

APPENDIX B

AMC UK ENVIRONMENTAL MANAGEMENT PLAN (EMP)

May 2017

Environmental Management Plan (EMP)
Woodsmith Mine Site

Contractor: AMC UK

Client: Sirius Minerals PLC

AMC UK Contract Number: RPA-127

Scheme: Phase 4 – Diaphragm Wall
Construction

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	Name	Role	Signature	Date
Prepared by	Hugh Medcalf	HSE Advisor		25/05/17
Reviewed by	-	Engineering		25/05/17
Approved by	Jonathan White	Operations Director		25/05/17

Employer Acceptance

	Name	Role	Signature	Date
Checked by				
Accepted by				

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1.0 INTRODUCTION

1.1 Terms of Reference

This Environmental Management Plan (EMP) has been prepared by Associated Mining Construction UK (AMC UK) to provide a stand-alone management framework for dealing with environmental matters and performance during construction activities relating to the new mine surface development at Woodsmith Mine (Off B1416), Sneatonthorpe, North Yorkshire, YO22 5HZ, (hereafter referred to as 'the Site').

1.2 Project Description

Sirius Minerals PLC (the Client and mine operator) is developing a new mine, which is located 3.5 km south of Whitby, in North Yorkshire.

The mine will comprise deep shafts and lateral workings for the extraction of polyhalite. The ore will be transferred via an underground mine transport system to a materials handling facility for processing, before subsequent export from a new harbour facility on the River Tees, some 37 km to the north-west of the Site.

A full and detailed description of the project can be found in the Environmental Statement.

1.3 Scope of Environmental Management Plan

The purpose of the EMP is to set out a framework for managing activities that have potential to give rise to environmental risks or impacts during construction works. The EMP is intended to cover the Phase 4 Construction Activities only, which include the following:

- Operation of the concrete batch plant;
- Installation, commissioning and operation of the bentonite plant and associated temporary structures;
- Installation of concrete guide walls (excavate to -3.5m and concrete wall down to -1.5 to -1.75 m);
- Mobilisation to site of diaphragm walling equipment (cutters, cranes, workshops etc.); and
- Diaphragm wall construction to -60m below ground level at the Production, Service and Mineral Transport System shafts.

Site Layout for Phase 4 Construction Activities is shown on Drawing 40-ARI-WS-71-CI-DR-1081 in Appendix A.

The EMP is a dynamic document and should be reviewed and updated at regular intervals to ensure that it remains relevant in the context of activities being undertaken on Site.

This report should be read in conjunction with the following Phase 4 documents:

- Construction Environment Management Plan (CEMP)
- Project Management Plan (PMP)
- Project Quality Plan (PQP)
- Construction Phase Health and Safety Plan (CPHSP)

1.4 Programme of Works

The proposed start date for Phase 4 Construction activities is July 2017 with the works anticipated to be completed in March 2018.

2.0 ENVIRONMENTAL MANAGEMENT FRAMEWORK

2.1 Environmental Policy

AMC UK is committed to the protection of the environment and to ensuring that its operations and personnel create no significant impact to the environment. AMC UK supports the commitments of the Client's own Environmental Policy (Doc. 00-AMC-HS-PO-0003, dated March 2017), which sets out the Vision of 'Zero Harm' by 'minimising environmental impact through the planning construction and operation of our assets'.

By following AMC UK's Environmental Policy, procedures and regulatory standards, as well as maintaining due diligence, then this Vision can be accomplished.

In accordance with this Policy, the project will be planned and implemented with strict adherence to relevant regulatory requirements, guidelines and standards. Employees and sub-contractors at every level are accountable and responsible for ensuring all standards are met.

A copy of the AMC UK Environmental Policy is included in Appendix B.

2.2 Sustainability Policy

AMC UK recognises that mining construction has the potential to change and sometimes transform local environmental and social conditions. AMC UK will aim to minimise the effects of its operations on the environment, actively support the sustainability of local communities and provide a safe workplace for all persons associated with its operations.

AMC UK is committed to embedding the following sustainable development principles throughout these works:

- Respecting the environment, resources and biodiversity of the area and ensuring that processes and practices are technically appropriate and environmentally and socially responsible;
- Identifying and addressing the diverse needs of people affected by, and within, our operations and promoting wellbeing, social cohesion and equal opportunity. Upholding fundamental human rights and respecting cultures, customs and values;
- Creating sustainable economies both for our shareholders and those affected by our operations, delivering sustainable profitable growth whilst taking responsibility for any environmental and social costs of our operations and ensuring efficient use of resources;
- Providing good governance by implementing effective systems of ethical governance and integrating sustainable development considerations within the corporate decision-making process;
- Ensuring continual improvement of our health and safety and environmental performance, and working with partners and suppliers who have made a commitment to continuous improvement of their own sustainability development performance; and
- Managing our projects in a sustainable manner, using resources efficiently, protecting and enhancing the environment in which we work and reducing our impacts.

A copy of the AMC UK Sustainability Policy is included in Appendix B.

2.3 Environmental Aspects and Impacts Assessment

The principal environmental objective of AMC UK is to continually improve its environmental performance to prevent or minimise pollution, minimise waste and to conform to environmental legislation, regulations and Company Policies and Procedures.

AMC UK will ensure all activities undertaken on site will be subject to an Environmental Aspects and Impacts Assessment (EAIA). The EAIA will be prepared with regard to the information in the CEMP and all other relevant documents. These will:

- Identify any significant environmental impacts that can be anticipated;

- Assess the risks from these impacts;
- Identify control measures to mitigate the risk; and
- Report any unacceptable residual risk such that changes can be implemented to reduce the risk to an acceptable level.

The findings of each EIA and, in particular, the necessary controls to reduce risk, will be incorporated into the scheme RAMS (Risk Assessment Method Statement) and 'Daily Pre Shift Briefings', as required. These documents shall be briefed to all site operatives involved in the works prior to the commencement of activities on site. Daily Pre Shift Briefings shall be used to target environmental issues of particular significance at relevant times throughout the works.

Should any aspect of the scheme change, the EIA will be updated accordingly.

2.4 Environmental Objectives

AMC UK has defined a series of environmental objectives for the project, based on the Environmental and Sustainability Policy commitments. These are set out as follows:

- Minimise significant adverse environmental impacts from construction particularly in regard to noise and vibration, air quality, water quality, and storage and handling of hazardous materials;
- Prevent unnecessary consumption of energy, fuel and water supplies where possible;
- Minimise waste production from all activities;
- Minimise disruption to residents, land owners and other neighbours by acting in a socially responsible manner; and
- Improve management of environmental issues across the project.

2.5 Environmental Targets

AMC UK has defined its Environmental Targets for the project based on the Environmental Objectives defined in Section 2.4. These are included below:

- Design, implement and maintain a programme for monitoring and minimising the impact of construction processes on local receptors, including noise and vibration, air quality, water quality, and storage and handling of hazardous materials;
- Monitor energy and water use across Site and undertake a review of water use efficiency following six months of operations;
- Implement and maintain the construction Site Waste Management Plan (SWMP) including measures that follow the waste hierarchy – reduce, re-use, recycle. Undertake review of the SWMP on a six-month basis;
- Review relevant processes/procedures following receipt of justifiable complaint(s) and make appropriate operational changes. Document all complaints and corrective actions undertaken; and
- Hold two environmental protection awareness raising events for all workers per year.

Relevant monitoring programmes and record keeping will be implemented by the Environmental Manager and reviewed with the Package Manager(s) and Health and Safety Manager. Progress against these targets will be reviewed monthly by the Environmental Manager and reported in the environmental review meetings.

3.0 LEGISLATION, REGULATIONS, GUIDANCE AND CONSENTS

3.1 Legislation, Regulations and Guidance

AMC UK will comply with relevant environmental legislation in implementing the construction works. This will include, but may not be limited to the following.

3.1.1 Primary Legislation (Acts or Orders)

Primary legislative requirements include:

- Town and Country Planning Act 1990;
- Environmental Protection Act 1990;
- Environment Act 1995;
- Control of Pollution Act 1974;
- Clean Air Act 1993;
- Water Resources Act 1991;
- Water Act 2004;
- Land Drainage Act 1991;
- Traffic Management Act 2004;
- Clean Neighbourhoods & Environment Act 2005; and
- The Wildlife and Countryside Act 1981.

3.1.2 Subordinate Legislation (Regulations)

Subordinate legislative requirements include:

- Waste (England and Wales) Regulations 2011;
- Site Waste Management Plans Regulations 2008;
- Control of Pollution (Oil Storage) (England) Regulations 2001;
- Control of Substances Hazardous to Health (COSHH) Regulations 2002;
- Control of Noise at Work Regulations 2005;
- Control of Asbestos Regulations 2012;
- Environmental Damage Regulations 2015; and
- Environmental Permitting (England and Wales) Regulations 2016.

3.1.3 Relevant Guidance

Relevant guidance may include:

- Pollution Prevention Guidelines (PPGs) published by the Environment Agency were withdrawn in December 2015; however, they still form a basis for good operational practice. Relevant PPGs include the following;
 - PPG1 – Understanding your environmental responsibilities;
 - PPG2 – Above ground oil storage tanks;

- PPG4 – Treatment and disposal of sewage where no foul sewer is available;
 - PPG5 – Works and maintenance in or near water;
 - PPG7 – Safe operation of refuelling facilities;
 - PPG21 – Pollution incident response planning; and
 - PPG22 – Dealing with spills.
- Control of water pollution from construction sites - Guidance for consultants and contractors (CIRIA C532);
- Environmental Good Practice – Site Guide (Fourth Edition) (CIRIA C741);

All RAMS prepared as part of the works will have due regard to legislative requirements and published guidance to ensure compliance with regulatory needs.

3.2 Environmental Consents/Permits Register

AMC UK will ensure that all relevant consents and permits are acquired from statutory bodies prior to works commencing. AMC UK will develop and maintain a register of environmental consents required for the construction of the project. The list of consents/permits required for Phase 4 construction activities is set out in Table 1.

Table 1: Relevant Environmental Consents/Permits

Consent Type	Reference No.	Regulatory Authority	Work Package/Duration

The consent/permit requirements will be communicated to all relevant workers through Site Induction, Toolbox talks and training (see Section 5.0) so that there is compliance with the conditions of those consents. Non-compliance will be reported through the Non-Conformance Procedure (see Section 7.0).

4.0 ROLES AND RESPONSIBILITIES

4.1 Organisational Structure

A management structure showing the key roles of those responsible for implementing this EMP is shown in Figure 1.

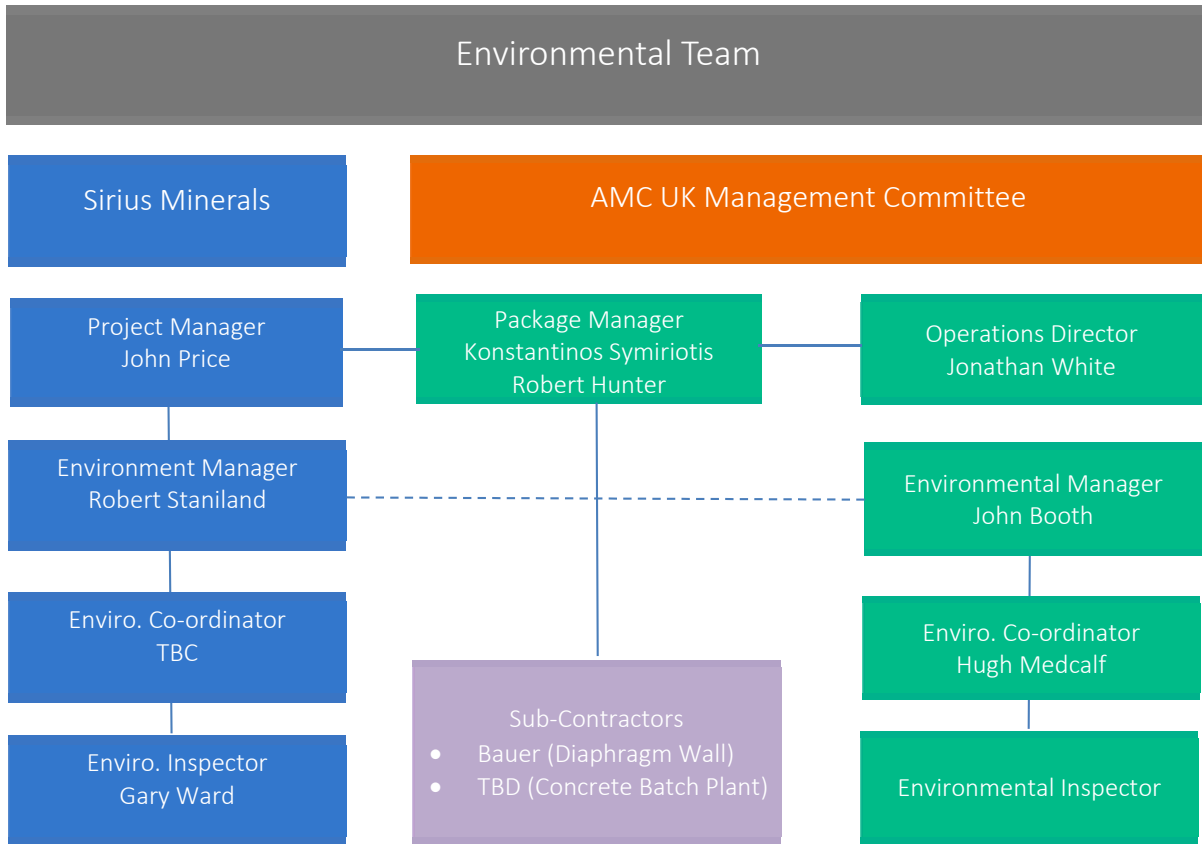


Figure 1: Project Structure and Key Roles

A summary of the roles and responsibilities to be undertaken by both Sirius Minerals and AMC UK are provided in the PMP.

