'. The working platform for the cutter must be installed flat at 0 degrees. The working platform for the cranes can be inclined up to 0.5 degrees. Any ramps to access the platform, or within the platform must not exceed an inclination of 1 in 10.

The appointed ganger/banksman will supervise all rig manoeuvres and direct the attendant excavator(s) in their duties.

A Federation of Piling Specialists (FPS) compliant Working Platform Certificate (Form FPS/WPC/1) must be issued by AMC UK to BTL prior to commencement of the site works.



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Date: 26.05.2017

Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

#### 14. KEY CONTACTS & SITE PERSONNEL

*Table 2: Key contacts*

Name	Company	Position	Assist
Jonathan White	AMC	Operations Director	
Thomas Prinz	AMC	Site Supervisor	+
Siegfried Wenninger	AMC	Lead Engineer - Mining	tbc
tbc	AMC	H&S Manager	tbc
Gustav Jahnert	Bauer	Senior Project Manager	
Asad Khan	Bauer	Site Agent	
Norbert Hoffmann	Bauer	Site Agent	+
Nick Thomas	BAUER	HSEQ Manager	
tbc	Bauer	Site Supervisor	tbc

All site personnel will have as a minimum a CSCS card and where applicable a CPCS card. All operatives will have their CSCS/CPCS cards.

Site Supervisors to hold SSSTS certification and Site Manager will hold SMSTS certification



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Date: 26.05.2017

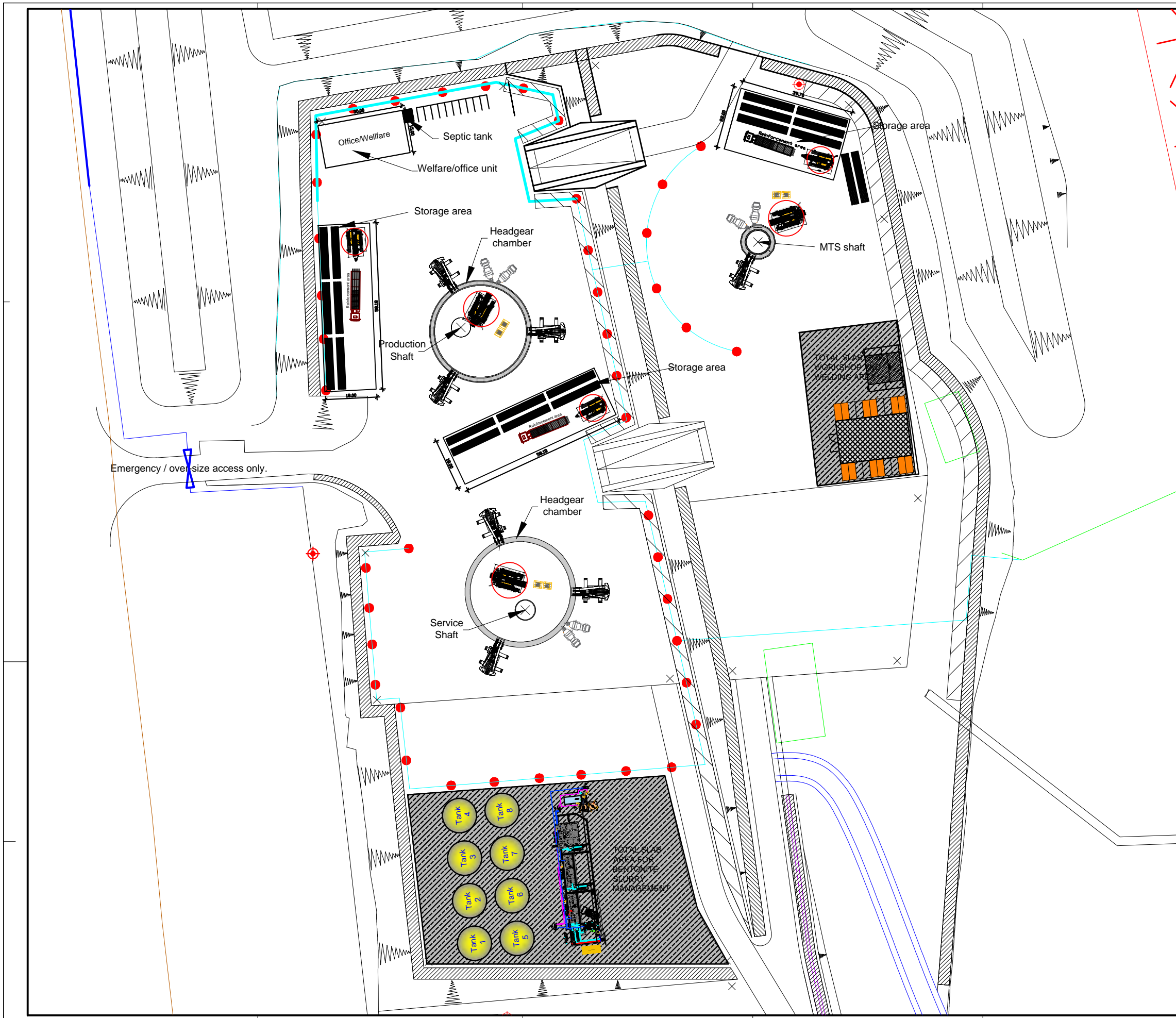
Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX A – DRAWINGS***



**FOR PLANNING PURPOSES  
NOT FOR CONSTRUCTION**

± 0,00 =

ALL DIMENSIONS AND SERVICES  
HAVE TO BE CONFIRMED ON SITE!

CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX

A P P R O V E D

THIS DRAWING IS UNDER COPYRIGHT AND IS NOT TO BE COPIED OR PRESENTED TO UNAUTHORIZED PARTIES WITHOUT SPECIAL PERMISSION

	<b>BAUER Technologies Ltd</b> Millers Three, Southmill Road Bishops Stortford, Herts, UK, CM23 3DH
	CLIENT: Sirius Minerals Plc

MAIN CONTRACTOR	Associated Mining Construction AMC (UK) Limited
SUB CONTRACTOR	BAUER Technologies Limited

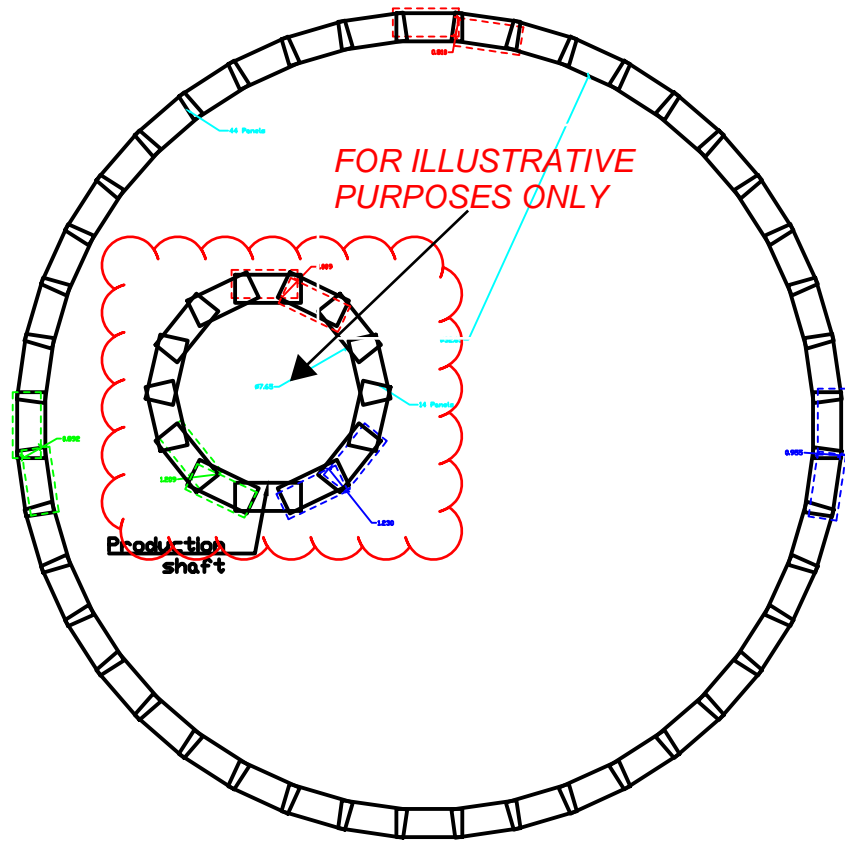
PROJECT: NORTH YORKSHIRE POLYHALITE PROJECT

DRAWING: Preliminary Diaphragm Wall Site Installation  
Option B: SS + PS 60 m and Farmer Tanks

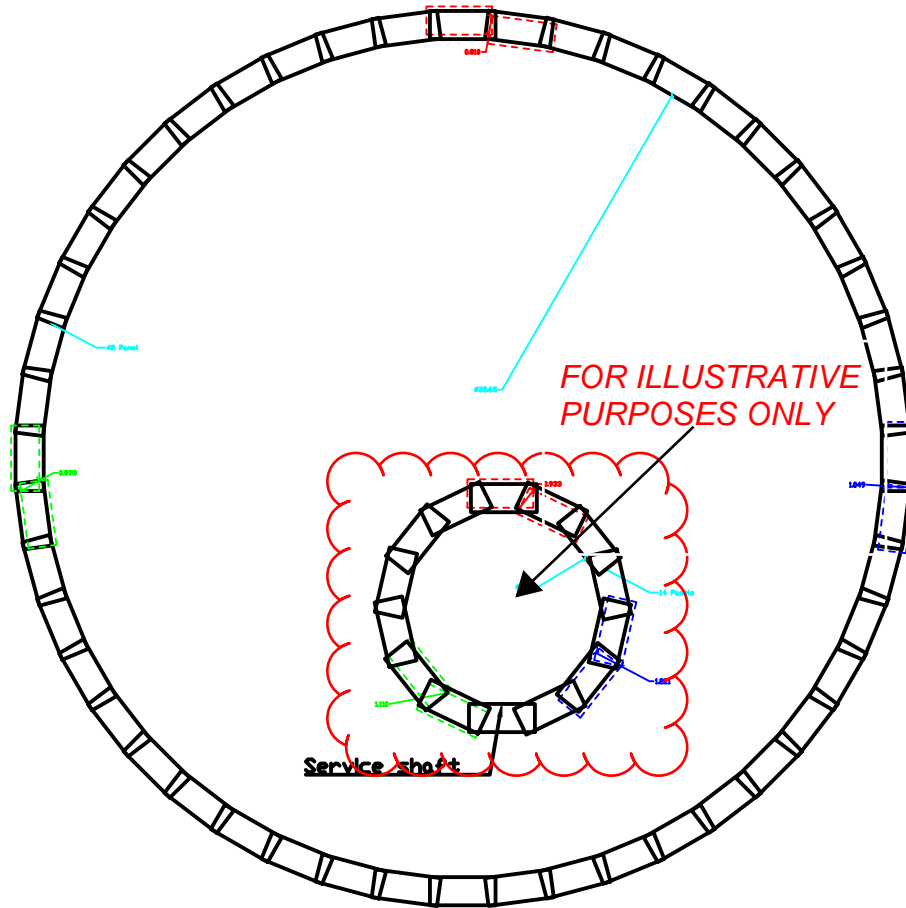
SCALE: No	DRAWN: B. Seifried	DATE: 25.05.2017
	CHECKED: N. Hoffmann	DATE: 25.05.2017
PLAN SIZE: A0	DESIGNED BY: BAUER	DATE: 25.05.2017