5.0 COMMUNICATION

5.1 Communication with Site Workers and Visitors

The AMC UK Environmental Manager will communicate regularly with workers and visitors to the Site on environmental matters, providing advice and feedback on environmental matters during Site Inductions, routine site inspections and formal audits.

The AMC UK Environmental Manager will, in conjunction with the Project Team, liaise with all workers and provide feedback and guidance on pollution prevention and control; identify areas of good practice that can be shared with co-workers; and make recommendations for improving working practices.

Formal feedback will be provided following all inspections to assess compliance with environmental management and controls. Section 7.0 refers to Monitoring and Compliance.

5.2 Communication with the AMC UK’s Management Team

At the beginning of the works, a specific induction will be given to the AMC UK Package Manager and other members of their Environmental Team by the AMC UK’s Environmental Manager to ensure they have broad appreciation of environmental matters. This training will include a presentation on sites designated for Nature Conservation, protected and invasive species, and an overview of legal requirements (including matters such

as nesting birds). They will also include an overview of environmental permits licences and consents, and the implications of non-compliance or loss of those that apply to the works.

The AMC UK Environmental Manager will hold monthly meetings with the AMC UK's Management Team (including, as a minimum, the Package Manager, Health and Safety Manager) to ensure that current and forthcoming issues are identified, site environmental performance monitoring is discussed, and good practice disseminated. The key findings from these meetings will be communicated formally to the Client's Project Manager and the AMC UK Package Manager as a summary note. These meetings will cover:

- Review environmental performance at the Site over the preceding two week period;
- Identify any trends in performance and discuss reasons for these;
- Consider the need for amendments to the CEMP, PMP, RAMS, Site Waste Management Plan and other relevant documents;
- Propose actions required to mitigate issues that have arisen and/or forthcoming risks; and
- Identify best practice on Site, which can be shared with workers and adopted on other aspects of the project.

The key findings from these meetings will be communicated formally to the Client's Project Manager and Client's Environmental Manager and records maintained on Site.

5.3 Communication with Client's Representatives

The AMC UK Environmental Manager will hold monthly project environmental reviews (two weeks after the AMC UK meeting defined in Section 5.2), attended by the Client's Environmental Manager, with other relevant representatives attending when required. These meetings will:

- Consider the past period performance;
- Review audits and available data from inspections;
- Provide an overview of any environmental monitoring results;
- Plan actions required to mitigate issues that have arisen and/or forthcoming risks; and
- Provide a mechanism to disseminate best practice across the Site.

The information discussed at these meetings will be presented at Site-wide monthly progress meetings, with notes from the meetings being used to prepare the monthly environmental progress report.

5.4 Communication with the Statutory Bodies

When necessary, representatives from Statutory Bodies may be required to attend monthly project environmental review meetings in to address matters of concern to them or for them to provide information on changes to legislative requirements or its interpretation.

Communication with Statutory Bodies in the event of an incident will follow the procedures set out in the Emergency Response and Preparedness Plan (EPPP). A copy of this is included in Appendix C.

5.5 Communication with the Public

AMC UK will adhere to the Sirius Minerals Community Stakeholder and Engagement Framework (CSEF). This framework sets out the approach and rationale to community and stakeholder communications during the construction phase.

The CSEF includes provision for a quarterly Liaison Group Forum in which local elected representatives that are open to members of the public to attend and to receive project updates and exchange feedback, on all project matters, not simply environmental ones. The AMC UK Environmental Manager may attend such meetings as required by the Client.

In addition, there is a 24-hour community helpline (telephone: 0845 543 8964) that can be used by local stakeholders to contact the Client.

A copy of the Community Stakeholder and Engagement Framework is included in the CEMP.

5.6 Complaints Procedure

Where a complaint from the public is received regarding environmental matters it will be handled in accordance with the Client's Complaints Procedure. All complaints, regardless of the source, will be managed through the Client's External Affairs team and will involve AMC UK representatives as appropriate.

Where a complaint from the public is received, it will be immediately logged and all relevant details obtained. The complaint will be investigated and the complainant contacted within five working days to be advised of the findings of the investigation and any mitigation required. All complaints will be acknowledged within 24 hours of receipt of the complaint, and will be closed out within five working days in order to satisfy the complainant.

A copy of the Complaints Procedure is included in the CEMP.

6.0 ENVIRONMENTAL AWARENESS, TRAINING AND COMPETENCY

6.1 Site Inductions

It is important that all individuals involved in the construction phase are aware of the environmental risks associated with their activities and their responsibilities in respect of avoiding environmental damage.

All staff and sub-contractors working on Site will be required to attend a pre-start Site Induction prior to commencing work on site. This will cover the key environmental aspects relating to the project and the roles and responsibilities of individuals.

All staff will be made aware of the key requirements with respect to the EMP and its appropriate implementation. This will include, but not be limited to, the following:

- Environmental Policy (AMC UK and its sub-contractors);
- Roles and Responsibilities;
- Communication;
- Environmental issues;
- Site Waste Management;
- Dust Control and Mitigation;
- Emergency Response and Spill Management; and
- Incident Response and Reporting.

6.2 Toolbox Talks

Environmental Toolbox talks will be undertaken by the AMC UK Environmental Manager or other nominated personnel, throughout the duration of the project. The aim will be to communicate information to all staff and serve to educate, prompt and remind them of their responsibility to protect the environment. These talks will be relevant to the works being undertaken and the risks involved; they will outline pollution incident response procedures.

Toolbox talks will be undertaken when it is identified that there is a specific activity which has inherent environmental issues or potential risks. Attendance at Toolbox talks will be recorded. It is anticipated that each work team will receive at least one environmental-based Toolbox talk per month.

Awareness of environmental issues will be continually reinforced during the project through the use of incident reporting, behavioural based safety awareness, poster campaigns and through Health, Safety, Security and Environmental (HSSE) communications.

6.3 Environmental Training

Where necessary, job and role specific training will be provided by AMC UK to raise an awareness of environmental matters specific to the activity.

6.4 Training Records

Training records will be held by the AMC UK Environmental Manager for all training attended by staff, including formal and informal (e.g. Toolbox talks) training. Records will be maintained in accordance with the applicable policies and procedures.

7.0 PERFORMANCE MONITORING AND REPORTING

7.1 Inspection and Audits

7.1.1 Informal Inspections

The AMC UK Environmental Manager or delegate will be responsible for ensuring compliance with the EMP, RAMS and other environmental controls through daily informal inspections. Such inspections would normally be undertaken by the Site Supervisor and will include Site surveillance and worker observation.

Where substandard conditions or working practices are identified then the responsible parties will implement prompt corrective actions. Any corrective actions will be communicated to the Project Team. Such inspections will not normally be formally documented, except to document that they have been completed.

7.1.2 Formal Inspections

The AMC UK Environmental Manager will undertake formal Site Inspections to identify potential risks, contravention to the EMP and RAMS, good working practice, and any required corrective actions. Such inspections will be planned in advance and may include a number of Project Team representatives. Following the inspection, the team will meet to discuss and agree any required actions, including sharing of good practice.

The AMC UK Environmental Manager will be responsible for ensuring that all corrective actions arising from formal inspections are implemented in an agreed timescale. Such inspections would be documented and records maintained on Site.

7.1.3 Leadership Audits

Formal leadership audits will be undertaken periodically during the works. A timetable for such audits will be agreed with the AMC UK Package Manager and Client's Environmental Manager in advance of works commencing. The following parties may attend Site for the purpose of undertaking an audit:

- AMC UK Senior Management;
- Client;
- Health and Safety Manager or Environmental Manager;
- Approved third party (e.g. regulatory body) (if required); and
- Health & Safety Executive (if required).

The audits will be specific to one or more aspect of the works (e.g. refueling procedure) and will include a review of the procedure in advance of the activity being undertaken; observation of the activity and workers; an inspection of any equipment and/or pollution prevention controls; and interviews with relevant staff.

The audits will determine if the activity is compliant with the procedure and provide feedback (positive or negative) to the relevant workers. Where the activity is not compliant, then a Corrective Action Report will be generated in line with the Non-Compliance Procedure (Section 7.4).

An audit report will be prepared that identifies the following:

- Non-conforming or non-compliance issues;
- Observations;
- Corrective and Preventative Actions; and
- Feedback.

7.2 Inspection Checklists

AMC UK will ensure consistency and transparency in its approach to inspections and audits by using topic related checklists. These include, as a minimum the following:

- Waste management;
- Silt and water management;
- Pollution prevention and controls;
- Noise and air pollution;
- Storage of hazardous materials; and
- Energy, fuel and water consumption.

Copies of AMC UK Inspection Checklists will be available and stored at the site office(s).

7.3 Environmental Monitoring

The AMC UK Environmental Manager will ensure that environmental monitoring, for which AMC UK have responsibility, is undertaken in accordance with relevant Monitoring Plans required under the planning consent or any other consent or permit required to monitor the effects of construction activities.

Monitoring may include recording emissions to air, land, water; rates of consumption of energy, water or fuel; and waste generation.

7.4 Reporting Environmental Performance

The findings of routine inspections and formal audits will be recorded by the AMC UK Environmental Manager and the outcomes disseminated to the Project Team in weekly Progress Reports and monthly Progress Meetings.

The results of any monitoring works will be reviewed by appropriately experienced and competent personnel for compliance with relevant consents and permits. Any breaches in compliance limits will be reported to the AMC UK Environmental Manager.

Monthly Progress Meetings will be used to review the environmental performance of the works and to identify and agree any improvements required. The AMC UK Environmental Manager will be responsible for ensuring that all improvements are implemented and reviewed as required.

Copies of all inspection/audit records, meeting Minutes and other relevant information (e.g. compliance monitoring) will be held on Site throughout the duration of works and made available to third parties e.g. regulatory authorities on request.

7.5 Non-Conformance, Corrective and Preventative Actions

In the event of non-conformance with any issue relating to environmental matters at the Site, the Environmental Manager shall follow the Non-Conformance Procedure set out in the PQP. Such events may include works not being undertaken in accordance the CEMP, task Method Statements, customer complaints, or breach of environmental performance limits. The procedure is summarised below:

- A Non-Conformance Report (NCR) will be raised where a deficiency is identified as a result of monitoring, inspection, surveillance and valid complaints. The NCR will be issued to the responsible parties for analysis and review. Such parties include sub-contractors, the AMC UK Package Manager, AMC UK Health and Safety Manager and the Client's Environmental Manager.
- A Corrective Action Report (CAR) will be issued once an agreement is reached on effective response measures. Any corrective or preventative actions will be assigned a nominated owner, together with a timescale for reviewing and closing out the actions.
- The results of any corrective or preventative actions will be recorded and held on Site throughout the duration of works and made available to third parties e.g. regulatory authorities on request.

8.0 OPERATIONAL CONTROL PROCEDURES

8.1 Specific Management Plans

8.1.1 Dust Management Plan

AMC UK will ensure that any Phase 4 construction activities that have the potential to give rise to noticeable levels of dust and particulates will be identified and appropriate risk control measures put in place through the site wide Dust Management Plan (DMP).

The DMP is a project-wide document that considers the control measures and monitoring required for the following activities:

- Haulage routes, vehicles and construction plant;
- Construction activities, including plant operation; and
- Materials handling, storage, stockpiling, spillage and disposal.

Specific control measures will be defined in the activity specific RAMS.

AMC UK will ensure that any processes requiring permitting by Local Authorities are adequately controlled and monitored.

8.1.2 Site Waste Management Plan

All waste arising from Phase 4 construction activities will be managed in strict accordance with the Site Waste Management Plan (SWMP) (refer to Appendix D). The SWMP will be reviewed and updated at regular intervals (as required).

The SWMP sets out the framework for managing responsibly all waste streams arising at the Site and minimising waste in accordance with the waste hierarchy as follows:

- Prevention – using less material in design and using less hazardous materials;
 - Preparing for re-use – checking, cleaning, repairing, refurbishing items;
 - Recycling – turning waste into a new substance or product;
 - Other recovery – converting waste into energy or other materials;
 - Disposal – landfill and/or incineration without energy recovery.
-

AMC UK will ensure that all waste is dealt with in accordance with the Waste Duty of Care Code of Practice (Defra, March 2016) and relevant legislation.

8.1.3 Noise and Vibration Management Plan

AMC UK will ensure that any Phase 4 activities that have the potential to give rise to noise and vibration impacts will be identified and appropriate risk control measures put in place through the site wide Noise and Vibration Management Plan (NVMP).

The NVMP is a project-wide document that considers the control measures, restrictions and monitoring required to address the following:

- Impacts from noise and/or vibration on neighbouring properties;
- Impacts from vibration on site structures and any identified heritage sites; and
- Complaints from neighbours, landowners and others in the local community.