PROJECT NO.: A	DRAWING NO.: Rev_03
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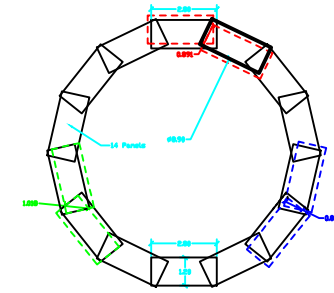
Top View Panel Layout Production Shaft



Top View Panel Layout Service Shaft



Top View Panel Layout MTS / TBM Shaft



FOR PLANNING PURPOSES  
NOT FOR CONSTRUCTION

10m 5m 0m M 1:100

± 0,00 =

ALL DIMENSIONS AND SERVICES  
HAVE TO BE CONFIRMED ON SITE!

CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX

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**BAUER** Technologies Limited  
 Millers Three, Southmill Road Bishops Stortford, Herts  
 CM23 3DH UK  
 www.baueritech.co.uk

CLIENT	Sirius Minerals Plc		
MAIN CONTRACTOR	AMC Associated Mining Construction UK		
PROJECT	NORTH YORKSHIRE POLYHALITE PROJECT		
DRAWING	Preliminary Diaphragm Wall Panel Layout		
SCALE:	DRAWN : C.Saller	DATE : 23.05.2017	
	CHECKED : N.Hoffmann	DATE : 23.05.2017	
PLAN SIZE: A0	DESIGNED BY: ---	DATE: 23.05.2017	
PROJECT NO.:	A-	DRAWING NO.:	Y17015002-





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Date: 26.05.2017

Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX B – RISK ASSESSMENT***

**BAUER Technologies Ltd.**  
**General Risk Assessment Diaphragm Wall Construction with Hydraulic Trench Cutter**  
**Project: NORTH YORKSHIRE POLYHALITE PROJECT, 26/05/17 (Incl. AMC UK comments)**



Likelihood	Consequence				
	Insignificant (1)	LIKELIHOOD	Insignificant (1)	LIKELIHOOD	Insignificant (1)
Almost Certain (5)	M (5)	H (10)	E (15)	E (20)	E (25)
Likely (4)	M (4)	H (8)	H (12)	E (16)	E (20)
Possible (3)	L (3)	M (6)	H (9)	E (12)	E (15)
Unlikely (2)	L (2)	L (4)	M (6)	H (8)	E (10)
Rare (1)	L (1)	L (2)	M (3)	M (4)	M (5)

RISK RATING (RR)			
Score	colour	Action	Responsibility
1 – 4	Low	PROCEED – Daily Revision	Acceptable with continued data collection and trending for continuous improvement
5 – 12	Medium	MANAGE RISK – CONTINUE WITH CAUTION	Acceptable after review of the operation. Requires continued tracking and recorded action plans.
13 – 19	High	MANAGE RISK – CONTINUE WITH PROJECT MANAGERS PERMISSION	Manageable under risk control & mitigation. Requires Project Managers permission
20 – 25	Extreme	<b>STOP ! STOP ! STOP !</b>	Unacceptable under existing circumstances requires immediate rectification action

**BAUER Technologies Ltd.**  
**General Risk Assessment Diaphragm Wall Construction with Hydraulic Trench Cutter**  
**Project: NORTH YORKSHIRE POLYHALITE PROJECT, 26/05/17 (Incl. AMC UK comments)**



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Supervisor to brief all staff on safe work procedures	Misunderstanding / communication breakdown	2	4	8	<ul style="list-style-type: none"> <li>Ensure correct and up to date information has been passed to all staff prior to work commencing.</li> <li>Use competent, ticketed operator and other personnel.</li> <li>Operator to undergo familiarisation training.</li> </ul>	1	4	4	Supervisor Operator
Preparation to commence operations	Suitability of working platform	2	5	10	<ul style="list-style-type: none"> <li>Properly designed and installed working platform based on rig loadings.</li> <li>Area fenced and signed.</li> <li>Signed off platform certificate prior to commencement of works.</li> <li>Visual inspection and monitoring of the platform daily to ensure integrity of platform is maintained throughout lifting operations.</li> </ul>	1	4	4	Supervisor Operator
Loading / Unloading the equipment	Unsuitable lifting devices and / or incorrect loading / unloading can result in the lifting device, the equipment or the transport vehicle tipping over or the load falling off. This can cause severe or fatal injury to people near the equipment.	4	4	16	<ul style="list-style-type: none"> <li>As a rule, the area under suspended loads must be free at all times.</li> <li>Only use authorised and undamaged lifting devices.</li> <li>Attach lifting slings only to provided lifting points.</li> <li>Please note the change in weight distribution and centre of gravity with suspended loads.</li> </ul>	2	4	8	Supervisor, Operator, Banksman



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Slips trips and falls	Untidy and/or poor lighted workplaces can lead to injuries of personnel.	3	2	6	<ul style="list-style-type: none"> <li>Clear the working area of all trip hazards before daily work commences.</li> <li>Maintain a clean working area.</li> <li>Maintain a well-lit working area at night time or in poor visibility.</li> <li>Remove and clean all spills of support fluid immediately.</li> <li>Remove all spoil from around the working area.</li> </ul>	2	2	4	Supervisor, Foreman
Slips trips and falls	Lines, pipes and electrical cables	3	2	6	<ul style="list-style-type: none"> <li>Proper laying of cables and pipes in conduits or shifted outside of walkways.</li> <li>Crossovers shall be placed in areas where pipes and cables are crossing walkways.</li> <li>Good housekeeping has to be maintained at all times.</li> </ul>	2	2	4	Supervisor, Foreman
Equipment Movement	Equipment moves on the platform for set up at panel location	4	4	16	<ul style="list-style-type: none"> <li>Banksman to direct rig movement as required</li> <li>Remove unnecessary personnel from works area.</li> <li>Delineate works area.</li> </ul>	2	4	8	Supervisor, Banksman
Equipment Movement	Slew to Hole. Slewing machinery - crushing of personnel / impact with other plant platform.	3	4	12	<ul style="list-style-type: none"> <li>Adequate clearance to be maintained around the turning radius of the rig.</li> <li>Rig to be operated clear of obstacles.</li> <li>Banksman to direct movement of rig.</li> </ul>	2	4	8	Operator, Banksman
Equipment Movement	Risk of accident if driver does not have an all-round view from the cab!	3	4	12	<ul style="list-style-type: none"> <li>The driver of the rig must be assisted by a person giving hand signals during travel.</li> </ul>	2	4	8	Operator, Banksman
Work area protection	Errant vehicles / people entering and leaving the works area.	2	4	8	<ul style="list-style-type: none"> <li>Prestart meeting daily prior to commencement of work.</li> <li>No plant or materials to traverse on to works area.</li> </ul>	1	4	4	Supervisor



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Work area protection	Personnel falling into trenches.	2	3	6	<ul style="list-style-type: none"> <li>Signage &amp; barricading to be erected around works area.</li> <li>Using platform to cover the trench during concrete casting and during all non-operational working hours.</li> <li>Use gloves while handling the platforms.</li> <li>All rigs to have travel alarms.</li> </ul>	1	3	3	Supervisor
Placing cutter in guide wall	Crushing injuries	2	4	8	<ul style="list-style-type: none"> <li>Set up exclusion zones, use signage and spotters.</li> <li>All rigs and machinery to have travel alarms.</li> <li>All to use PPE.</li> </ul>	1	4	4	Banksman All
Placing cutter in guide wall	Slips, trips and falls	2	3	6	<ul style="list-style-type: none"> <li>Banksman not to go closer than 1m from excavation. Hard barrier in place at all times.</li> </ul>	1	3	3	Banksman All
Connecting pipes to cutter heads, ensure pressure valve is closed	Leaks, manual handling, burst lines, hose could strike people	2	3	6	<ul style="list-style-type: none"> <li>Proper manual handling techniques.</li> <li>Radio control with bentonite plant.</li> <li>Remote control for pumps.</li> <li>Tie wire clips shut.</li> <li>Ensure valve is open/off.</li> <li>Check with bentonite plant that work can proceed.</li> <li>Regular inspection and maintenance of bentonite pipelines.</li> </ul>	1	3	3	All
Operating controls	Repetitive strain injury	3	3	9	<ul style="list-style-type: none"> <li>Carry out stretching exercises prior to operating.</li> <li>Stretch and exercise hands as much as possible.</li> <li>When not operating, take a break from the cab.</li> </ul>	1	3	3	Operator



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Check hydraulics above cutter pump	Trapping of fingers / hands	2	3	6	<ul style="list-style-type: none"> <li>Ensure that descent of cutter is controlled.</li> <li>Keep minimum amount of hand within cutter at all times.</li> <li>Do not place fingers / hand in areas where trapping could occur.</li> <li>Maintain contact between operator and mechanic during these essential checks.</li> <li>Have a spotter in place to check for any unintended movement.</li> </ul>	1	2	2	Operator Mechanic
Panel Excavation	Personnel injured by hydraulic cutter	2	4	8	<ul style="list-style-type: none"> <li>Exclusion zone to be maintained around the front of the hydraulic cutter.</li> </ul>	1	4	4	Supervisor Banksman Operator
Panel Excavation	Damage to services / utilities	3	2	6	<ul style="list-style-type: none"> <li>Permit to Excavate to be issued by others prior to commencement of works, detailing all services &amp; utilities in the vicinity of the works.</li> </ul>	1	2	2	Supervisor Banksman Operator
Panel Excavation	Personnel falling into open trench	2	4	8	<ul style="list-style-type: none"> <li>Provide barrier protection and cover open trenches.</li> <li>Ensure all personnel are aware of the excavation works. Provide sufficient warning signs.</li> </ul>	1	4	4	Supervisor Banksman Operator

**BAUER Technologies Ltd.**  
**General Risk Assessment Diaphragm Wall Construction with Hydraulic Trench Cutter**  
**Project: NORTH YORKSHIRE POLYHALITE PROJECT, 26/05/17 (Incl. AMC UK comments)**



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Panel Excavation	Personnel can fall into open trenches	3	3	9	<ul style="list-style-type: none"> <li>All personnel to remain more than 1.5 m from excavation in progress. Remove unnecessary personnel from works vicinity.</li> <li>Delineate works area. Barricades to be placed around open excavation when cutter or grab is in use.</li> <li>Hole covers to be placed over open excavation when cutter or grab is not working.</li> <li>Banksman to be in attendance at the excavation at all times while the cutter or grab is operating.</li> <li>Clear communication, stay in operator's line of vision.</li> <li>Banksman to keep clear of cutter or grab.</li> <li>Banksman to direct all machine movements.</li> </ul>	1	3	3	Supervisor, Foreman
Panel Excavation	Undermining work platform	3	3	9	<ul style="list-style-type: none"> <li>Monitor platform integrity visually on daily basis.</li> <li>Ensure slurry levels maintained to near ground level. Monitor excavation depth</li> <li>Level of slurry to be monitored at all times by banksman.</li> <li>Slurry properties to be tested to ensure compliance with specification.</li> </ul>	2	3	6	Banksman
Panel Excavation	Collapse of trench	3	3	9	<ul style="list-style-type: none"> <li>Immediately remove personnel and equipment in case of collapsed trench. Start backfilling procedure of the trench as soon as possible, after proper assessment of the situation by the Project manager and HSE Manager</li> </ul>	2	3	6	Supervisor, Foreman
Checking panel depth	Falling into excavation	2	4	8	<ul style="list-style-type: none"> <li>Depth to be measured from behind a barricade that the banksman will move into place as needed or through a mesh cover hole.</li> </ul>	1	4	4	Banksman
Clearing the top	Falling into excavation	2	4	8	<ul style="list-style-type: none"> <li>Use spotters, exclusion zones and signage.</li> </ul>	1	4	4	Banksman

**BAUER Technologies Ltd.**  
**General Risk Assessment Diaphragm Wall Construction with Hydraulic Trench Cutter**  
**Project: NORTH YORKSHIRE POLYHALITE PROJECT, 26/05/17 (Incl. AMC UK comments)**



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
of guide wall of debris	Struck by falling objects	2	4	8	▪ Do not work under loads; use a spotter to check and clear grab.	1	4	4	
	Slips, trips and falls	3	3	9	▪ Stay 1m back from the guide wall edge.	1	3	3	
Covering excavated bites	Pinch hazards Slips, trips and falls	2	3	6	▪ Banksman only person to approach the excavation. ▪ High visibility PPE must be worn at all times. ▪ Exclusion zones in place.	1	3	3	Banksman
Washing off the cutter	Crushing.	2	4	8	▪ Experienced personnel to carry out works. ▪ Clear communication between the operator and persons operating the water blaster.	1	4	4	Operator Washer
Washing off the cutter	High pressure water projectiles.	2	3	6	▪ Double eye protection & gloves.	1	3	3	Operator Washer
Equipment	Oil or diesel spill can cause environmental damage	4	4	16	▪ MSDS provided. ▪ Spill kit to be kept on site. ▪ Refuelling by mobile tanker. ▪ Service/repairs of equipment to be carried out on a hard standing.	2	4	8	Supervisor
Electricity	Improper and/or defect electrical connections, tools or cables can cause electrification of personnel.	3	4	12	▪ Inspect leads and socket for damage prior to use. ▪ Check current tag attached. ▪ Ensure sockets securely coupled (tight) and suspended above ground. ▪ Check leads placed in secure location away from potential damage. ▪ Ensure RCD's functional.	2	4	8	Electrician





Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Equipment Maintenance	Risk of damaging the equipment	4	4	16	<ul style="list-style-type: none"> <li>The prescribed maintenance intervals apply also to a cutter which has been out of service for a long time.</li> <li>Maintenance which has been left out during a standstill must be carried out before the cutter is started up again.</li> </ul>	2	3	6	Operator, Supervisor
Equipment Maintenance	Risk of damaging the cutter gears	4	4	16	<ul style="list-style-type: none"> <li>A Special Service for overhauling the cutter gear is required every 1500 hours of operation</li> <li>In extreme work conditions (rock and boulders), the service interval may have to be shortened.</li> </ul>	2	3	6	Operator, Supervisor
Equipment Maintenance	Contaminated gear oil or air in the gear oil may damage the cutter gear	4	4	16	<ul style="list-style-type: none"> <li>Take an oil sample and have it analysed every time the oil is changed and when the oil is thought to be contaminated!</li> <li>If contamination is detected in the oil (for example bentonite, sand), the cutting operation must be stopped immediately to avoid further damage to the cutter gears.</li> <li>The cutter gears must not be put into operation again until they have been opened, completely cleaned, checked, and repaired by qualified personnel.</li> <li>The escaping oil must be free from air bubbles in order to ensure that the gear is filled correctly.</li> </ul>	2	3	6	Operator, Supervisor
Equipment Maintenance	Injury hazard - mud deposits in the mud hose can be pushed by pressure and escape at the inspection hole.	4	3	12	<ul style="list-style-type: none"> <li>Before opening, check that the mud hose is completely empty.</li> </ul>	2	3	6	Operator, Banksman, Mechanic



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Equipment Maintenance	Cutter / Grab / Chisel maintenance works can lead to entanglement, crushing, hand or feet injuries	4	3	12	<ul style="list-style-type: none"> <li>Workers not to stand or place arms, legs etc. under excavation equipment (e.g. cutters, grabs, chisels ...).</li> <li>Keep hands &amp; feet clear when cutter wheels are turned for chisel change.</li> <li>Clear signals to direct operator and act as spotter.</li> <li>Personnel to maintain adequate clearance from the load.</li> <li>Ensure suitable access and escape routes available.</li> </ul>	2	3	6	Operator, Banksman
Equipment Maintenance	Mechanics or other personnel is required to work at heights	3	4	12	<ul style="list-style-type: none"> <li>Address 'Working at Height' topic regularly during briefings.</li> <li>Use always man-rider baskets, MEWP, cherry picker and/or fall arrests.</li> <li>Install rigid fences and handrails at all plant walkways, ladders and stairways.</li> <li>Before starting a task, carry out a 'pre-use' check to spot any obvious visual defects to make sure the ladder, man-rider baskets, MEWP, cherry picker is safe to use.</li> </ul>	2	4	8	Supervisor
Rigging / Derigging	Risk of damaging components!	4	4	16	<ul style="list-style-type: none"> <li>Always keep the rope and hoses lightly tensioned.</li> <li>Avoid pull on the cutter.</li> <li>Set down the guider for auxiliary crane 2.</li> <li>Auxiliary crane must never pull on the boom head through the guy strand.</li> <li>Avoid collision of the rocker with other components.</li> <li>Raise the cutter while slowly travelling towards the cutter with the base machine to prevent horizontal tension</li> </ul>	2	4	8	Operator



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Equipment Repair and Maintenance	Hazardous Chemicals Pipes and associated equipment is likely to be contaminated with oils.	3	3	9	<ul style="list-style-type: none"> <li>Ensure COSHH assessments on site and relevant PPE is provided.</li> <li>Dispose of as hazardous waste appropriately.</li> </ul>	2	3	6	Supervisor
Site Traffic / Equipment Movements	Ground workers or vehicles can be injured by reversing, slewing or moving equipment on site.	4	4	16	<ul style="list-style-type: none"> <li>Daily briefings will be conducted in order to explain the daily tasks and special risks to all people involved in the construction of the platform.</li> <li>Keep out general site traffic from the working area as good as possible.</li> <li>Banksman shall safeguard reversing or sewing machines.</li> </ul>	2	4	8	Supervisor, Banksman
Working height at	People falling from height during assembly, operation and disassembly of the plant	3	4	12	<ul style="list-style-type: none"> <li>Address 'Working at Height' topic regularly during briefings.</li> <li>Use always man-rider baskets, MEWP, ladders and/or fall arrests when working at height.</li> <li>Install rigid fences and handrails at all plant walkways, ladders and stairways.</li> </ul>	2	4	8	Supervisor
Workplace Lighting	People tripping, slipping and falling due to insufficient lighting of workplace	3	3	9	<ul style="list-style-type: none"> <li>Ensure proper general lighting is sufficient for the complete plant area.</li> <li>Install task lighting wherever specific, greater demand of lighting is required.</li> </ul>	2	3	6	Supervisor
Manual handling	Incorrect lifting of heavy or awkward loads could result in musco-skeletal injury	4	2	8	<ul style="list-style-type: none"> <li>Carry out assessment for awkward lifts - generally over 25Kg; Assess load prior to lifting, protect sharp edges wherever possible; Use mechanical means where possible; Only carry loads which are comfortable for you to do so; Ask for help if need be; Keep load close to your body; Ensure that hand protection is worn; Wear foot protection and suitable gloves; If in shared lifting operation ensure that clear commands are given</li> </ul>	2	2	4	Foreman