Noise and vibration arising from the construction works will be controlled through the application of 'Best Practicable Means' (BPM), and monitored throughout the construction period. BPM will include the following measures:

- Control of noise at source;
- Selection of low noise or low frequency methods;
- Control of working hours;
- Selection of quiet or low noise equipment and/or isolation of the plant from the transfer medium; and
- Screening through earth bunds, hoardings or other purpose built screens.

8.1.4 Surface Water Drainage Scheme

Surface water drainage at the Woodsmith Mine site (within which the Phase 4 works will be completed) is defined in the *Sirius Surface Water Drainage Scheme*. It has been designed such that the development does not increase flood risk to the surrounding area and manages flood risk at the site. The surface water drainage system also includes the following aspects:

- Surface water runoff from areas of hard-standing will be collected in hard standing perimeter ditches with check dams and passed through oil separators, a silt removal facility, attenuation storage ponds and a wetland before being discharged to the tributaries of Sneatonthorpe Beck.
- Surface water runoff from temporary spoil bunds and permanent landscaped bunds will be controlled by the aid of swales with check dams and cleansed with hay/heather bales and silt fencing before being passed through the treatment train of attenuation ponds and wetlands. There will be multiple secondary silt fences positioned in fields downstream of some swales to intercept, slow and treat any water that seeps over the edge of the swales to mimic a more 'natural' response and avoid surface water 'sheeting' off the slopes.
- The discharge from the wetlands will be monitored for suspended solids, using a combination of visual monitoring and turbidity meter monitoring in accordance with the *Groundwater and Surface Water Monitoring Scheme*. If the trigger levels are exceeded the appropriate plan of action will be implemented in accordance with the remedial action plan condition.

AMC UK will assist in the monitoring and management of sections of drainage system within their works area(s) to ensure that this drainage system remains operational in accordance with its design specification (refer to *AMC UK Silt and Surface Water Management, Inspection and Maintenance Plan*).

8.1.5 Traffic Management Plan

AMC UK will work with Sirius Minerals and other Contractors to ensure that the controls and restrictions defined in the *Construction Traffic Management Plan (CTMP)* are adhered to. Specifically in relation to the number of vehicle movements and the heavy vehicle routes defined for the delivery of plant, machinery and raw materials and the removal of wastes.

8.1.6 Protected Species Management Plan

AMC UK will ensure that any Phase 4 activities that have the potential to give rise to impacts to protected species (including bats, reptiles, badgers, or nesting birds) will be identified and appropriate risk control measures put in place through the site wide *Protected Species Management Plan (PSMP)*.

The PSMP is a project-wide document that considers impacts from the following:

- Earthworks and excavations;
- Dust emissions;
- Lighting pollution; and
- Damage to trees or hedgerows.

8.2 Pollution Prevention and Control Measures

Construction activities have the potential to give rise to pollution incidents from accidental spillages, leakages or acts of vandalism. To reduce the risk of pollution incidents occurring, AMC UK will ensure that adequate planning and design is undertaken to comply with specific legislative requirements and industry best practice measures.

AMC UK and its sub-contractors will incorporate suitable pollution prevention measures in all activities. The AMC UK Environmental Manager will review all proposals for such measures made by sub-contractors. Working methods or measures to protect key receptors from pollution incidents will be identified in task specific RAMS and communicated to all staff via the communication methods outlined in Section 5.0.

Table 2 summarises the minimum pollution prevention and control measures that will be incorporated by AMC UK and its sub-contractors in its construction activities. The final selection of the most appropriate mitigation measures and/or additional measures (as required on a case-by case basis) will be documented in the RAMS provided by the relevant sub-contractor.

A series of Pollution Prevention Guidance notes have been prepared by AMC UK to set out the overarching approach to reducing the risk from pollution during the activities in Table 2. These are included in Appendix E.

Table 2: Summary of Minimum Pollution Prevention Measures Required

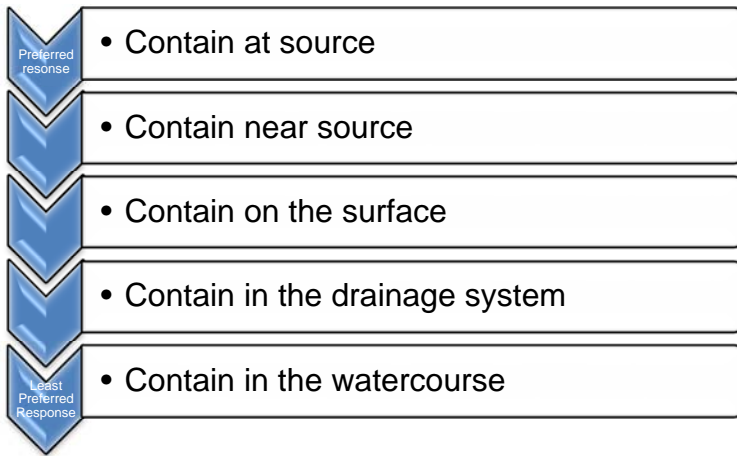
Issue or Activity	Pollution Prevention Measures
Excavations, earthworks, stockpiling.	<p>Stockpiles of excavated material will be minimised as far as is reasonably practical.</p> <p>Stockpiles will be positioned at agreed locations and constructed/managed to collect drainage and direct to the site drainage system and to prevent loss of entrained water to ground. Stockpiles of material will be damped down during dry weather and/or covered with sheeting.</p> <p>Potentially contaminated or geotechnical unsuitable materials (unsuitable for re-use on site) will be disposed of in line with the Site Waste Management Plan.</p>

Issue or Activity	Pollution Prevention Measures
	<p>Dust suppression techniques will be implemented in line with the Dust Management Plan, including water spraying in dry weather, wheel washing facilities for vehicles leaving the site and covering stockpiled material.</p> <p>Refer PPG 003 '<i>Excavation Activities</i>', Appendix E</p>
Concrete washout	<p>Cement and, more importantly, concrete washout water is highly alkaline and can change the chemical balance of surrounding groundwater, natural watercourses and drainage systems.</p> <p>A designated concrete wash-out skip or facility will be located within the works area to stop the wash out water from entering drainage or natural water systems.</p> <p>Concrete wash out will be appropriately signed and all operatives and drivers trained in how to use it. Re-use of the water may be considered within the batch plant operations, alternatively it will be disposed off-site.</p> <p>Concrete waste from the washout facility will be broken out and reused on site as engineered fill, or sent off site as inert waste.</p> <p>Refer PPG 002 '<i>Cementitious Material Storage and Handling</i>', Appendix E.</p>
Storage, handling and use of hazardous materials	<p>The storage, handling, use and disposal of any potentially hazardous materials will comply with the relevant statutory provisions, Environment Agency and Health and Safety Executive codes of practice and guidance notes, together with any manufacturers' recommendations.</p> <p>Hazardous substance stores (including fuel and chemical stores) and areas at risk of spillage/leakage of polluting materials will be stored above ground and bunded.</p> <p>Storage compounds, tanks or stores will either have integrated bunds or be housed in a purpose built bund with an impervious base, which can hold at least 110% of the capacity of the tank or drum it contains to minimise the risk of hazardous substances entering the drainage system or ground/groundwater.</p> <p>Labels will be used to clearly indicate the contents of containers. There should be no storage of hazardous substances near open drains. In cases of doubtful identification, waste materials should be treated as special waste until proven otherwise. Special waste shall be stored separately from other waste, and be adequately stored, labelled and covered.</p> <p>Environmentally considerate lubricants, such as synthetic, non-toxic biodegradable hydraulic fluids are available and may be used at sensitive locations.</p> <p>Refer PPG 001 '<i>Fuel & Oil Storage and Handling</i>', Appendix E.</p>
Refuelling of vehicles and plant	<p>Delivery of fuel and oil will be supervised at all times and checks will be made to ensure that the correct type and quantity of fuel is being delivered.</p>

Issue or Activity	Pollution Prevention Measures
	<p>Refuelling of plant and vehicles will be undertaken at designated refuelling points at the Woodsmith Mine site, or on site in accordance with the RAMS and the Refuelling Procedure.</p> <p>All fuel lines and fuelling points will be protected from vandalism and unauthorised interference, and will be turned off and locked when not in use.</p> <p>Drip trays will be used when filling smaller containers from tanks or drums to avoid drips and spills from entering the ground or drainage system.</p> <p>Any drains in the vicinity of the refuelling point will be blocked off to ensure that any spillages cannot wash into the drainage system and into any adjacent watercourses.</p> <p>Plant and vehicles will be regularly inspected and well maintained so that leakages do not occur during refuelling (or during use).</p> <p>Refer PPG 001 '<i>Fuel & Oil Storage and Handling</i>', Appendix E.</p>
Oil/Fuel spillages	<p>Oil/fuel spill kits will be available at Site and appropriately trained staff will be present during all working activities. In the event of an oil or fuel spillage, staff will ensure that the spill area is properly sealed and that the Site Supervisor notified of the issue.</p> <p>Staff on site will clean up the spillage in accordance with their training and ensure that the oil or fuel contaminated spill kits are disposed of in accordance with the Control of Substances Hazardous to Health Regulations 2002 (as amended).</p> <p>If the volumes of oil/fuel spilled are such that the oil kits on site are not sufficient, additional oil spill kits will be obtained or external remediation contractors engaged.</p> <p>Oil spillages will be reported in line with the Environmental Incident Reporting Procedure.</p> <p>Refer PPG 001 '<i>Fuel & Oil Storage and Handling</i>', Appendix E.</p>
Significant loss of bentonite slurry to permeable geological units.	<p>During the excavation and construction of the diaphragm wall, there is a potential for bentonite slurry loss to occur into formations where there are more permeable geological units.</p> <p>This potential issue is outlined in the Bauer <i>Slurry Management Plan</i> and the AMC UK <i>Environmental Emergency Preparedness Plan</i>.</p> <p>Monitoring of bentonite slurry levels at the panel locations and the presence of slurry indicators in groundwater in adjacent monitoring wells (as defined in the '<i>Monitoring Programme for D-Wall Slurry Losses</i>', Appendix F) will be used to assess the occurrence of support fluid losses to the sub-surface.</p> <p>In the event of a significant slurry loss to the sub surface then the mitigation measures defined in the Bauer <i>Support Slurry Management (Bentonite)</i> plan will be followed.</p>

Issue or Activity	Pollution Prevention Measures
Silt and Surface Water Management	<p>Measures to reduce or prevent mobilisation or loss of sediments/silt into surface water will be implemented. Such measures will be defined in the RAMS, but may include: silt traps, drainage ditches, earth bunds, silt fences and oil separator tanks.</p> <p>Accumulated sediment shall be removed to ensure the design capacity of surface water infrastructure (e.g. ponds and swales) is maintained.</p> <p>To ensure the reliability of the surface water drainage system, it should be inspected, maintained and repaired as required on a regular on-going basis.</p> <p>Refer PPG 003 'Excavation Activities', Appendix E</p>
Light Pollution (site wide)	<p>Directional tower lighting with directional lanterns will be used, with lights directed down towards the works area required to be lit and away from any sensitive receptors.</p> <p>Task lighting will be used where appropriate to light up local areas of small works instead of mast illumination affecting a large radius.</p> <p>Lights will be turned off when not required to avoid unnecessary light pollution.</p> <p>The lighting will comply with the lowest recommended criteria, particularly with regard to minimising impacts on wildlife from light spillage e.g. installation of hoods, shields, reflectors and baffles.</p>
Dust and particulate emissions (site wide)	<p>If required, dust suppression measures, including imposing speed limits on haul roads, damping down of road surfaces, road sweeping and wheel and vehicle wheel washing will be utilised across the works area.</p> <p>Site fencing, barriers and scaffolding will be kept clean using wet methods where there is the risk of dust accumulation.</p> <p>Waste materials that have the potential to create dust problems will be removed, unless they are to be re-used on site. Where possible these will be covered or contained in fenced area until used.</p> <p>Burning of waste materials will be prohibited.</p>

Pollution control measures will be required to manage incidents of unplanned releases into the environment. AMC UK will adopt the guiding principles of the pollution control hierarchy, which is as follows:



The incident response will vary depending on the nature of the pollutant and severity of the incident. This is discussed more fully in Section 9.0.

9.0 ENVIRONMENTAL INCIDENTS, REPORTING AND INVESTIGATION

9.1 Environmental Incidents

The Environmental Emergency Preparedness Plan (EEPP) sets out the procedures to be followed in the event of emergencies and environmental/pollution incidents. This includes details of the arrangements for control and coordination of an effective response.

The EEPP will be communicated through Site Induction and Toolbox talks and attendance/training records maintained. All staff, site workers and visitors will be conversant with the EEPP, which will be displayed on noticeboards at the Site.

A copy of the EEPP is included in Appendix C.

9.2 Incident Categories

The response to an environmental incident will be determined by its severity (or category), with notifications for higher ranked incidents escalating to a higher level within the Project Team and externally to emergency services and regulatory authorities.

A description of each incident category and the actions to be taken in the event of such an incident occurring is included in the EEPP. The incident categories are summarised in Table 3.