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Lifting Works	Improperly assessed lifting works and poor/wrong attachment of loads can lead to severe incidents.	-	-	-	<ul style="list-style-type: none"> <li>Refer to applicable lift plans</li> </ul>	-	-	-	-
Substances hazardous to health	Failure to identify SHH Personal injury / longer term ill health	3	4	12	<ul style="list-style-type: none"> <li>Material safety data sheets (MSDS) shall be requested for all products at the procurement stage</li> <li>COSHH Assessment shall be generated for all hazardous substances</li> <li>Unsafe work with hazardous substances shall be stopped until the necessary precautions are implemented</li> </ul>	1	4	4	PM
Substances hazardous to health	Issue / unsafe handling of substances hazardous to health without information / instruction Personal injury / longer term ill health	3	4	12	<ul style="list-style-type: none"> <li>COSHH Assessments shall be retained in the relevant stores. Workers issued with hazardous substances shall be verbally advised of the handling precautions and issued relevant PPE as necessary</li> </ul>	1	4	4	PM
Substances hazardous to health	Failure to store substances hazardous to health in line with manufacturers' guidelines Personal injury / longer term sickness Fire	3	4	12	<ul style="list-style-type: none"> <li>Hazardous and / or flammable substances shall be stored separately from general materials.</li> <li>COSHH / Flammable stores shall be locked to prevent unauthorized access</li> <li>COSHH stores shall be temperature controlled should the local conditions / environments prevent safe storage at local temperatures</li> <li>COSHH stores shall be clearly marked with appropriate, highly visible signage</li> </ul>	1	4	4	PM

**BAUER Technologies Ltd.**  
**General Risk Assessment Diaphragm Wall Construction with Hydraulic Trench Cutter**  
**Project: NORTH YORKSHIRE POLYHALITE PROJECT, 26/05/17 (Incl. AMC UK comments)**



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Oil / fuel spills	<p>Broken hydraulic hoses can lead to considerable damage of the environment</p> <p>Oil / fuel spillage during re-fuelling of equipment and / or maintenance can lead to environmental damages</p>	3	4	12	<ul style="list-style-type: none"> <li>▪ Preventive:                             <ul style="list-style-type: none"> <li>○ Proper maintenance of the equipment has to be documented in the maintenance reports</li> <li>○ Daily pre-use equipment inspections have to be carried out by the machine operator and to be documented</li> <li>○ Organize a physical check of delivery hoses</li> <li>○ Trip trays shall be placed below the machine in order to hinder oils / fluids from penetrating soil.</li> </ul> </li> <li>▪ Corrective:                             <ul style="list-style-type: none"> <li>○ Immediate measures should be taken to contain the spill and prevent potential migration of contamination in accordance to the COSHH sheet</li> <li>○ Oil spill response shall be carried out in accordance to AMC UK's Emergency Environmental Preparedness Plan</li> <li>○ Contaminated materials / soil have to be disposed in accordance with local regulations.</li> </ul> </li> </ul>	1	4	4	



Subscope A – Diaphragm Wall Excavation with Hydraulic Trench Cutter									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Spills of materials hazardous to health	Spills of solid or liquid materials can lead to Environmental damages	3	3	9	<ul style="list-style-type: none"> <li>Handle hazardous materials with care and in accordance with the applicable MSDS</li> <li>Spills of solid material - shovel excess and place contaminated material into an approved drum, cover and label</li> <li>Small Liquid Spills - absorb with sorbent material, including sand or clean fill. Place contaminated material into an approved drum, cover and label</li> <li>Large Liquid Spills - immediately dike the area surrounding the spill or create some type of obstruction to prevent the spill migration. Absorb the spill with a sorbent material, including sand or clean fill. After all free liquid is absorbed; remove the material and any contaminated soil. Place contaminated material into an approved drum, cover and label. All bags, containers, drums, etc. containing contaminated materials must be labelled.</li> </ul>	1	3	9	
Spills of trench support fluid	Spills of support fluid can lead to slippery conditions and may disturb the environment.	3	3	9	<ul style="list-style-type: none"> <li>Level of the support fluid will be monitored by the Banksman.</li> <li>The top of the guide wall is located in a small trench, so that overflow of bentonite slurry will be contained in this trench (and not flood the working platform)</li> <li>In case a spill happened the fluid shall be removed from the working platform as soon as possible by means of wheel loader or equal.</li> </ul>	1	3	9	



Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Supervisor to brief all staff on safe work procedures	Misunderstanding/ communication breakdown	3	4	12	<ul style="list-style-type: none"> <li>Ensure correct and up to date information has been passed to all staff prior to work commencing.</li> <li>Use competent, licensed operator</li> <li>Operator to undergo familiarisation training.</li> </ul>	1	4	4	Supervisor Operator
Preparation to commence operations	Suitability of working platform	3	5	15	<ul style="list-style-type: none"> <li>Properly designed and installed working platform based on crane loadings.</li> <li>Area fenced and signed.</li> <li>Visual inspection and monitoring of the platform daily to ensure integrity of platform is maintained throughout lifting operations.</li> </ul>	1	4	4	Supervisor Operator
Work area protection	Errant vehicles / people entering and leaving the works area.	3	5	15	<ul style="list-style-type: none"> <li>Prestart meeting daily prior to commencement of work.</li> <li>No plant or materials to traverse on to works area.</li> </ul>	1	4	4	Supervisor
	Personnel falling into trenches.	3	5	15	<ul style="list-style-type: none"> <li>Signage &amp; barricading to be erected around works area.</li> </ul>	1	3	3	
Establish site access	Traffic collisions or hold-ups	2	4	8	<ul style="list-style-type: none"> <li>Exclusion zones to be maintained near to overhead services.</li> <li>Suitable traffic management to be in place.</li> </ul>	1	3	3	Supervisor
	Road/ramp access	2	4	8	<ul style="list-style-type: none"> <li>Prior check of road/ramp access required.</li> <li>Ramp gradient to be a maximum of 1:10.</li> </ul>	1	3	3	
Off-loading & tracking equipment	Striking personnel	3	5	15	<ul style="list-style-type: none"> <li>Equipment to be operated by competent, experienced, licensed personnel only.</li> </ul>	1	3	3	Operator Dogman
	Damage to property	3	5	15	<ul style="list-style-type: none"> <li>Operator only to move machine when directed to do so by</li> </ul>	2	2	4	

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Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Damage to equipment	3	5	15	<ul style="list-style-type: none"> <li>signalman</li> <li>Appropriate traffic management to be in place.</li> <li>All lifting equipment must be visually checked by competent, experienced, certified signalman prior to use</li> </ul>	2	2	4	
Attaching / Removing chains & slings	Falls from height	4	5	20	<ul style="list-style-type: none"> <li>Use secured ladder / harnesses where applicable, with ladder footed or tied off.</li> <li>3 points of contact when using ladders.</li> <li>Use certified man-box.</li> </ul>	1	4	4	Supervisor
Operation of excavator / service cranes	Striking personnel	3	5	15	<ul style="list-style-type: none"> <li>To be operated by competent, experienced, ticketed personnel only.</li> <li>Authorized personnel only, check sheet signed off prior to use.</li> <li>All lifting operations shall be carried out on levelled grounds.</li> <li>All operations to be controlled by the experienced, competent ticketed banksman</li> <li>Use tag lines when lifting large, bulky objects.</li> <li>All lifting points to be certified.</li> </ul>	1	3	3	Operator Banksman
	Damage to property	3	5	15		2	2	4	
	Damage to equipment	3	5	15		2	2	4	
Concreting of slab / walls	Nails in formwork.	3	2	6	<ul style="list-style-type: none"> <li>Ensure nails are removed from formwork.</li> </ul>	2	2	4	Supervisor Banksman
	Struck by reversing concrete truck.	3	5	15	<ul style="list-style-type: none"> <li>Concrete trucks to be directed by banksman at all times.</li> </ul>	1	3	3	
	Concrete splash.	3	2	6	<ul style="list-style-type: none"> <li>All personnel involved in concreting operations to wear appropriate PPE.</li> <li>Exclusion zone to be maintained around concreting area.</li> </ul>	2	2	4	



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Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Delivery of materials	Struck by reversing delivery vehicle.	3	5	15	<ul style="list-style-type: none"> <li>Delivery trucks to be directed by banksman at all times.</li> <li>All personnel involved in operations to wear appropriate PPE.</li> <li>Minimise reversing wherever possible.</li> <li>Exclusion zones, barriers and spotters to be used.</li> <li>A forklift will be utilised for bulk material handling on site.</li> </ul>	1	3	3	Supervisor Banksman
Welding	Radiation and flying objects produced can damage welder's/ personnel's eyes.	2	4	8	<ul style="list-style-type: none"> <li>All personnel involved in operations to wear appropriate PPE.</li> <li>Welding machine shall be inspected by competent, experienced, licensed electrician at regular intervals.</li> </ul>	1	2	2	Supervisor Welder All personnel
	Person could be electrocuted.	4	4	16	<ul style="list-style-type: none"> <li>Frames of arc-welding machine to be properly earthed.</li> <li>Elevate all cables where practical to do so.</li> <li>All cables must be checked prior to use. If cable found worn, remove and replace immediately prior to use.</li> </ul>	1	4	4	
	Slag burn adjacent material / clothing of welders.	2	3	6	<ul style="list-style-type: none"> <li>No welding operation shall be allowed near places where combustible materials are stored or near materials or plants where explosive or flammable dust, gases or vapours are likely to be present or emitted.</li> <li>Where appropriate, screens shall be provided adjacent to the works when flame cutting.</li> </ul>	1	2	2	
Laying of poly and steel pipes	Manual handling injuries.	2	4	8	<ul style="list-style-type: none"> <li>Correct manual handling procedures used.</li> <li>All personnel involved in operations to wear appropriate PPE and riggers gloves.</li> <li>Pipes are fitted together using a coupling and clamp system to ensure no spillage occurs during delivery of Bentonite.</li> </ul>	1	2	2	Supervisor All personnel