Table 3: Environment Incident Category

Category	Description
Major Incident (Cat 1)	Likely to be a large scale environmental incident in breach of regulatory consents or current legislation, with major damage or adverse effects, possibly irreversible harm to the environment/health/amenities. Likely to result in prosecution and cessation of works.
Significant Incident (Cat 2)	Likely to be a medium scale environmental incident, in breach of regulatory consents or current legislation, with significant damage or adverse effect, but possibly reversible harm to the environment/health/amenities. Likely to result in prosecution and restriction of works.

Category	Description
Minor Incident (Cat 3)	Likely to be small scale (localised) environmental incident, with minimal damage and transitory effects on the environment. May result in prosecution or enforcement notices. Limited restriction of works.
Near Miss (Cat 4)	An event that occurred, which had the potential to result in an environmental incident.

9.3 Incident Reporting

Any incident (observed or realised) on Site must be reported in accordance with the Incident Reporting Procedure set out in the EEPP (see Appendix C).

All near misses shall be reported using an Incident Report Form. The Environmental Manager will review and respond to near miss reports as appropriate.

In the event of an environmental incident occurring, the first priority will be to make the scene safe, ascertain if any person is injured, and if so, instigate the relevant procedure for dealing with the provision of first aid where necessary and preventing further incidents.

The incident will be reported immediately to the Site Supervisor, who will instigate the communication protocol by notifying the AMC UK Package Manager, H&S Manager and Environmental Manager immediately.

The Client's Representatives and relevant stakeholders will be notified in accordance with the Incident Reporting Procedure set out in the EEPP.

Monthly reports will be prepared by the AMC UK Environmental Manager, which includes details of Level 1, 2 and 3 incidents and any significant trends identified in Level 4 near misses.

9.4 Incident Investigation and Reporting

All incidents will be investigated by AMC UK in accordance with the procedure set out in the EEPP (refer to Appendix C). The investigation team for all incidents will involve the following participants as a minimum:

- AMC UK Environmental Manager;
- AMC UK Health and Safety Manager;
- Sub-Contractor's representative (in cases where a contractor was involved); and
- The person(s) involved.

An investigation report will be prepared that identifies the root cause of any incident, actions taken and lessons learnt. The report will be shared with all parties involved, the Client and the relevant regulators.

9.5 Implementing Corrective and Preventative Actions

All corrective and preventative actions will be undertaken in agreement with the Client, the AMC UK Package Manager and any relevant stakeholders e.g. statutory bodies. The AMC UK Environmental Manager will review the success of such actions periodically.

9.6 Incident Recording

All actions, whether originating from hazards, incidents, inspections, audits or improvement suggestions, will be documented in a single Actions Register, which will be the responsibility of the AMC UK Environmental Manager to keep up-to-date, and which will detail the action, the action source, the date and the name of the person responsible for undertaking the action.

10.0 RECORD KEEPING AND MANAGEMENT REVIEW

10.1 Record Keeping and Archiving

All environmental records will be maintained in accordance with applicable policy and procedures and relevant legal requirements (e.g. Waste Transfer Notes).

Records will be maintained in either hard copy or electronic format (as required) so as to be readily identifiable, retrievable and protected against damage, deterioration or loss.

Records will be maintained for the applicable duration of time and can only be disposed of by the individual responsible for them.

10.2 Management Review

The EMP will be reviewed by the AMC UK Environmental Manager (in consultation with relevant stakeholders) on a case-by-case basis in the following circumstances:

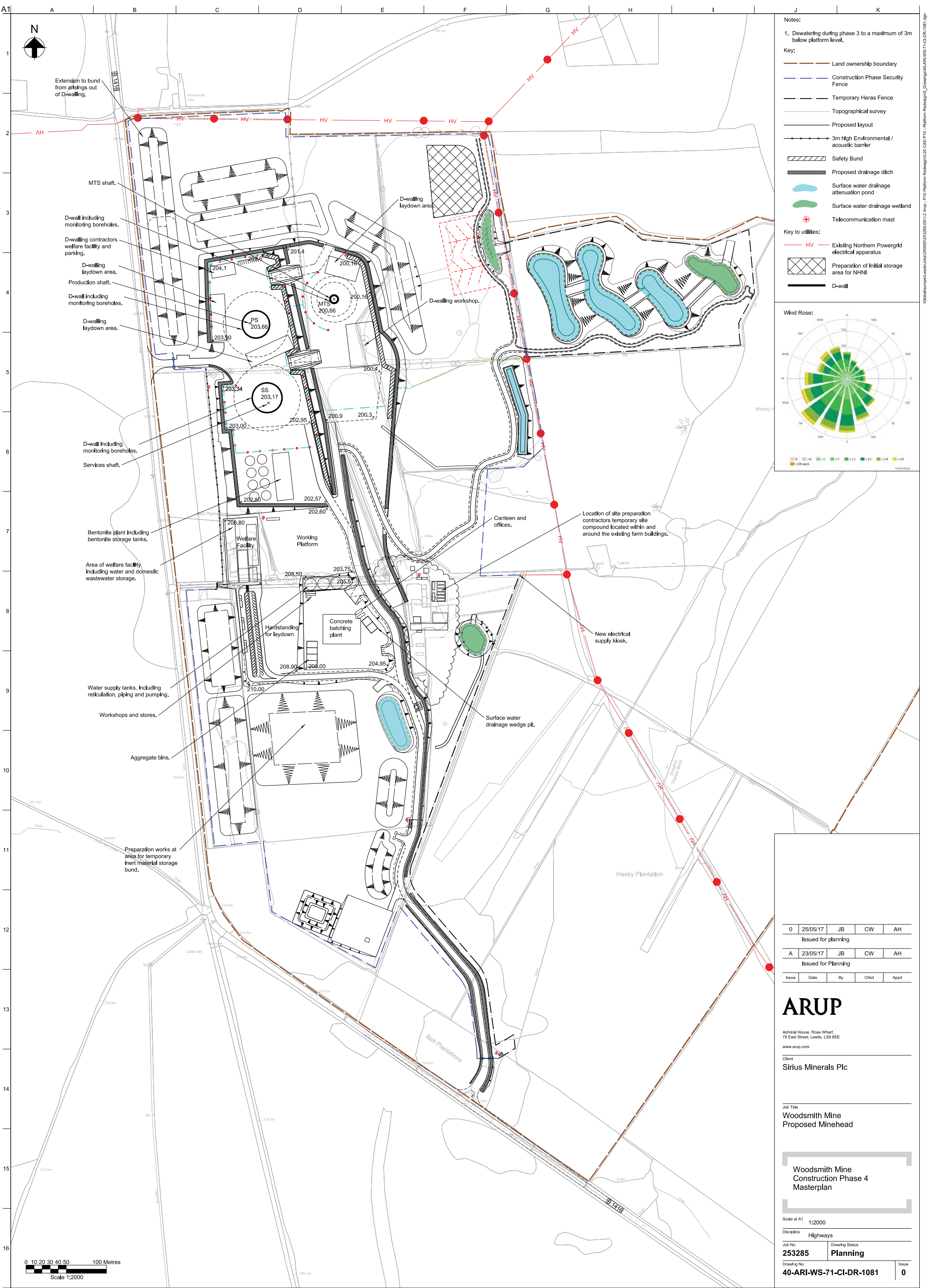
- An incident investigation makes recommendations for changes in the management of environmental issues;
- An audit or inspection makes recommendations for improvements in working practice; or
- There is a significant change to worksite activities e.g. a new activity is proposed that requires additional risk control measures;

In addition, the EMP will be reviewed by the AMC UK Environmental Manager at each phase of construction work, or on an annual basis, whichever is sooner, in order to ensure that the Plan remains relevant and current. Any changes to the EMP will be captured under the change control procedures identified in the PMP.

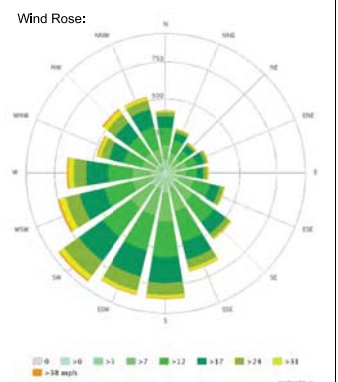
All changes will be communicated formally to the Client and other relevant stakeholders via the agreed communication routes set out in the PMP. All changes to the EMP will be communicated to Site workers during Toolbox talks and recorded on the training records and/or meeting notes.

APPENDIX A

Drawings



- Notes:
- Dewatering during phase 3 to a maximum of 3m below platform level.
- Key:
- Land ownership boundary
 - Construction Phase Security Fence
 - Temporary Heras Fence
 - Topographical survey
 - Proposed layout
 - 3m High Environmental / acoustic barrier
 - Safety Bund
 - Proposed drainage ditch
 - Surface water drainage attenuation pond
 - Surface water drainage wetland
 - Telecommunication mast
- Key to utilities:
- HV Existing Northern Powergrid electrical apparatus
 - Preparation of initial storage area for NHNI
 - D-wall



0	25/05/17	JB	CW	AH
Issued for planning				
A	23/05/17	JB	CW	AH
Issued for Planning				
Issue	Date	By	Chkd	Appd

ARUP

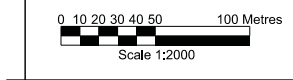
Admiral House, Rose Wharf,
75 East Street, Leeds, LS9 8EE
www.arup.com

Client
Sirius Minerals Plc

Job Title
**Woodsmith Mine
Proposed Minehead**

**Woodsmith Mine
Construction Phase 4
Masterplan**

Scale at A1: 1:2000
Discipline: Highways
Job No: 253285
Drawing Status: Planning
Drawing No: 40-ARI-WS-71-CI-DR-1081
Issue: 0



APPENDIX B

AMC UK Policies

Associated Mining Construction UK Limited Corporate Policy For: Environmental

Associated Mining Construction UK Limited is committed to the protection of the environment and to ensure that our operations and personnel do not create significant negative impacts to the environment. There is no task that cannot be done in an environmentally responsible manner and Associated Mining Construction UK Limited is committed to ensuring this philosophy is implemented at all our operations.

All Associated Mining Construction UK Limited projects are planned and carried out with strict adherence to government guidelines. In addition, Associated Mining Construction UK Limited follows the specific requirements of the client and their policies and procedures.

Employees and sub-contractors at every level are accountable and responsible for ensuring all standards are met. Complete and active participation by everyone, every day, in every job is necessary for the environmental excellence the company expects. Management supports coordination of environmental protection amongst all workers/contractors.

Management supports participation in environmental protection by all employees and provides proper equipment, training and procedures. Employees are responsible for following all procedures, working responsibly and, whenever possible, improving environmental protection measures.

No negative environmental impact is our goal. By following policies, procedures and government standards as well as due diligence, we can accomplish this.

Jonathan White Operations Director

Innovation and Safety through Knowledge, People and Leadership



Environmental Policy

Updated on: 31/3/2017
00-AMC-HS-PO-0003

Associated Mining Construction UK Limited Corporate Policy For: Sustainability

Associated Mining Construction UK Limited recognizes that mining construction has the potential to change and sometimes transform local environmental and social conditions. As such it is our responsibility to minimize the effects of our operations on the environment, actively support the sustainability of local communities and provide a safe workplace for all persons associated with our operations. Associated Mining Construction UK Limited is committed to embedding the following sustainable development principles throughout our operations:

- **Operating within environmental limits** – respecting the environment, resources and biodiversity of the areas we operate in and ensuring that our processes and practices are technically appropriate and environmentally and socially responsible.
- **Upholding strong, healthy just societies** – identifying and addressing the diverse needs of people affected by and within our operations and promoting wellbeing, social cohesion and equal opportunity. Upholding fundamental human rights and respecting cultures, customs and values.
- **Creating sustainable economies** – both for our shareholders and those affected by our operations, delivering sustainable profitable growth whilst taking responsibility for any environmental and social costs of our operations and ensuring efficient use of resources.
- **Good governance** – Implementing effective systems of ethical governance and integrating sustainable development considerations within the corporate decision-making process.
- **Continuous improvement** - Ensuring continual improvement of our health and safety and environmental performance, and working with partners and suppliers who have made a commitment to continuous improvement of their own sustainability development performance.

All Associated Mining Construction UK Limited projects are planned and carried out with strict adherence to government guidelines and any specific requirements of the client and their policies and procedures.

Employees and sub contractors at every level are accountable for working responsibly in line with our guiding principles. Participation in our sustainability principles by all employees is supported by all at AMC UK

Jonathan White Operations
Director

Innovation and Safety through Knowledge, People and Leadership



Sustainability Policy

Updated on: 31/3/2017
00-AMC-HS-PO-0004

APPENDIX C

Environmental Emergency Preparedness Plan

May 2017

Environmental Emergency Preparedness Plan
Woodsmith Mine Site

Contractor: AMC UK

Client: Sirius Minerals PLC

AMC UK Contract Number: RPA - 127

Scheme: Phase 4 – Diaphragm Wall
Construction

Document Reference: 40-AMC-WS-71-EN-PL-0005

DOCUMENT CONTROL AND APPROVALS

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Required Approvals

	Name	Role	Signature	Date
Prepared by	Hugh Medcalf	HSE Advisor		25/05/17
Reviewed by	-	Engineering		25/05/17
Approved by	Jonathan White	Operations Director		25/05/17

Sirius Minerals Acceptance

	Name	Role	Signature	Date
Checked by				
Accepted by				

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1.0 INTRODUCTION

1.1 Terms of Reference

This Environmental Emergency Preparedness Plan (EPPP) has been prepared by Associated Mining Construction UK (AMC UK) to provide a stand-alone framework for dealing with emergency environmental incidents during construction activities relating to the Phase 4 Construction Works at Woodsmith Mine (Off B1416), Sneatonthorpe, North Yorkshire, YO22 5HZ, (hereafter referred to as 'the Site').

1.2 Objectives

This document sets out the arrangements under which AMC UK intends to operate when responding to and managing environmental incidents relating to its activities at the Site in a timely and responsible manner. All AMC UK Managers, Supervisors and other duty holders must be familiar with this document, in case they are required to assume and maintain command of a situation.

1.3 Scope of EPPP

Mitigation of construction risks are considered during the design and planning stages, and routinely implemented on site through appropriate risk assessment and mitigation. Despite this there is still the risk of an unplanned event occurring. Therefore, the EPPP covers the potential environmental incidents occurring during construction works and details the arrangements for control and coordination of an effective response to, and recovery from environmental emergency situations.

The EPPP is intended to cover the Phase 4 Construction activities only, which include the following:

- Operation of the concrete batch plant;
- Installation, commissioning and operation of the bentonite plant and associated temporary structures;
- Installation of concrete guide walls (excavate to -3.5m and concrete wall down to -1.5 to -1.75 m);
- Mobilisation to site of diaphragm walling equipment (cutters, cranes, workshops etc.); and
- Diaphragm wall construction to -60m below ground level at the Production, Service and Mineral Transport System shafts.

1.4 Site Layout

A Site Layout for Phase 4 construction activities is shown on Drawing 40-ARI-WS-71-CI-DR-1081 provided in Appendix A of the Environmental Management Plan.

1.5 Related Documents

Reference should also be made to the Construction Phase Health and Safety Plan (CPHSP) for Phase 4 Construction activities for appropriate response procedures for dealing with health and safety related incidents. The emergency response roles in this EPPP are generally aligned with those in the CPHSP.

1.6 General Requirements

The details of the EPPP will be communicated to all site workers and visitors through Site Inductions and Toolbox Talks.

Copies of this plan will be made available to all personnel involved in construction activities at the Site and will be displayed on noticeboards across the work site.

Copies will also be made available to other stakeholders as appropriate, including the Client and the Environment Agency.

The EPPP is a dynamic document and will be subject to regular review and update following an incident, management review, or significant changes to the Site and proposed works.

2.0 COMMUNICATION LINES

2.1 Immediate Communications Process

Communications on-site for environmental incidents will be via the site radio system linking AMC UK Site Supervisors with the wider site operations managed by Sirius Minerals.

The emergency response and communication approach will differ based on the nature and severity of the incident. Figure 1, presents the communication approach to be adopted based on the scale of the incident.

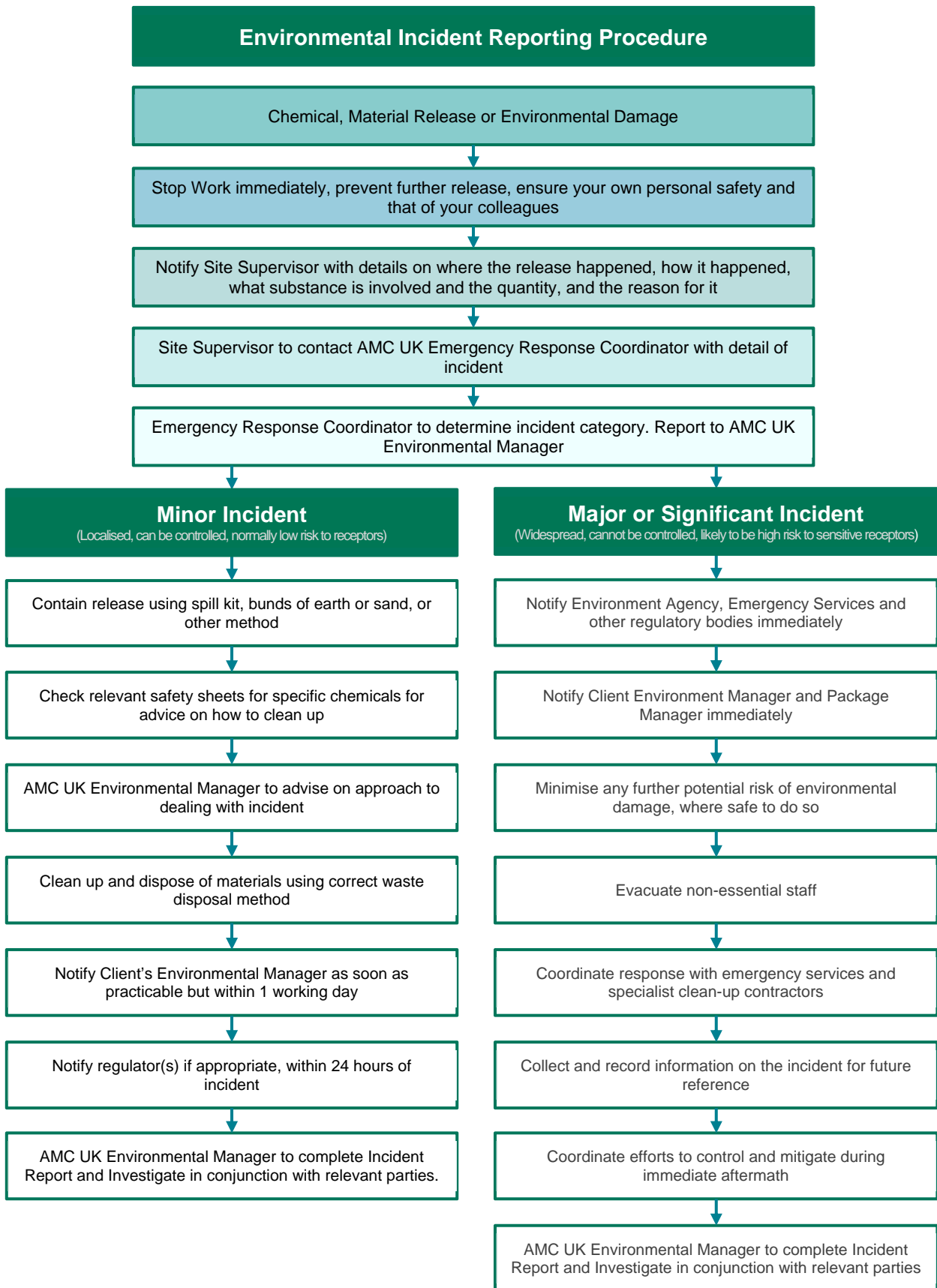


Figure 1: Emergency Response and Communication

2.2 Project Stakeholders

2.2.1 AMC UK – Emergency Telephone Numbers

CONTACT NAME	TEL NO.
TBD, Site Supervisor (Diaphragm Wall Construction)	TBD
Thomas Prinz, Site Supervisor (Concrete Batching Plant)	
John Booth, Environmental Manager	TBD
Hugh Medcalf, Environment Advisor	
Robert Hunter, Package Manager (Diaphragm Wall Construction)	TBD
Konstantinos Symiriotis, Package Manager (Concrete Batching Plant)	

2.2.2 Client – Emergency Telephone Numbers

CONTACT NAME	TEL NO.
Gary Ward Health and Safety Advisor	
Robert Staniland, Environment Manager	
William Woods, Project Development Manager	
Terry Quaife, Area Manager Shafts	
Sirius Media Team	TBD

2.2.3 Other AMC UK Contact Details

In the event that immediate response is not available from the relevant site contacts, then other AMC UK contacts should be contacted.

CONTACT/ POSITION	NAME	TEL NO.
Head Office	Andrea Whittingham	
Operations Director	Jonathan White	
Engineering Director	Jürgen Franz	+
Commercial Manager	Lee Williamson	

2.3 Emergency Services

Key numbers for the Emergency Services are included in Table 1.

Table 1: Emergency Service Contact Numbers

Emergency Service	Contact Details	Purpose of Consultation
Fire Brigade		Fire evacuation and rescue
Police - Emergency		Emergency response to crime etc.
Ambulance		Urgent medical attention/hospitalisation
A&E Department – Scarborough Hospital		Contact for admissions enquiries

Emergency Service	Contact Details	Purpose of Consultation
Local Police Station		Security arrangements, crime etc.

2.4 Statutory Bodies and other External Stakeholders

Dependent on the nature of the environmental emergency, one of more of the statutory bodies shown in Table 2 may also need to be notified.

Table 2: Statutory Stakeholders - Contact Details

Service	Contact Details	Purpose of Consultation
Gas, National Grid (National Gas Emergency Service)		Report gas leak or if pipeline struck
Electricity, Northern Power Grid		Report incidents involving underground cables or overhead assets
Environment Agency	Contact: TBC	Pollution prevention measures and incident reporting/response
Water Services, Yorkshire Water		Report water leaks, loss of water
Sewerage Services, Yorkshire Water		Report incident involving sewage pipeline.
Oil (or gas) Pipeline, British Pipeline Agency		Report incident involving underground pipeline
North Yorkshire Council	Contact: Pam Johnson	
North Yorkshire Moors National Park Authority	Contact: Mark Hill	
Health and Safety Executive	TBC	TBC

2.5 Communication Protocols

2.5.1 Emergency Services

During an incident, the Emergency Response Coordinator will liaise with the Emergency Services as required, unless this role is delegated to the Package Manager or Environmental Manager.

Out of Hours, the nominated person in charge will assume this responsibility until otherwise advised by the Package Manager, the Environmental Manager or a more senior or qualified person.

2.5.2 Client Interface

During an incident the Package Manager or Environmental Manager will liaise with the Client contacts to ensure that they are fully appraised of the situation and to agree on implementation of relevant actions.

2.5.3 Media, Regulatory Authorities and Members of the Public

All contact with the media, local authorities, community groups, businesses or other bodies regarding any environmental emergency will be handled by Sirius Minerals.

3.0 EMERGENCY RESPONSE ARRANGEMENTS

3.1 Roles and Responsibilities

3.1.1 Emergency Response Coordinator

The first or most senior person responding to the emergency will take control of the location and will coordinate the emergency response (acting as initial Emergency Response Coordinator). The position of Emergency Response Coordinator can be reassigned if a more qualified or senior person were to respond. The responsibilities are as follows:

- Oversee all safety aspects of the environmental incident;
- Assess the hazards that may be encountered for the emergency and mitigate the hazardous situations;
- Coordinate the First Aiders to provide support to the injured person(s) (if required);
- Contact the emergency response team, providing all relevant information on the incident;
- Nominate persons to the roles outlined in this plan and ensure that any evacuation is undertaken;
- Provide information/guidance to the Package Manager and Environmental (and Health and Safety) Manager(s) on the incident and safety implications, and request support as required;
- Appoint Entrance Guards to be strategically placed to guard entry into the incident area and maintain contact with them to ensure no unauthorized entries into the incident area and that emergency services are directed to the incident location;
- Coordinate the emergency response with the emergency response team or emergency services once they arrive on site;
- Exercise emergency authority to stop and prevent any unsafe acts which might either make the incident worse or lead to a secondary incident; and
- Preserve evidence, record events and initiate preliminary investigation of accidents within the incident area.

3.1.2 Package Manager and Environmental Manager

The Package Manager and/or Environmental Manager will undertake the following:

- Assist the initial Emergency Response Coordinator. Ensure they have sufficient support and resources to effectively manage the situation;
- If necessary or available take control of the incident and take on the role of overall Emergency Response Coordinator (complete roles as defined above);
- Coordinate the emergency response with the emergency services (if required);
- Ensure that all appropriate government agencies have been notified;
- Ensure Client and relevant stakeholders are notified of the situation;
- Exercise emergency authority to stop and prevent any unsafe acts which might either make the incident worse or lead to a secondary incident; and
- Preserve evidence, record events and initiate preliminary investigation of accidents within the incident area.

3.1.3 Entrance Guard

The Entrance Guard's responsibilities are as follows:

- Barricade and guard the entrance to the Incident Area and to facilitate the access to the emergency services;
- Guard and allow only authorized personnel to enter the Incident Area;
- Maintain radio contact with the Emergency Response Coordinator on any personnel entering or exiting the Incident Area;
- Instruct any bystanders or people leaving the Incident area to report to the nearest muster point; and
- Remain at the post until the ALL-CLEAR has been given.

3.1.4 Fire Warden

Appointed Fire Wardens will be appointed and trained such that they can respond in the event of an environmental incident giving rise to fire. The responsibilities are as follows:

- Ensure all personnel are evacuated safely from the incident area;
- Undertake a roll-call at the muster points to ensure all workers and visitors are accounted for; and
- Liaise with the emergency services as directed by the Emergency Response Coordinator.

3.1.5 Appointed First Aider

Appointed first aid personnel will be trained to a relevant standard and be required to maintain their skill level to allow them to undertake their duties. The Appointed First Aider will:

- Provide first aid to injured parties to the best of their abilities, without putting themselves in danger;
- If the injuries are not significant, provide first aid and escort the person to the nearest A&E hospital; and
- Advise the emergency services of any first aid provided.