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Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Slips trips and falls. Working within 600mm nominal excavation.	2	4	8	<ul style="list-style-type: none"> <li>Bauer to seek an excavation permit before any dig works.</li> <li>Where excavations are across working trunk roads, steel plates shall be used as a temporary measure to ensure the road is kept open. Only half the road will be shut at any one time.</li> <li>All personnel to step down into 600mm excavation moving forwards instead of backwards, not carrying items greater than 10kg in weight. All other lifts by crane</li> <li>Pipes in the ground will be identified by using appropriate tagging/flagging material</li> </ul>	1	3	3	
Electrical connection of bentonite plant	Electricity	3	5	15	<ul style="list-style-type: none"> <li>Use competent, licensed electrician at all times.</li> </ul>	1	4	4	Electrician
Mixing bentonite	Personnel entering works zone	3	2	6	<ul style="list-style-type: none"> <li>Provide exclusion zone preventing unauthorised access</li> </ul>	1	2	2	Bentonite Technician/ all personnel
	Pinch & crush injuries	3	4	12	<ul style="list-style-type: none"> <li>Moving parts to be guarded.</li> </ul>	1	2	2	
	Dust	3	2	6	<ul style="list-style-type: none"> <li>Wear appropriate gloves and disposable masks during all mixing processes.</li> <li>Change masks at each break.</li> <li>Place shroud around bentonite mixer</li> <li>An extractor fan will be supplied to aid in dust suppression</li> </ul>	2	2	4	
	Spillage	3	2	6	<ul style="list-style-type: none"> <li>Contain the plant by building a surrounding bund</li> </ul>	1	2	2	



Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Manual handling	3	4	12	<ul style="list-style-type: none"> <li>Place pallets of cement and bentonite with a fork lift at a working level to reduce back strain</li> <li>The use of lifting aids should be considered where appropriate</li> <li>Task rotation of workers involved in handling cement</li> </ul>	1	2	2	
	Exposure (weather)	3	2	6	<ul style="list-style-type: none"> <li>Consider shading/shelter where appropriate.</li> </ul>	1	2	2	
	Dermal Exposure	3	2	6	<ul style="list-style-type: none"> <li>Input controls/ PPE as per MSDS (eyewash/ shower/ chemical gloves and disposable coveralls)</li> </ul>	1	2	2	
Placing Bentocryl / Sodium Bicarbonate into mixing tank	Spill of Bentocryl / Sodium Bicarbonate	3	3	9	<ul style="list-style-type: none"> <li>Bund built from concrete around bentonite plant.</li> <li>Spill kits to be stored at the Bentonite plant and used as and when needed to contain any such incident</li> <li>Bentocryl to be stored within Dangerous Goods approved container, PPE used as per MSDS.</li> <li>An area around the Bentonite plant will be sealed off using appropriate materials to contain any spills that may occur.</li> </ul>	1	2	2	Bentonite Technician/ all personnel
Placing sodium bicarbonate to mixing tank	Spill or splash of Sodium bicarbonate onto person.	4	3	12	<ul style="list-style-type: none"> <li>Decant liquid from 1000 litre drums into containers at the mixing plant to add into the mixing bowl.</li> <li>Wear PPE: Glasses face shield, rubber gloves, and disposable coveralls accordance with the MSDS.</li> <li>Live water supply shall be available at the decanting area for eyewash/ flushing of affected skin areas.</li> <li>SDS on hand at the Batching plant for reference.</li> </ul>	1	2	2	Bentonite Technician All personnel



Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Storing, placing or transporting sodium bicarbonate	Spill onto ground	2	2	4	<ul style="list-style-type: none"> <li>IBC 110% to be positioned under stored sodium bicarbonate as per MSDS.</li> <li>Any spills are to be immediately contained by an earth bund and bagged on site.</li> <li>Temporary storage can be in an empty spill kit wheelie bin or otherwise isolated area</li> <li>Any spill contaminated material will be disposed of at an approved waste handling facility</li> <li>Sodium bicarbonate drums should be covered from direct sunlight as per MSDS whilst stored.</li> <li>MSDS to be placed on the outside of the exclusion zone.</li> </ul>	1	2	2	Bentonite Technician All personnel
Bentonite transportation through pipeline to / from cutter	Pipe rupture underground causing bentonite fluid spillage	3	2	6	<ul style="list-style-type: none"> <li>Steel pipes to be used under haul roads</li> <li>Where poly pipe is used underground clamps to be tie wired tight.</li> <li>Bentonite pump to have remote on working platform so that pump may be shut off within 10 seconds.</li> <li>Bentonite technician / superintendent / grabs and cutter to have radios for quick communication.</li> <li>Survey as-built pipe locations.</li> <li>Clean up any bentonite spills immediately. If spill over 1m<sup>3</sup> dig localised trench, place ruptured line within trench and pump bentonite back to plant using concreting bentonite pump.</li> </ul>	1	2	2	Foreman Bentonite Technician Operators

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Sub scope B – Diaphragm Wall supporting Slurry Plant									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Removal of waste bentonite	Spillage	3	2	6	<ul style="list-style-type: none"> <li>▪ Toolbox work crew prior to commencement of works.</li> <li>▪ Wash tanks from above on gantry.</li> <li>▪ Use sucker truck hose to remove Bentonite.</li> <li>▪ Use sealed trucks to remove bentonite.</li> <li>▪ Clean truck hoses into Bentonite tank.</li> <li>▪ Remove bentonite to a licensed waste tip.</li> </ul>	1	2	2	Foreman
Commissioning of Bentonite Plant	Striking personnel Damage to property Damage to equipment	2	3	6	<ul style="list-style-type: none"> <li>▪ Bentonite Plant to be commissioned and signed off by an appropriately qualified technician after installation.</li> <li>▪ Engineer sign off for silo's</li> </ul>	1	3	3	Bentonite Technician
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Subscope C – Handling and Installation and Reinforcement Cages									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Supervisor to brief all staff on safe work procedures	Misunderstanding/ communication breakdown	4	4	16	<ul style="list-style-type: none"> <li>Ensure correct and up to date information has been passed to all staff prior to work commencing.</li> <li>Use competent, ticketed operator</li> <li>Operator to undergo familiarisation training.</li> </ul>	1	4	4	Supervisor Operator
Preparation to commence operations	Suitability of working platform	3	5	15	<ul style="list-style-type: none"> <li>Properly designed and installed working platform based on crane loadings.</li> <li>Area fenced and signed.</li> <li>Signed off platform certificate prior to commencement of works.</li> <li>Visual inspection and monitoring of the platform daily to ensure integrity of platform is maintained throughout lifting operations.</li> </ul>	1	4	4	Supervisor Operator
Moving delivery truck into position	Truck striking plant, objects or personnel	4	5	20	<ul style="list-style-type: none"> <li>TMP to be enforced</li> <li>Trucks to enter the working area under the direction of a banksman and park in a safe spot.</li> <li>Clear communication between the truck driver and banksman.</li> <li>Exclusion zones, barriers and spotters to be used.</li> </ul>	1	4	4	Driver Traffic Controller All
Offloading Steel Cage from truck	Fall from heights	4	5	20	<ul style="list-style-type: none"> <li>Personnel to wear an approved harness and attach an approved lanyard to a fixed point.</li> </ul>	1	4	4	Signalman All
	Pinch and crush injuries.	4	4	16	<ul style="list-style-type: none"> <li>Keep body parts clear of load.</li> </ul>	1	3	3	
	Crane striking other plant or personnel.	3	5	15	<ul style="list-style-type: none"> <li>Rigger can attach a 6 metre sling to the secondary rope of the crane and secure his lanyard to it. This will be kept centred over his head. In the case of a fall, crane operator can lower the banksman to the ground.</li> </ul>	2	5	10	



Subscope C – Handling and Installation and Reinforcement Cages									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Falling and loose objects striking personnel or plant.	4	5	20	<ul style="list-style-type: none"> <li>Use spotters, signage and exclusion zones.</li> <li>Ensure pile cages are wedged in position when stored to prevent rolling.</li> </ul>	1	4	4	
Lifting of Steel cage	Cage falling while lifting.	4	5	20	<ul style="list-style-type: none"> <li>Quality welding work to be carried out, check welds before lifting.</li> <li>Secure the U-bolts with steel cage and certified lifting gear.</li> <li>Ensure reinforcement cages have adequate stiffness for lifting and placing.</li> <li>Use correct lifting points.</li> </ul>	1	4	4	Operator Signalman All
	Swing of the cage striking other plant and personnel.	4	5	20	<ul style="list-style-type: none"> <li>Proper signals between operators and crews.</li> <li>No personnel to work underneath the hoisted cage, exclusion zones, barricades or spotters to be used to maintain a clear lift area.</li> <li>Use tag line to stable the cage.</li> <li>Avoid working in strong winds.</li> </ul>	1	4	4	
	Loose objects falling from cage at height.	4	5	20	<ul style="list-style-type: none"> <li>Visual check of cage, weld the loose bars.</li> <li>Remove all hand tools.</li> </ul>	1	4	4	
Lowering cage into trench / pile bore	Trapping of body parts / pinch and crush injuries.	3	4	12	<ul style="list-style-type: none"> <li>Keep all body parts clear of cage while it is being lowered.</li> <li>Correct manual handling procedures.</li> <li>Use appropriate PPE.</li> </ul>	1	3	3	All
	Slips, trips and falls.	4	4	16	<ul style="list-style-type: none"> <li>Make sure guide walls / area around casings are clear of debris, tools and materials</li> <li>Clear signals/communication between operator and crews.</li> </ul>	1	3	3	

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Subscope C – Handling and Installation and Reinforcement Cages									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Loose objects falling from cage.	4	5	20	<ul style="list-style-type: none"> <li>Use exclusion zones, barricades and spotters</li> </ul>	1	4	4	
Splicing cages together	Trapping of body parts/pinch and crush injuries.	3	5	20	<ul style="list-style-type: none"> <li>Keep all body parts clear of cage as much as possible during splicing.</li> <li>Correct manual handling procedures.</li> <li>Work platform to be clear of unnecessary tools and materials.</li> </ul>	1	3	3	Welder All
	Slips, trips and falls.	4	4	16	<ul style="list-style-type: none"> <li>Clear signals/communication between operator and crews.</li> <li>Use exclusion zones, barricades and spotters.</li> </ul>	1	3	3	
	Loose objects falling from cage	4	5	20	<ul style="list-style-type: none"> <li>Ensure splice is adequately U-bolted or welded before continuing.</li> </ul>	1	4	4	
	Cuts and abrasions.	3	3	9	<ul style="list-style-type: none"> <li>Use appropriate PPE.</li> <li>To follow the safe welding procedures.</li> </ul>	2	2	4	