3.1.6 Muster Point Coordinator

The Muster Point Co-ordinator will be responsible for the following:

- Proceeding to the Muster Point and relaying information on AMC UK employees that have arrived at the muster points;
- Record the names and number of personnel at the muster point and relay the information to the Emergency Response Coordinator; and
- Once all personnel are accounted for at the muster points contact the Site Supervisor and if applicable coordinate to move the personnel to a safe indoors location.

3.2 Emergency Response Team

The names and contact details of the Emergency Response Team, together with their roles and responsibilities, will be displayed on noticeboards at the Site within the welfare area and at other points in the Site. These will include details of the Environment Agency’s 24 hour Freephone number for reporting environmental incidents.

These details will be communicated to all staff and visitors and updated regularly. Table 3 provides the list of nominated personnel for Phase 4 construction activities.

Table 3: Emergency Response Team – Contact Details

Role	Contact Details	Organisation
Emergency Response Coordinator	Site Supervisors or Package Managers	AMC UK / Bauer
Package Manager	Konstantinos Symiriotis Robert Hunter	AMC UK
Environmental Manager	John Booth	AMC UK
Entrance Guard	TBD	Bauer
Appointed First Aiders	TBD	Bauer (with support from Sirius Minerals)
Muster Point Coordinator	TBD	AMC UK / Bauer

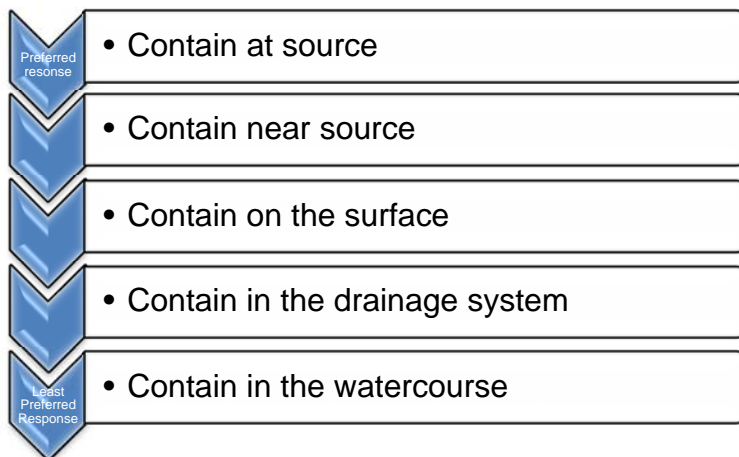
4.0 ENVIRONMENTAL INCIDENT RESPONSE PROCEDURES

4.1 Dealing with Pollution Incidents

4.1.1 General Response Procedures

The workforce will be alerted to incidents by visual identification, verbal command, radio communications or telephone. Personnel raising the alarm shall ensure that all personnel on Site are alerted to any environmental incident likely to impact on others.

Pollution control measures undertaken in response to an environmental incident will follow the guiding principles of the pollution control hierarchy:



On identification of incident, or upon hearing the alert, project personnel shall:

- Stop all work immediately;
- Shut down and isolate all plant and equipment and make all substances safe;
- If safe to do so, remove or assist anybody in immediate danger;
- Raise the alarm;
- Evacuate the work site if required, proceeding to the assembly area via the safest route;
- If safe to do so, contain the incident using spill control measures and isolation of drains;
- Notify the Site Supervisor immediately with details on the location of the spillage, substance and estimated quantity involved, and reason for spillage; and
- Implement response in accordance with the severity of the incident (see Section 4.1.1) and escalate as appropriate, up the chain of command.

4.1.1 Incident Category

Pollution incidents will be managed in accordance with the severity or category of incident. Table 4 sets out the four categories of incidents that have the potential to occur at the Site. The incident category may be elevated or reduced at any stage of the process as more details become available and the emergency services and/or regulators become involved.

Table 4: Environment Incident Category

Category	Description
Major Incident (Cat 1)	Likely to be a large scale environmental incident in breach of regulatory consents or current legislation, with major damage or adverse effects, possibly irreversible harm to the environment/health/amenities. Likely to result in prosecution and cessation of works.
Significant Incident (Cat 2)	Likely to be a medium scale environmental incident, in breach of regulatory consents or current legislation, with significant damage or adverse effect, but possibly reversible harm to the environment/health/amenities. Likely to result in prosecution and restriction of works.
Minor Incident (Cat 3)	Likely to be small scale (localised) environmental incident, with minimal damage and transitory effects on the environment. May result in prosecution or enforcement notices. Limited restriction of works.
Near Miss (Cat 4)	An event that occurred, which had the potential to result in an environmental incident.

Upon notification of an incident, the Site Supervisor will immediately contact the Emergency Response Coordinator and Environmental Manager to appraise him/her of the incident. The Emergency Response Coordinator will be responsible for determining the category of incident, in conjunction with the Environmental Manager.

The Emergency Response Coordinator will be responsible for managing the incident response as outlined in previous sections. Details on the Incident Response Procedures for each Incident Category are included in Section 4.7.

4.1.2 Review the Pollution Inventory

A comprehensive and up to date inventory of all substances to be stored on Site will be maintained by the Environmental Manager. This will include details of any hazardous substances that may fall under Control of

Substances Hazardous to Health (COSHH) Regulations 2002. All containers will be clearly labelled and stored appropriately.

In relation to pollution of controlled waters (groundwater or surface water), substances are treated either as 'hazardous substances' or 'non-hazardous pollutants'.

Hazardous substances are toxic, persistent and liable to bio-accumulate in the environment. They should be prevented from being discharged into groundwater. Examples of hazardous substances relevant to Phase 4 Construction activities include the following: hydraulic oils, hydrocarbons (fuel) and solvents.

Non-hazardous pollutants are any substances capable of causing pollution but have not been classified as a hazardous substance. Examples that may be relevant to Phase 4 activities include the following: metals, biocides (disinfectants), and substances that have a deleterious effect on the taste/odour of groundwater (e.g. bentonite, cement, soil conditioners etc.).

In the event of an emergency or incident occurring, the Pollution Inventory will be used by the Emergency Response Team, which may include the emergency services, to manage and deal with the incident appropriately.

The Pollution Inventory will be made available to all member of the Emergency Response Team.

4.1.3 Deploy Pollution Control Equipment

4.1.3.1 Emergency Equipment Availability

The equipment available to site workers and visitors for use in incident or emergency situations is listed in Table 5. This list is not exhaustive and should be updated as works progress.

Table 5: Emergency Equipment Availability

Equipment Type	Details of Equipment	Location
Spill Kits	Type : TBD	Fuelling area
Drip Trays	Type : TBD	Fuelling area
Spill Kits	Type : TBD	Bentonite plant
Spill Kits	Type : TBD	Concrete batching plant
Spill Kits	Type : TBD	Diaphragm Wall workshop facility
Defibrillator Units	Type : TBD	Welfare
First Aid	Type : TBD	First Aid kits will be available at the Site Offices, Concrete Batch Plant, Bentonite Plant and within all AMC UK vehicles.

All emergency equipment will be routinely checked to ensure that it is available, accessible and within date.

4.1.3.2 Spill Response Kits

Spill response materials including spill kits, booms and absorbent granules will be readily available and easily accessible on site, with all staff trained in their usage.

The content of spill kits will differ depending on the nature of the works, but will typically contain gloves, hazardous waste bags, heavy duty plastic bags, spades, hammer and stakes, absorbent booms, rolls, pads, socks drain seals and floating / turbidity silt curtains.

Spill kits designed for different purposes may be employed on Site, including dealing with fuel and oils, sediments and chemicals.

In the event of a major or significant spillage a specialist contractor will need to be engaged to deal with such an event. Such an organisation will provide 24/7 emergency response cover.

4.1.3.3 Personal Protective Equipment (PPE)

All staff who are required to deal with pollution incidents will be issued with appropriate PPE to undertake the task safely and in accordance with the risk assessment for the task.

4.2 Dealing with Fire

For fires within the Site / Works Area the following actions must be undertaken (in this order):

- Shout "Fire";
- Personnel will attempt to fight small fires if competent to do so while not exposing them to undue risk;
- The area will be vacated and all staff retire to a safe distance/local muster point;
- The Emergency Services should be contacted by dialling 999 and asking for the fire service. Give the operator your name, location and full particulars;
- The AMC UK Site Supervisor and/or Emergency Response Coordinator will be immediately informed of the situation.
- Follow the Emergency Evacuation Procedures outlined in the Emergency Response Plan (appended to the CPH&SP).

4.3 Dealing with Previously Unidentified Contaminated Land

The discovery of contaminated land is not anticipated; however, visual and olfactory monitoring of excavated materials will take place and sampling undertaken if concerns arise. When contamination is suspected, then the following procedure will be followed:

- Stop work immediately;
- Report the discovery to the Site Supervisor so that further advice can be sought from the Environmental Manager;
- Isolate the area and contain any potential for spread of contaminants; isolate any potential sources of ignition; and
- Agree the scope of testing and characterise the material to determine the best method for remediation and/or disposal in line with regulatory requirements and in conjunction with the Site Waste Management Plan.

4.4 Dealing with Flooding Incidents

In order that sufficient warning may be given in the event of flooding affecting the Site, the following actions must be undertaken:

- If flooding is anticipated to occur, works will cease and the Site will undertake a controlled process shutdown where it is safe to do so;
- The area will be vacated and all staff retire to a safe distance/local muster point or stood down from site;
- The AMC UK Site Supervisor and/or Emergency Response Coordinator will be immediately informed of the situation; and
- Follow the Emergency Evacuation Procedures outlined in the Emergency Response Plan (appended to the CPH&SP).

4.5 Dealing with Loss of Support Slurry to Drainage System

During the excavation of the diaphragm wall panels, 'fresh' support slurry is pumped from the batch plant to the cutter unit, which simultaneously pumps slurry and excavated material back to the batching plant where the excavated material is separated from the support slurry in the desanding unit. Feed and return lines will

be laid across the site to reach the diaphragm wall construction areas, with the feed/return lines buried under haul roads through dedicated protected ducting.

As this is a sealed transfer system the risk of losses of support fluid to ground and potentially the site drainage system will be low. As part of the installation works, an inspection of the alignment of the transfer pipes will be undertaken to ascertain high risk areas (connections and joints in the pipeline, high risk receptors etc.). As part of this review, if additional mitigation measures (such as dams and heather silt barriers in the surface water drainage system) are required they will be installed to mitigate impacts of potential accidental releases of support slurry.

If losses from the system do occur, the pump system will be shut down and the spillages of support slurry cleaned up using an excavator and pumps (refer to Bauer *Slurry Management Plan*). The recovered materials will be either re-introduced into the slurry system or disposed of. Where the spillage is due to a blockage in the pipes, all pumps will be turned off until the blockage has been removed and the joints have been resealed.

4.6 Dealing with Significant Losses to Permeable Geological Units

The support slurry is designed to temporarily stabilise the trench excavation with minimal losses to ground (to form near trench soil clogging and filter cake formation), however greater slurry losses may occur in any permeable strata. To ascertain the loss slurry to more permeable strata it will be assessed either via real time monitoring of adjacent monitoring wells or via an observed drop in slurry levels in the diaphragm wall panels being cut.

Only major and sudden drops of the slurry level in the trench can generally be recognised. If major losses are observed, the following contingency plan will be instigated to allow removal of the cutter and to stabilise the trench:

- 1) Increase feed volume of slurry to trench to retain trench stability to allow removal of the cutter.
- 2) Recover cutter.
- 3) Fill sand (stored in a suitable location close to the diaphragm wall location) into trench.
- 4) Backfill panel with sand, backfill material (previously excavated material) or backfill concrete.

Alternative excavation approaches will then be designed to deal with these more permeable geological units.

The approach to manage significant losses of bentonite support slurry is further outlined in the Bauer *Support Slurry Management (Bentonite)* and the AMC UK *Support Slurry Production, Storage and Handling Pollution Prevention Guidance* documents.

4.7 Incident Reporting Procedure

4.7.1 Near Misses

All near misses (Category 4) shall be reported using an Incident Reporting Form. The Environmental Manager will review and respond to near miss reports as appropriate. Feedback will be provided to the workforce through toolbox talks, poster campaigns and other staff awareness training. A copy of the Incident Reporting Form is included in Appendix A.

Such incidents may include, but not be limited to the following:

- Inappropriate storage of fuel/oil or other COSHH substances;
- Unstable stockpiles, presenting a risk of slippage of sediments into drainage system;
- Spill kits or drip trays not being available at a point of re-fuelling; and
- Identification of protected species in the works area.

4.7.2 Minor Incidents

Minor Incidents (Category 3) will be managed locally by the Site Supervisor and workforce responsible for the working area/activity. Such incidents may include, but not be limited to, the following:

- Minor spillages of fuel/oils with limited areal extent on the ground surface, which can be dealt with adequately using proprietary spill kits;
- Sediments or contamination in a limited reach of the drainage system with potential to enter watercourse; and
- Noise, vibration or dust temporarily exceeding permitted thresholds.

The Environmental Manager will be notified of the incident as soon as practicable, but as a minimum within two hours of the event occurring.

The Client's Environmental Manager will be notified as soon as reasonably practicable, or at the latest within one working day, of any minor incidents occurring and the actions taken to remediate or mitigate the issue.

The response procedure to Minor incidents will follow the flow diagram in Figure 1. All Minor Incidents will be reported using the Incident Reporting Form.

If required, the Environment Agency's Emergency Hotline will be contacted as required or if more appropriate, the local regulatory contacts, to inform them of the event and the actions taken to manage this and limit the release.

It may be that a regulatory inspection may occur as a result of a complaint being lodged and that this then may result in such an incident being notified.

4.7.3 Significant or Major Incidents

Significant or Major incidents (Category 1 and 2) will be dealt with as an Emergency and the response will be managed by the Emergency Response Team. Such incidents will include, but not be limited to, the following:

- Unplanned releases that have the potential to impact on surface water or groundwater on a large scale. Materials include, but are not limited to: vehicle fuel, oils, chemicals, cementitious products, sewage effluent, silt and waste products.
- Chemical/fuel fires resulting from poor housekeeping or mixing of waste streams, resulting in emissions to air, and potential release of firewater to surface or groundwater.
- Persistent or long term impact on local habitats caused by unplanned releases.

The Package Manager or Environmental Manager will notify the Client's Environmental Manager immediately, or as soon as reasonably practicable in the event of an emergency environmental incident.

The Package Manager or Environmental Manager will notify the Environment Agency and/or other relevant regulators immediately and follow up with email communication with relevant local contacts.

The response procedure for Significant or Major Incidents will follow the flow diagram in Figure 1.

The Emergency Response Coordinator will take responsibility for managing and containing pollution source in the immediate aftermath of the incident. The Emergency Response Coordinator will perform the roles described in Section 3.1.1.

4.8 Incident Investigation Procedure

All incidents will be investigated by AMC UK in conjunction with other stakeholders, as appropriate. The Incident Investigation Form included in Appendix B, will be used to report the findings of Category 3 and 4 Incidents. The investigation of such incidents can be closed out by the Environmental Manager.

Investigation of Category 1 and 2 incidents will be led by Senior Managers in the AMC UK and the Client's Project team. Such incidents will be subject to formal reporting that will likely extend beyond the standard proforma for the Incident Investigation Form. The investigation of such incidents can only be closed out by Directors of the AMC UK and Sirius Minerals teams.

Quarterly reports identifying the root cause of any incidents, actions taken and lessons learnt will be shared with the AMC UK team, the Client's team and the relevant regulators. These reports will include details of Category 1, 2 and 3 incident and any significant trends identified in Category near misses.

5.0 TRAINING AND AWARENESS

5.1 Environmental Incident and Emergency Response Training

Awareness training allows skills and knowledge to be transferred to employees, inducing motivation and a change in attitudes towards environmental issues and in particular pollution prevention and control techniques. Training is essential in providing a sound understanding of responsibilities for all employees involved with implementation of environmental initiatives within AMC UK.

Environmental Toolbox talks will be provided on a regular basis, these will be relevant to the works being undertaken, the risks involved and outline pollution incident response procedures.

Site induction will detail specific environmental aspects and incident control procedures. All operatives and staff, including visitors, will have to undergo site induction training. Training will include:

- Awareness of the potential for harm to people and the environment from the materials held on-site;
- Information on the sensitivity of the environment surrounding the site;
- The environmental responsibilities of AMC UK;
- Use of the correct personal protective equipment and any appropriate and/or necessary health and safety training;
- Reporting and emergency procedures;
- Safe and correct use of all spill clean-up equipment or pollution prevention structures and/or devices on site;
- Safe handling and legal disposal of contaminated materials and wastes resulting from an incident, including arrangements for using specialist contractors and services; and
- Appropriate and safe decontamination following an environmental incident.

5.2 Training Records

AMC UK will maintain a training register to record training and induction and to monitor qualification expiry. Induction documentation and copies of qualifications and competencies shall be maintained within this training register. The training register shall be regularly reviewed to monitor qualification expiry and to update induction and training records for all personnel.

5.3 Emergency Response Exercises

Emergency response exercises will be conducted throughout the project to test the efficiency of the project's emergency response process and to additionally reinforce emergency procedures and processes to project personnel. Emergency response exercises may include the following:

- Spill emergency response exercise – in the event of uncontrolled release of substances; and
- Fire evacuation procedures.

Evacuation drills shall be undertaken on site at least once per year.

The Environmental Manager shall be responsible for initiating and coordinating emergency response exercises. The Environmental Manager will facilitate a de-briefing following an emergency response exercise and shall provide a written report on the exercise, results and recommendations to the Sirius Minerals Environment Manager.

APPENDIX A

Incident Reporting Form

INCIDENT REPORTING FORM

BASIC DETAILS	
Incident Number: <input type="text"/>	Client Incident Number: <input type="text"/>
Incident Date/Time: <input type="text"/>	Supervisor: <input type="text"/>
Reported Date/Time: <input type="text"/>	Project Description: <input type="text" value="Sirius Minerals – Woodsmith Mine"/>
Reported By: <input type="text"/>	Project Number: <input type="text"/>
Contracting Firm: <input type="text"/>	Exact Location: <input type="text"/>

INCIDENT DESCRIPTION
Summary: <input type="text"/>
Incident Type: <input type="text" value="Select from list"/>
Detailed Description:

CONSEQUENCES		
Please enter a rating (0-5) for all consequences		
Category	Actual	Potential
Injury / Illness:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Environment:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Plant & equipment damage:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Financial:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Outrage & Reputation:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Security:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Motor vehicle accident:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Quality:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

IMMEDIATE CORRECTIVE ACTION

NOTIFICATION	
People Immediately Notified: <input type="text"/>	People to be Notified: <input type="text"/>
Health and Safety Advisor for the area: <input type="text"/>	Site Supervisor (Who will review this notification): <input type="text"/>

Portion above to be submitted as first alert for all incidents

APPENDIX B

Incident Investigation Form

INVESTIGATION REPORT FORM

BASIC DETAILS	
Incident Number: []	Client Incident Number: []
Incident Date/Time: []	Supervisor: []
Reported Date/Time: []	Project Description: Sirius Minerals – Woodsmith Mine
Reported By: []	Project Number: []
Contracting Firm: []	Exact Location: []

INCIDENT DESCRIPTION
Summary: []
Incident Type: Select from list
Detailed Description:

CONSEQUENCES		
Please enter a rating (0-5) for all consequences		
Category	Actual	Potential
Injury / Illness:	N/A	N/A
Environment:	N/A	N/A
Plant & equipment damage:	N/A	N/A
Financial:	N/A	N/A
Outrage & Reputation:	N/A	N/A
Security:	N/A	N/A
Motor vehicle accident:	N/A	N/A
Quality:	N/A	N/A

IMMEDIATE CORRECTIVE ACTION

NOTIFICATION	
People Immediately Notified: []	People to be Notified: []
Health and Safety Advisor for the area: []	Site Supervisor (Who will review this notification): []

Portion above to be submitted as first alert for all incidents

INVESTIGATION DETAILS		
Investigator: [REDACTED]	Start Date: [REDACTED]	End Date: [REDACTED]
Investigation Team: [REDACTED]		
Detailed description of investigation: [REDACTED]		
Witnesses to incident: [REDACTED]		
Supporting documentation location: [REDACTED]		

INCIDENT INVOLVING INJURY OR ILLNESS	
Injured or ill person: [REDACTED]	Employee Type: Select From List
Employer: [REDACTED]	Injury Classification: Select From List
Did Injury result in Loss of Consciousness? No	Was the injured person at work on modified work duties? No
Number of Days Lost: [REDACTED]	Number of Restricted Days: [REDACTED]
Bodily location 1: Select From List	Nature of injury 1: Select From List
Bodily location 2: Select From List	Nature of injury 2: Select From List
Agency: Select From List	Mechanism: Select From List
Detailed Description of injury: [REDACTED]	

INCIDENT INVOLVING ENVIRONMENT DAMAGE:	
Type of Ecological Loss: Select From List	Initiating Event: Select From List
Habitat Description: [REDACTED]	
Detailed Description: [REDACTED]	
Contaminant Type: Select From List	Other Contaminant : [REDACTED]
Volume Released: [REDACTED] Unit: Select From List	Volume Contained: [REDACTED] Unit: Select From List
Area Impacted: [REDACTED] Unit: Select From List	Distance from Sensitive Area: [REDACTED]
Sensitivity Type – Area: Select From List	Sensitivity Type – Other: [REDACTED]
Species: [REDACTED]	Number: [REDACTED] Protected: Yes No

INCIDENT INVOLVING PLANT, EQUIPMENT OR VEHICLE DAMAGE:	
Equipment damage or loss classification: Select From List	
Equipment Description: [REDACTED]	
Model: [REDACTED] Year [REDACTED]	Serial number: [REDACTED] Owner: [REDACTED]

INCIDENT INVOLVING FINANCIAL LOSS:

 Financial Description:
INCIDENT INVOLVING OUTRAGE / REPUTATION:

 Outrage / Reputation Description:
INCIDENT INVOLVING SECURITY:

 Type of Security Incident: Select From List

 Security Description:

 Resolution Outcome Select From List

 Resolution Property Select From List

INCIDENT INVOLVING MOTOR VEHICLE:

 Weather Conditions: Select From List

 Time of Day: Select From List

 Road Type: Select From List

 Road Surface Conditions: Select From List

 Vehicle Type (eg sedan, 4WD etc):

 Vehicle Make:

 Vehicle Model:

 Vehicle Year:

 Registration Plate Number:

 Company Vehicle? No

 Driver Name:

 Site Permit Number:

 Driver License Number:

 License Expiry Date:

 Number of Passengers:

 Number of Work Hours:

 Vehicle Direction of Travel: Select From List

 Vehicle Speed:

 Length of Skid Marks:
INCIDENT INVOLVING QUALITY:

 Type of Quality Incident: Select From List

 Equipment Number

 Machine Number:

 Summary of Deficiency:

 Immediate Control Measure:

 Explanation of Deficiency:

ROOT CAUSE ANALYSIS	
<i>Select the root causes for this incident</i>	
<i>Select general reason(s)</i>	<i>Select specific reason(s)</i>
Were procedures/safe systems of work/work instructions adequate? Y e s	
Procedures not used / not followed	<input type="checkbox"/> Select From
List Procedures followed incorrectly	<input type="checkbox"/> Select From
List	
Procedures incorrect	<input type="checkbox"/> Select From
List	
<i>Comment:</i>	
Was training adequate? Y e s	
No training given	<input type="checkbox"/> Select From
List	
Understanding needs improvement	<input type="checkbox"/> Select From
List	
Was quality control adequate? Y e s	
No inspection/checklist	<input type="checkbox"/> Select From
List	
Quality control needs improvement	<input type="checkbox"/> Select From List
<i>Comment:</i>	
Was communication adequate? Y e s	
Misunderstood verbal communication	<input type="checkbox"/> Select From List
No communication or not timely	<input type="checkbox"/> Select From List
<i>Comment:</i>	
Is the management system adequate? Y e s	
Organization	<input type="checkbox"/> Select From List
Corrective action	<input type="checkbox"/> Select From List
Oversight/employee relations	<input type="checkbox"/> Select From List
Standards/policies/admin control not used/in place	<input type="checkbox"/> Select From List
Standards/policies/admin controls need improvement	<input type="checkbox"/> Select From List
<i>Comment:</i>	

ROOT CAUSE ANALYSIS		
Is the human engineering adequate? Yes		
Complex system	<input type="checkbox"/>	Select From List
Human / machine interface	<input type="checkbox"/>	Select From List
Non-fault tolerant system	<input type="checkbox"/>	Select From List
Work environment	<input type="checkbox"/>	Select From List
Error enforcing conditions	<input type="checkbox"/>	Select From List
Violation Producing Conditions	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was the immediate supervision adequate? Yes		
Preparation	<input type="checkbox"/>	Select From List
Selection of worker	<input type="checkbox"/>	Select From List
Supervision during work/immediately unavailable	<input type="checkbox"/>	Select From List
Was the plant design adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was the hardware adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was the maintenance management adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was housekeeping adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was there clear guidance about priorities? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Were the defences adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was the contractor management and alignment adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		
Was hazard identification adequate? Yes		
	<input type="checkbox"/>	Select From List
Comment: [Redacted]		

ROOT CAUSE ANALYSIS

Were there any other contributing factors? No

CORRECTIVE ACTIONS

No.	Category	Description	Issued To	Due Date
1	Select From List			
2	Select From List			
3	Select From List			
4	Select From List			
5	Select From List			
6	Select From List			
7	Select From List			
8	Select From List			

PICTURES

You may insert up to 4 photographs relevant to the incident. Include a caption in the text box below the frame. Please be sure to reduce file size prior to inserting them into the document.

Fig.1	Fig. 2
Fig. 3	Fig. 4

INVESTIGATOR'S ACKNOWLEDGMENT

Investigation team members:

Investigator comments and key learning's:

Signature:

Date:

SafeStart REVIEW

In your opinion what were the states of people involved prior to the incident?

- | | |
|---|--|
| a. <input type="checkbox"/> Rushing | c. <input type="checkbox"/> Fatigue |
| b. <input type="checkbox"/> Frustration | d. <input checked="" type="checkbox"/> Complacency |

What do you believe contributed to these states? NA

What critical errors did you think contributed to the incident?