Subscope D – Installation and use of Tremie Pipes for Concreting									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Supervisor to brief all staff on safe work procedures	Misunderstanding / communication breakdown	2	4	8	<ul style="list-style-type: none"> <li>Ensure correct and up to date information has been passed to all staff prior to work commencing.</li> <li>Use competent, ticketed operator and other personnel.</li> <li>Operator to undergo familiarisation training.</li> </ul>	1	4	4	Supervisor Operator
Supervisor to brief all staff on safe work procedures	Misunderstanding/ communication breakdown	4	4	16	<ul style="list-style-type: none"> <li>Ensure correct and up to date information has been passed to all staff prior to work commencing.</li> <li>Use competent, licence operator</li> <li>Operator to undergo familiarisation training.</li> </ul>	1	4	4	Supervisor Operator
Preparation to commence operations	Suitability of working platform	4	4	16	<ul style="list-style-type: none"> <li>Properly designed and installed working platform based on crane loadings.</li> <li>Area fenced and signed.</li> <li>Signed off platform certificate prior to commencement of works.</li> <li>Visual inspection and monitoring of the platform daily to ensure integrity of platform is maintained throughout lifting operations.</li> </ul>	1	4	4	Supervisor Operator
Lifting and moving of tremie rack / pipes	Swinging of load causing injury to personnel	4	4	16	<ul style="list-style-type: none"> <li>Use the proper lifting points and the correct lifting gear and tag lines.</li> <li>Ensure the correct lifting cap is used.</li> <li>Ensure the steel cable is fitted correctly between tremie sections</li> </ul>	1	4	4	Operator Signalman All
	Tremie sections falling while moving or tremie striking plant or other equipment.	4	5	20	<ul style="list-style-type: none"> <li>Avoid working in strong winds.</li> <li>Exclusion zones, signage, spotters.</li> <li>Experienced piling labourers are the only personnel to assemble tremie strings</li> </ul>	1	4	4	

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Subscope D – Installation and use of Tremie Pipes for Concreting									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
	Pinch and crush injuries.	3	4	12	<ul style="list-style-type: none"> <li>Keep all body parts clear of catch points and crush points.</li> </ul>	1	3	3	
Connection/disc onnection of tremie sections on the rack or over the excavation	Working at height.	4	4	16	<ul style="list-style-type: none"> <li>Tremie rack must be on firm and level ground.</li> <li>Personnel must work within the edge protection while on rack.</li> <li>Rack platform to be kept clean and free of mud and bentonite, grease etc.</li> </ul>	1	3	3	Operator Signalman All
	Slip on the rack platform.	3	4	12	<ul style="list-style-type: none"> <li>Use PPE (gloves) and make sure you don't put your hands in between a tremie and the rack. Keep hands clear of joint while joining strings.</li> <li>Use tremie fork correctly.</li> </ul>	2	3	6	
	Pinch / crush injuries	3	4	12	<ul style="list-style-type: none"> <li>Personnel must use the lifting lug to move the string.</li> </ul>	1	3	3	
Working next to trench / pile bore	Slipping into trench/bore/cage	4	5	20	<ul style="list-style-type: none"> <li>Using platform to cover the trench during concrete casting</li> <li>Use gloves while handling the platforms.</li> </ul>	1	4	4	All
	Slips trips and falls	3	4	12	<ul style="list-style-type: none"> <li>Clean the loose material, bentonite, mud, etc off the guide wall / platform / casing.</li> </ul>	1	3	3	
Pouring concrete	Crush injuries between concrete truck and other plant.	4	4	16	<ul style="list-style-type: none"> <li>Proper and clear signal to operator if necessary by radio.</li> <li>Spotter to make sure work area is clear and has stable solid footing.</li> <li>No personnel behind concrete truck while truck reversing.</li> <li>Minimise reversing as much as possible.</li> </ul>	1	4	4	All
	Concrete splash.	3	3	9	<ul style="list-style-type: none"> <li>Signage and barricades to delineate exclusion zone to ensure that there is no unauthorised access to working areas.</li> <li>Ensure fingers are not caught between chutes when chutes are opened.</li> </ul>	2	3	6	

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Subscope D – Installation and use of Tremie Pipes for Concreting									
Task Description	Hazard	Risk Rating			Control	Residual Risk			Action
		L	C	R		L	C	R	
Washing off tremie pipes	Crushing.	3	4	12	<ul style="list-style-type: none"> <li>Experienced personnel to carry out works.</li> <li>Clear communication between the operator and persons operating the water blaster.</li> </ul>	1	3	3	Operator Washer
Withdrawing of the cutter out of the trench	Danger of falling rocks!	4	5	20	<ul style="list-style-type: none"> <li>Clean the cutter and hose belts every time they are withdrawn from the trench.</li> </ul>	1	3	3	Operator Banksman Washer



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PROJECT – WOODSMITH MINE

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Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX C – BAUER H&S POLICY***

## Staying Safe & Healthy

Bauer Technologies is committed to ensuring the safety and health of our employees is not affected by the work they do. In order to ensure this we have implemented the following policies:

- Working Safely
- Working Hours
- Drugs and Alcohol
- Driving Safely



## Policy Booklet

### Drugs & Alcohol

We are committed to a healthy & safe working environment for our people. Accordingly the consumption or sale of alcohol or drugs at our places of work is prohibited. In order to ensure that everyone is aware of the acceptable standards and to ensure employees are treated in a fair and consistent manner we have put in place the following policy.

Employees should:

- Not present themselves for work if, due to alcohol or drugs, they are unfit,
- Not present themselves for work if they have just consumed or taken drink or drugs.
- Not be in possession of drink or drugs in the workplace (this includes in any company vehicles).
- Not consume or take drink or drugs whilst at work

If employees are on prescribed medication or are taking medicines that may make them drowsy, e.g. cold cures, Solpadine, hay fever remedies, etc. they should advise their Doctor to seek alternatives AND report the fact to the Health & Safety Manager who can check the possible effects of any medicines using the 'Chemist on Call' service provided by Healthcare Connections.

If employees are considered unfit for work then we have a legal duty to test their blood, urine or breath for drink or drugs.

For the purpose of 'general' works the drink drive limits will be adopted as the limits for detection of testing unless the work is classified as safety critical (e.g. when working on Network Rail infrastructure or similar) in which case the limits shall be:

- More than 29 milligrams per 100ml of blood;
- More than 13 micrograms of alcohol in 100ml of breath; or
- More than 39 milligrams of alcohol in 100ml of urine.

Any traces of illegal drugs, such as Cannabis, Cocaine, Amphetamines, Barbiturates, Methadone's etc. found will be deemed a positive test result.

If an employee is taking any medication they must declare this at the time of testing. If laboratory analysis reveals the presence of prohibited substances consistent with a therapeutic dosage of undeclared medication the employee will be interviewed to establish the reason for non-declaration. If the Medical Officer is satisfied a 'negative' result may be given. If the Medical Officer is not satisfied this will be recorded as a No Result and the employee must be re-tested immediately and will not be allowed to work until a negative (pass) result is achieved.

Any employee who is tested and is identified as positive for alcohol or drugs shall be subject to disciplinary action. A refusal to submit to test shall be subject to the same disciplinary action as a positive result.

All employees who hold PTS certification or are holders of Safety Critical Work posts should be aware that while working on Network Rail Managed Infrastructure, additional legislation is applicable to them and their work. In particular the Transport and Works Act 1992 Part 2 Section 27 specifically notes the need for employees to be free from the effects of Alcohol and Drugs. The requirements of Network Rail Company Standard **NR/L1/OHS/051** applies. If proved positive the individual's NCCA card will be removed and they will be immediately suspended, removed from the Contract and possibly the Company and reported to NCCA & Network Rail. Testing will be carried out by Link-Up approved medical providers.

The Company will not victimise employees who admit to having a drink or drug related problem if they approach the Company for help and are prepared to undergo an agreed form of treatment. We offer to assist any employee who voluntarily declares an alcohol or drug related problem. This will include confidential support and guidance to employees and their families. If you have or think that you may be developing an alcohol or drug related problem



## Policy Booklet

then you must advise the Managing Director immediately so that the help procedures can be applied. Disclosure or discovery of a problem prompted by a positive test result or an impending test is not acceptable.

All employees are strongly advised to leave 12 hours between drinking and commencing a shift. Don't forget to take into account any on-call, weekend or night shift work. Unannounced drug & alcohol testing will be carried out annually on a random selection of staff and operatives and our sub-contractors on a no-notice basis.

All new employees (and those existing employees who wish to start work on Network Rail Managed Infrastructure) will be required to undertake full screening for drugs and alcohol before employment. We will not knowingly employ people who are either recreational or habitual users of drugs.

For-cause screening will be carried out with no notice if there are reasonable grounds to suspect that an individual is under the influence of alcohol or drugs, or if their behavior prompts it, or if there has been an incident or accident in the work area.

Many of our clients also have a policy of unannounced screening for which no notice will be given.

Martin Blower  
Managing Director  
January 2015



## Policy Booklet

### Working Hours

In order to safeguard our employees and ensure they can work safely in accordance with procedures we have implemented the following policy in relation to the hours which our employees work.

- No person shall work more than 13 consecutive turns of duty
- No person shall spend more than 72 hours at the workplace in any consecutive 7 day period.
- No turn of duty shall be rostered to consist of more than 12 hours at the workplace
- The minimum time away from the workplace between turns of duty shall be 12 hours except that a short break of 8 hours between shifts is permitted: -
  - When changing turns at weekends or
  - When there are short breaks between no more than 2 consecutive shifts
- The maximum permitted traveling time is limited such that the total time of travel plus planned shift length does not exceed 14 hours. In any case travelling time prior to the start of the shift must not exceed 3 hours.

Note: the 'time' at the workplace does not include traveling time incurred by relief staff, redundancy traveling time, or 'wash up' or 'handover' time incurred by staff in some functions. The workplace means the site of work or it's booking on point.

Where staff are called out after completing a normal day of duty then providing the call out ends before 22:30 hours with at least 9 hours rest after call out then this will not prevent the individual from taking up their normal day turn at the normal booking on time. It is not expected that these circumstances should apply more than twice during a week.

Changes to working time patterns which introduce a need to work outside of the stated limits must be subjected to a formal risk assessment. Consultation with the staff affected by the change allows an opportunity for fatigue to be discussed.

#### DISPENSATION FROM LIMITS

The above limits will be observed in all cases. It is recognised however that in exceptional circumstances where owing to adverse weather, emergency, equipment failure, accident or other incident, extended working exceeding these limits may be necessary in order to avoid or reduce risk to people or significant disruption to services and it is not reasonably practicable to make alternative arrangements.

If any of the above circumstances occur the Supervisor will inform the Construction Manager and the Project Manager and complete an incident form detailing the circumstance. Where required the shift supervisor will ensure that all documentation has been completed and copied to the site file.

#### RECORDING

For each job a working hours (timesheet) form will be completed. The form will be completed per shift by the Supervisor and will detail:

- The member of staff
- The total travel time for the day
- The total working time – including any standing time

The form when completed will be returned to the Operations Manager for review, filing and where appropriate collating into a report. The form will be reviewed by the Project Manager, signed off and filed as appropriate. Where required by the Principal Contractor this information will be made available.

Where the records show that members of staff have exceeded the working time regulations this will be recorded





## Policy Booklet

and the data made available for the regular management meetings.

### MONITORING AND REVIEW

In view of the increased risk potential of staff accidents resulting from staff exceeding the working time limits it is necessary, as part of the monitoring process for the management to review the working hour reports. The statistics provided will be reviewed at management meetings and where appropriate regular exceedences are subject to discussion at this meeting.

The requirements of the Working Hour Regulations must be considered when compiling work rotas. The job sheet relating to a particular job is to be signed off in the relevant section to signify it has been reviewed and resourced for Working Hour Regulations by the Project Manager.

This policy conforms to the Working Time Regulations and Network Rail Standards NR/GN/INI/001 & NR/L2/ERG/003

Martin Blower  
Managing Director  
January 2015



## Policy Booklet

### Driving for Work

Driving is one of the most hazardous activities which many of us undertake on a daily basis. A Company Car Handbook is provided to all employees who have access to a company car. However over and above this all employees who drive are required to consider the following points in order to minimise the risk of being involved in an accident.

- Plan your journey to include a 15 minute break approximately every two hours of driving.
- Allow plenty of time for your journey.
- Plan your route well in advance.
- Try to avoid peak hour traffic and areas with heavy traffic congestion where possible.
- Plan your workload carefully & raise any schedule conflicts with your line manager
- Do not undertake unnecessary journeys if there is specific risk of adverse weather conditions.

If you feel tired or drowsy, find a safe place to take a stop and take a break. Feeling tired at the wheel can affect your ability to concentrate, correctly perceive, assess and respond to road hazards and to make safe driving decisions.

It is your responsibility to ensure your car is properly maintained to comply with the manufacturer's recommendations, relevant laws and regulations. You should arrange routine vehicle servicing and carry out routine checks in line with the vehicle manufacturer's recommendations.

It is illegal to use a hand held mobile phone while driving. The definition of a 'hand held phone' will include any electronic device used for accessing oral, text or pictorial communications (including the internet) if the device is hand held during at least part of its operation. The definition of 'holding a phone' does not include operating a phone that is held in a cradle. You will be regarded as 'driving' if the engine is running – even if the vehicle is stationary. The law also states that drivers must have a proper control of their vehicles at all times. You can be prosecuted for careless or inconsiderate driving, or even dangerous driving, if using a phone causes you to drive in this manner.

If you are not an 'essential car user' you will not be expected to take calls when driving, but you will be expected to stop at the most convenient point within your journey and return the call. You must at all times drive with your own and others safety in mind. Essential car users are defined as those who have the use of a company vehicle or receive a car allowance.

Any accident which occurs whilst driving on company business should be reported regardless of whether the vehicle is a company car or not. Driving on company business does not include driving to or from your regular place of work.

You are required to inform your line manager if you have been convicted of a driving offence or banned from driving a vehicle. Failure to do so may lead to disciplinary action.

Martin Blower  
Managing Director  
January 2015





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Page  
No.25

Date: 26.05.2017

Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX D – COSHH ASSESSMENT***

# COSHH Assessment Form



COSHH Assessment Number	BTL 122		
Product/Substance Name(s)	Concrete Ready mix		
Uses	General Construction		
Risks to health	Irritant		
Storage precautions	Store in mixer until required		
Transport precautions	Transported in ready mix trucks Concrete pipes to be inspected before use		
Manual Handling precautions	Not applicable		
Factors which increase risks	Wind can cause dust to be breathed in		
Name, address and telephone number of supplier of substance: Tremco Coupland Road, Hindley Green, Wigan, WN2 4HT			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input checked="" type="checkbox"/>
Skin Contact	<input checked="" type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure	Not applicable		
Personal protective equipment: (state type and when to be worn) Hi Visibility Clothing Gloves Safety Boots Hard Hat Overalls General purpose safety glasses (EN166 F)			
<b>EMERGENCY ACTIONS</b>			
Emergency action: first aid	On skin =wash off and flush with clean water Eyes =purge with eye wash for min 15 mins If irritation occurs seek medical advice		
Emergency action: fire	Non combustible		
Emergency action: spillage	Do not allow into water courses or drains		
Disposal precautions:	Dispose of as general construction waste		
Emergency action: contact person	R. Ayres =		
Authorized by		Date approved	23/08/12

# COSHH Assessment Form



COSHH Assessment Number	BTL 107		
Product/Substance Name(s)	Diesel oil		
Uses	Fuel oil		
Risks to health	Irritant Harmful Toxic		
Storage precautions	Store in double bunded diesel containers		
Transport precautions	Transport in double bunded bowsers		
Manual Handling precautions	None moved in double bunded containers		
Factors which increase risks	Mixing with other substances		
Name, address and telephone number of supplier of substance: Murco Petroleum Ltd St Albans			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input checked="" type="checkbox"/>
Skin Contact	<input checked="" type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input checked="" type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure	Drowsiness and dizziness		
Personal protective equipment: (state type and when to be worn) Gloves Safety Boots Overalls General purpose safety glasses (EN166 F) Hard Hat Hi Visibility Clothing			
<b>EMERGENCY ACTIONS</b>			
Emergency action: first aid	Eyes <wash out Skin <wash with soap and water Ingestion <DO NOT INDUCE VOMITING. seek medical advice Inhalation <remove to fresh air seek medical advice		
Emergency action: fire	Carbon dioxide, dry powder or foam		
Emergency action: spillage	Spillage will be limited due to less than 5 litres held Contain spillage, do not allow into water course Treat as environmental spillage		
Disposal precautions:	Via licenced waste remover		
Emergency action: contact person	R. Ayres – HSEQ Systems Manager		
Authorized by		Date approved	23/08/12









# COSHH Assessment Form



COSHH Assessment Number	BTL 108		
Product/Substance Name(s)	WD40		
Uses	Anti squeak, moisture repellent, releasing agent		
Risks to health	Irritant		
Storage precautions	Store in containers provided		
Transport precautions	Transport in containers provided		
Manual Handling precautions	None when used in aerosol containers		
Factors which increase risks	Mixing with other substances		
Name, address and telephone number of supplier of substance: WD40 Company Milton Keynes			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input checked="" type="checkbox"/>
Skin Contact	<input checked="" type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input checked="" type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure	Drowsiness, headache, nausea and dizziness		
Personal protective equipment: (state type and when to be worn) Gloves Safety Boots Overalls General purpose safety glasses (EN166 F) Hard Hat Hi Visibility Clothing			
<b>EMERGENCY ACTIONS</b>			
Emergency action: first aid	Eyes ?wash out Skin ?wash with soap and water Ingestion ?DO NOT INDUCE VOMITING. seek medical advice Inhalation ?remove to fresh air seek medical advice		
Emergency action: fire	Foam, water spray, dry chemicals, sand		
Emergency action: spillage	Contain spillage, do not allow into water course Treat as environmental spillage		
Disposal precautions:	Via licenced waste remover		
Emergency action: contact person	R. Ayres ?		
	Authorized by	R. Ayres	Date approved 17.06.13

# COSHH Assessment Form



COSHH Assessment Number	BTL 136		
Product/Substance Name(s)	Lithium Grease		
Uses	Lubricating grease		
Risks to health: <input type="checkbox"/> Flammable  <input checked="" type="checkbox"/> Harmful  <input type="checkbox"/> Biohazard  <input type="checkbox"/> Corrosive  <input type="checkbox"/> Oxidising  <input type="checkbox"/> Toxic  <input checked="" type="checkbox"/> Environmental  <input checked="" type="checkbox"/> Irritant 			
Storage precautions	Store away from strong oxidizing agents and elevated temperature. Keep container tightly closed		
Transport precautions	Not classified as dangerous for transport		
Manual Handling precautions	As per standard manual handling procedures		
Factors which increase risks	Avoid extreme heat, strong oxidizers and sources of ignition		
Name, address and telephone number of supplier of substance:			
Solent Lubricants, Osbourne Works, Leicester, England, LE18 1AT, +			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input checked="" type="checkbox"/>
Skin Contact	<input checked="" type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input checked="" type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure	Mild inflammation and irritation of skin		
Personal protective equipment: (state type and when to be worn)			
<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Hi Visibility Clothing <input checked="" type="checkbox"/> Safety Boots <input checked="" type="checkbox"/> Overalls <input checked="" type="checkbox"/> Gloves <input checked="" type="checkbox"/> Safety Goggles			
Notes:			

## EMERGENCY ACTIONS

# COSHH Assessment Form











Emergency action: first aid	Eye Contact AFlush eyes with water. Skin Contact AIf burned by hot material, cool skin with large amounts of water. Wash exposed skin with mild soap and water. Ingestion ARinse out mouth with water but DO NOT induce vomiting.
Emergency action: fire	Use dry chemical, foam, CO2 or water fog extinguishers. Combustion may cause toxic gases to be released.
Emergency action: spillage	Absorb spilt material with earth, sand etc and place in waste containers. Prevent area into waterways.
Disposal precautions:	Disposal in line with local regulations for hazardous material.
Emergency action: contact person	R. Ayres – HSEQ Manager Tel:

<b>Authorized by</b>		<b>Date approved</b>	15 <sup>th</sup> July 2013
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# COSHH Assessment Form











COSHH Assessment Number	BTL 114		
Product/Substance Name(s)	Bentonite Clay		
Uses	Stabiliser when constructing diaphragm walls or drilling large diameter piles		
Risks to health:	<input type="checkbox"/> Flammable  <input type="checkbox"/> Harmful  <input type="checkbox"/> Biohazard  <input type="checkbox"/> Corrosive  <input type="checkbox"/> Oxidising  <input type="checkbox"/> Toxic  <input type="checkbox"/> Environmental  <input checked="" type="checkbox"/> Irritant 		
Storage precautions	Store in dry conditions – slippery when wet		
Transport precautions	Classified as not dangerous. Transport in packaging supplied. Avoid dust creation		
Manual Handling precautions	As per standard manual handling procedures		
Factors which increase risks	Use in well ventilated areas and do not breath for long periods. Product becomes slippery when wet, do not allow to spill onto floor or footpath		
Name, address and telephone number of supplier of substance:			
Tolsa UK Ltd, Westcarr Road, Retford, Nottinghamshire, DN22 7ZF,			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input checked="" type="checkbox"/>
Skin Contact	<input type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input checked="" type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure	No short term toxicology issues. Long term may cause fibrosis or silicosis if exposure is long term and over the WEL		
Personal protective equipment: (state type and when to be worn)			
<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Hi Visibility Clothing <input checked="" type="checkbox"/> Safety Boots <input checked="" type="checkbox"/> Overalls <input checked="" type="checkbox"/> Gloves <input checked="" type="checkbox"/> Safety Goggles			
Notes: Wear dust mask when handling material			

EMERGENCY ACTIONS	
Emergency action: first aid	Skin and eye contact – wash out with clean water. Inhalation – move to fresh air. Ingestion – drink several glasses of milk or water. If symptoms persist seek medical help.
Emergency action: fire	No flammable but beware becomes very slippery when wet.
Emergency action: spillage	Sweep up if in powder form, if wet mix with absorbent material, collect up and dispose of as non-toxic waste
Disposal precautions:	Dispose of in accordance with local and national regulations using an approved disposal contractor.
Emergency action: contact person	R. Ayres – HSEQ Manager Tel:

<b>Authorized by</b>		<b>Date approved</b>	15 <sup>th</sup> July 2013
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# COSHH Assessment Form



COSHH Assessment Number	BTL 126		
Product/Substance Name(s)	Bentocryl 86		
Uses	Absorbing medium for technical applications		
Risks to health: <input type="checkbox"/> Flammable  <input type="checkbox"/> Harmful  <input type="checkbox"/> Biohazard  <input type="checkbox"/> Corrosive  <input type="checkbox"/> Oxidising  <input type="checkbox"/> Toxic  <input checked="" type="checkbox"/> Environmental  <input checked="" type="checkbox"/> Irritant 			
Storage precautions	Store between 5-35C (perishable if frozen). Keep tightly closed in a dry and cool place.		
Transport precautions	Not classified as dangerous for transport		
Manual Handling precautions	As per standard manual handling procedures		
Factors which increase risks	Addition of carbon monoxide		
Name, address and telephone number of supplier of substance: Süd-Chemie (UK) Ltd, 3 Drake Mews, Gadbrook Park, Northwich, Cheshire, CW9 7XF,			
<b>HARMFUL EXPOSURE ROUTES (tick relevant options)</b>			
Eye Contact	<input checked="" type="checkbox"/>	Ingestion	<input type="checkbox"/>
Skin Contact	<input checked="" type="checkbox"/>	Skin Absorption	<input type="checkbox"/>
Inhalation	<input checked="" type="checkbox"/>	Injection / sharps	<input type="checkbox"/>
Symptoms of over exposure			
Personal protective equipment: (state type and when to be worn) <input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Hi Visibility Clothing <input checked="" type="checkbox"/> Safety Boots <input checked="" type="checkbox"/> Overalls <input checked="" type="checkbox"/> Gloves <input checked="" type="checkbox"/> Safety Goggles Notes: Chemical resistant protective gloves			

# COSHH Assessment Form



EMERGENCY ACTIONS	
Emergency action: first aid	Eye Contact - Rinse immediately with plenty of water for approx 15 mins. Skin Contact - Wash off with soap and plenty of water. Inhalation - call a physician immediately.
Emergency action: fire	Standard procedure for chemical fires - water spray, CO2, dry powder, foam, water. Do NOT use a solid water stream as it may scatter and spread the fire.
Emergency action: spillage	Soak up with inert absorbent material (e.g. sand, silica gel, universal binder, sawdust). Beware of sliding risk when product in connection with water.
Disposal precautions:	Dispose collected material in accordance to prescription. Empty containers can be re-used after emptying and cleaning.
Emergency action: contact person	R. Ayres – HSEQ Manager Tel:

<b>Authorized by</b>		<b>Date approved</b>	15 <sup>th</sup> July 2013
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No.26

Date: 26.05.2017

Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX E – PLANT REGISTER***



**NORTH YORKSHIRE POLYHALITE PROJECT - DIAPHRAGM WALL WORKS**

**Plant register (environmental)**

Author: JAG  
 Update: 26-May-17  
 Stage: Pre-construction phase

Notes: The listed plant is indicative and may change due to operational requirements and available types of equipment at the time of construction.  
 The shown durations are indicative / based on the latest time schedule and may change.

Construction phase	Activity ID	Activity	Location	Plant	Numbers	Type	Sound power level LWA [db(A)]	Sound pressure level LpA [db(A)]	Power rating [kW]	% on-time	Start	Finish	24 hour working	Comments
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	D-wall cutter base crane	1	Bauer MC 128	117	80	709	70	July 2017	August 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	D-wall cutter base crane	2	Bauer MC 96	112	80	570	70	July 2017	August 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Crawler crane, 90t	2	Kobelco CKE900G or similar	110	80	213	50	July 2017	August 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Crawler crane, 160t	2	Liebherr LR1160 or similar	105	70	230	50	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Mobile crane, 110t	1	Liebherr LTM 1100 or similar	110	80	350	70	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Desander (incl.) desilter	4	MAT BE 250	104	84	59	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Desander (incl.) desilter	2	MAT BE 275	92	72	73	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Decanter	3	BD 90	88	78	115	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Slurry pumps	12	Various	85	80	25	90	July 2017	March 2018	Yes	Estimated average values
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Dry silo	3	Euromix 20t	n/a	n/a	2	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Slurry Tank	8	500m3 Bauer silo	n/a	n/a	5	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Slurry mixer	3	SK 11/15	n/a	n/a	30	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Screw feed	3	Bauer	n/a	n/a	8	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Water tank	3	MAT, 3m3	n/a	n/a	3	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Slurry agitation tank	3	MAT, 3m3	n/a	n/a	3	90	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	MEWPs	3	Z45D or similar	85	80	36	25	July 2017	March 2018	Yes	
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Delivery Lorries	Estimated: 25 per day	various: 20' rigid, 45' artic, low loaders	85	80	150	25	July 2017	March 2018	Yes	Estimated average values
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Welding set	3	Miller	82	70	35	50	July 2017	March 2018	Yes	Estimated average values
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Compressor	2	2 tool	80	70	35	25	July 2017	March 2018	Yes	Estimated average values
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Jet wash	3	With water bowser	80	70	35	25	July 2017	March 2018	Yes	Estimated average values
Diaphragm wall construction	D-WALL	Construction of diaphragm walls	Entire work area	Small plant and hand tools	Various	Various	Various	Various	Various	Various	July 2017	March 2018	Yes	Estimated average values



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No.27

Date: 26.05.2017

Contract Title: NORTH YORKSHIRE POLYHALITE  
PROJECT – WOODSMITH MINE

Made By:  
JAG

Checked by:  
NT

Work Scope: Installation of diaphragm walls

## ***APPENDIX F – PERSONNEL HISTOGRAM***



**NORTH YORKSHIRE POLYHALITE PROJECT - GUIDE WALL AND DIAPHRAGM WALL WORKS**

**Personnel histogram**

Author: JAG  
 Update: 16-May-17  
 Stage: Pre-construction phase

Notes: *The listed numbers are indicative and may change due to operational requirements and final construction programme.  
 Percentage of local labour is likely to be <5% as the availability of local skilled diaphragm wall operatives is very limited  
 Day shift working hours: 07am - 07pm, start Monday morning at 07am.  
 Night shift working hours: 07pm - 07am, finish Saturday morning at 07am.  
 If instructed, diaphragm wall construction working hours may be extended to 24/7 working.*

Construction phase	Activity ID	Month	Site Management (DAYSHIFT)	Site Management (NIGHTSHIFT)	Site Operatives (DAYSHIFT)	Site Operatives (NIGHTSHIFT)	Suppliers / subcontractors (DAYSHIFT)	Suppliers / subcontractors (NIGHTSHIFT)	Total (DAYSHIFT)	Total (NIGHTSHIFT)	TOTAL
Mobilisation	MOB	Jul-17	6	4	15	15	15	0	36	19	55
Diaphragm wall construction	D-WALL	Aug-17	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Sep-17	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Oct-17	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Nov-17	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Dec-17	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Jan-18	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Feb-18	10	4	35	35	2	2	47	41	88
Diaphragm wall construction	D-WALL	Mar-18	10	4	35	35	2	2	47	41	88

# NORTH YORKSHIRE POLYHALITE PROJECT

## Personnel histogram - BAUER