- | | |
|--|---|
| a. <input type="checkbox"/> Eyes not on task | c. <input type="checkbox"/> Line of fire |
| b. <input type="checkbox"/> Mind not on task | d. <input type="checkbox"/> Balance/Traction/Grip |

Can you provide further information on the errors? NA

N/A

What critical error reduction techniques could have prevented these errors or avoid a similar incident from happening again?

- | |
|--|
| a. <input type="checkbox"/> Self triggering on the state or amount of hazardous energy so you don't make a critical error. |
| b. <input type="checkbox"/> Analyzing close calls, and small errors to prevent agonizing over big ones. |
| c. <input type="checkbox"/> Look at others for the patterns that increases the risk of injury. |
| d. <input type="checkbox"/> Working on improved habits |
| e. <input type="checkbox"/> Other technique: _____ |

Why do you feel these techniques could be effective?

NA

Print Report

APPENDIX D

Site Waste Management Plan

May 2017

Site Waste Management Plan (SWMP)
Woodsmith Mine Site

Contractor: AMC UK

Client: Sirius Minerals PLC

AMC UK Contract Number: RPA - 127

Scheme: Phase 4 – Diaphragm Wall
Construction

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	Name	Role	Signature	Date
Prepared by	Hugh Medcalf	HSE Advisor		25/05/17
Reviewed by	-	Engineering		25/05/17
Approved by	Jonathan White	Operations Director		25/05/17

Employer Acceptance

	Name	Role	Signature	Date
Checked by				
Accepted by				

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1.0 INTRODUCTION

This Site Waste Management Plan (SWMP) provides a stand-alone framework for dealing with wastes arising from the Phase 4 Construction activities associated with the new mine surface development at Woodsmith Mine (Off B1416), Sneatonthorpe, North Yorkshire, YO22 5HZ, (hereafter referred to as 'the Site').

Phase 4 Construction activities include the following main phases of works:

- Operation of the concrete batch plant;
- Installation, commissioning and operation of the bentonite plant and associated temporary structures;
- Installation of concrete guide walls (excavate to -3.5m and concrete wall down to -1.5 to -1.75 m);
- Mobilisation to site of diaphragm walling equipment (cutters, cranes, workshops etc.); and
- Diaphragm wall construction to -60m below ground level at the Production, Service and Mineral Transport System shafts.

The exact nature of the works is outlined in the Phase 4 design documents. These identify activities that are likely to generate materials and waste for either re-use and/or disposal. The proposed locations of the works activities are shown on Drawing 40-ARI-WS-71-CI-DR-1081 provided in Appendix A of the Environmental Management Plan.

The SWMP is a dynamic document and should be reviewed and updated at regular intervals to ensure that it remains relevant in the context of activities being undertaken on Site and any changes to legislation and regulations.

The SWMP has been prepared to enable a framework for the careful identification, segregation, management and recording of waste movements within and from the Site and to ensure that the duty of care requirements are met.

1.1 Programme of Works

The proposed start date for Phase 4 Construction activities is July 2017 with the works anticipated to be completed in March 2018.

2.0 OBJECTIVE

Sirius Minerals (the Client and 'mine operator') and AMC UK are committed to implementing the Environmental Management Plan (EMP) and the SWMP so that works on Site are effective and economical whilst minimising impacts on the environment.

To effectively manage waste on Site, the approach outlined in the SWMP involves the effective planning, managing, monitoring and reporting of waste streams.

3.0 ROLES AND RESPONSIBILITIES UNDER THE SWMP

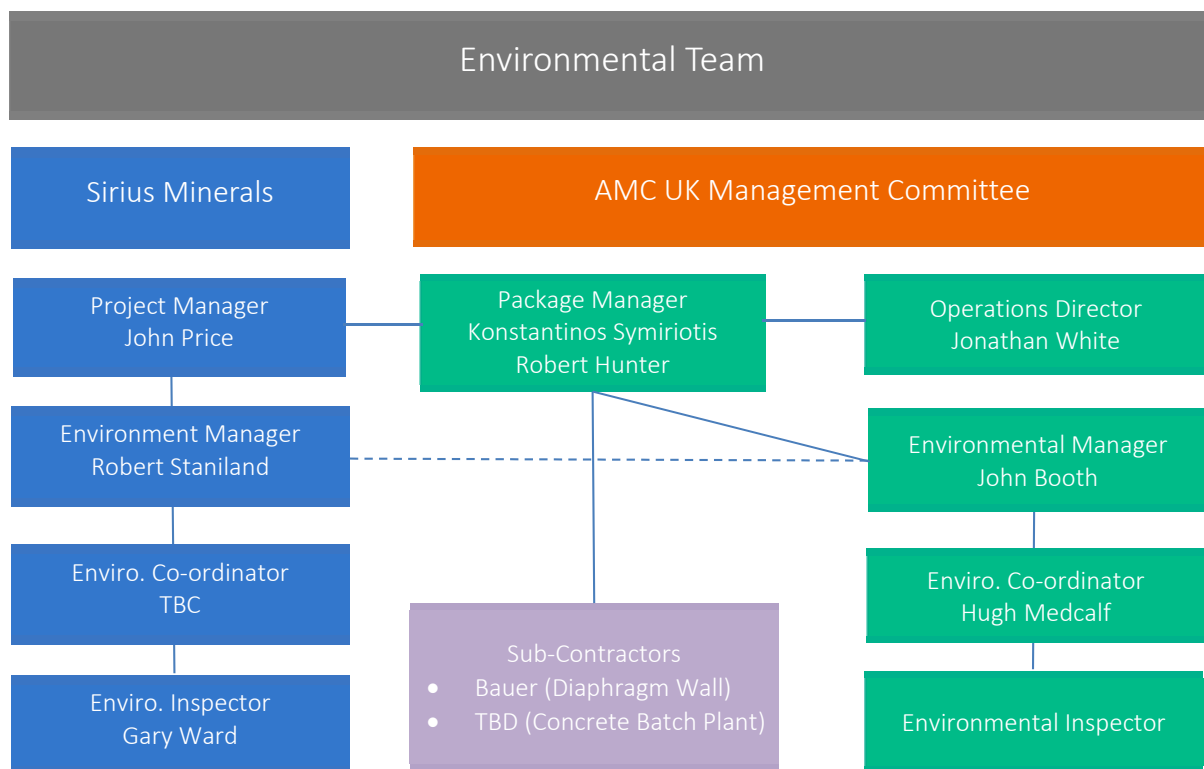
The Site will be established as a stand-alone operation, owned and directed by Sirius Minerals (mine operator), with day to day construction activities undertaken by AMC UK (the contractor). The AMC UK Environmental Manager and Package Manager will maintain communication with the Client's senior management via the Sirius Minerals Environment Manager.

The implementation of the SWMP will be the responsibility of the AMC UK Environmental Manager, overseen by the AMC UK Package Manager and the Sirius Minerals Environment Manager.

Table 1: Key Project Roles

Position	Name	Contact Details
Client (mine operator)	Sirius Minerals PLC Environment Manager - Robert Staniland	7 – 10 Manor Court Manor Garth, Scarborough
Operations Director	AMC UK - Jonathan White	7 – 10 Manor Court Manor Garth, Scarborough
Package Manager (Diaphragm Wall Construction)	Robert Hunter, AMC UK	
Package Manager (Concrete Batching Plant)	Konstantinos Symiriotis, AMC UK	
Environmental Manager	AMC UK – John Booth	
Site Supervisor	Bauer	TBD
Site Supervisor	TBD	TBD
Document Controller	Kath Davis, AMC UK	

All staff working on the Site will have been selected on the basis of competency and relevant experience. Site staff will be supported by the AMC UK management team (Package Manager and Environmental Manager) who will be based on Site throughout the duration of the project. The AMC UK Environmental Manager will be the co-ordinator for the SWMP process and as such responsible for ensuring training, implementation and oversight of SWMP procedures.



4.0 LEGAL COMPLIANCE

AMC UK and any associated subcontractors will comply with relevant legislation by:

- Identifying and describing the waste correctly on waste documentation;
- Preventing the escape of waste;
- Storing hazardous wastes separately from other wastes;
- Transferring waste to authorised waste carriers;
- Disposing of wastes at licensed waste management facilities;
- Keeping records; and
- Storing skips on hard-standing in a secure area.

Both AMC UK and the Client must take reasonable steps to ensure that sufficient Site security measures are in place to prevent the illegal disposal of waste on the Site.

Waste generated from the construction activities will be removed from Site and sent for recycling or disposal using a registered waste carrier to a licensed recycling facility, transfer station, landfill site, licensed incineration plant or to a site or facility holding an appropriate Exemption from the Environment Agency.

AMC UK will undertake appropriate due diligence on all its appointed waste sub-contractors, including reviewing permits, licences and potentially even auditing sites. The validity of licences (waste carriers, collectors, site licences and waste management licences/permits) will be checked on the Environment Agency public register. These documents will be filed in the Project Management file along with any correspondence.

The Waste (England and Wales) Regulations 2011 require all inert or non-hazardous waste leaving Site has to be accompanied by a Waste Transfer Note. Waste Transfer Notes (or copies of them) will be retained on Site. A record (either paper or electronic) of any waste transfers must be retained for two years.

AMC UK will ensure that Waste Transfer Notes contain all the required information, including (but not limited to) an accurate description of the waste, time and date of transfer and the quantity. In order to avoid non-compliant Waste Transfer Notes (often provided by third party waste carriers) an AMC UK 'Waste Transfer Note' check sheet will be completed, where required.

An assessment of waste to be transferred for disposal or re-used on Site will be carried out by the Environmental Co-ordinator in order to determine whether or not the waste is classified as hazardous.

Where waste is to be transferred as hazardous waste, then this falls under the Hazardous Waste (England and Wales) Regulations 2005. This will be dealt with in accordance with the Regulations and will require the completion of Hazardous Waste Consignment Notes. Copies of these will be retained for at least three years.

5.0 AUDITING OF SWMP

The AMC UK Package Manager and Environmental Manager will monitor the effectiveness and accuracy of the SWMP at regular intervals during Site audits. Regular audits and reviews of the SWMP and associated procedures and document retention requirements will be carried out.

Duty of care checks will be undertaken as standard for all new licensed waste contractors. Minimum requirements will be that any waste operators, and any Sites to which the waste is being taken, hold a permit under the Environmental Permitting (England and Wales) Regulations 2016 or are registered (under those Regulations) as a waste operation exempt from the need for such a permit.

A schedule for auditing the SWMP will be agreed between Sirius Minerals and the AMC UK Environmental Manager.

6.0 RECORD KEEPING

An up to date copy of the SWMP will be maintained at the main Site office. Associated records will be held in the AMC UK SWMP files, including copies of waste carriers licences, environmental permits, waste transfer notes and consignment notes. Records of waste transfers may be requested by an authorised officer of the Environment Agency or local authority on demand within seven days.

Measurements of the quantities of waste materials reprocessed and reused within the project or recycled / disposed of off-Site will also be recorded and used to report on key performance indicators (KPIs).

7.0 REVIEW

A review of the SWMP will be undertaken on a 6 monthly basis by AMC UK and Sirius Minerals. The review will cover performance against waste targets, identification of any potential improvements / cost savings to waste handling procedures and contracts, and re-forecasting of anticipated waste production levels for the following period. Both parties will also ensure that any changes in roles and responsibilities identified in this review are clearly communicated to those affected.

8.0 DISTRIBUTION

The SWMP will be distributed electronically to Sirius Minerals, the AMC UK Environmental Manager, Package Manager(s) and the Site Supervisor and all applicable subcontractors working on Site. Re-distribution will occur every time the SWMP is updated as defined by the Document Control process.

9.0 TRAINING

All staff and contractors will receive basic training on waste segregation, re-use and recycling on Site during Site inductions and tool box talks. Specific training relating to environmental issues will be delivered for key Site staff (namely Site Supervisor(s), concrete and bentonite plant manager(s) etc.)

AMC UK will maintain a training register to record training and induction(s) and to monitor qualification expiry. Induction documentation and copies of qualifications and competencies shall be maintained within this training register. The training register shall be regularly reviewed to monitor qualification expiry and to update induction and training records for all personnel.

10.0 IDENTIFIED WASTE STREAMS

The following summarises the main waste streams anticipated to be generated from the construction activities

Table 2: Summary of Waste Types Anticipated to be generated as part of Construction Activities

Construction Activity	Type of waste material
Mobilisation of plant, cranes and machinery	Timber (from pallets).
	General waste (packaging) from mobilisation process.
Guide Wall Construction	<i>Excavated soils from the guide wall excavations are not defined as 'waste'. They will be re-used on site in accordance with a Material Management Plan.</i>
	Excavated soils from the guide wall excavations that do not meet the standards for re-use under a Material Management Plan ¹ .
	Timber (from guide wall formwork).
	Scrap metal (reinforcing bar/ mesh from guide walls construction).
	Concrete (surplus batches).
Installation, commissioning and operation of the bentonite plant (including workshop).	<i>Excavated soils from the diaphragm wall excavations and outputted from the bentonite plant desander unit are not defined as 'waste' (depths unlikely to intersect pyritic mudstone classified as a NHNI material²). This material will be re-used on site in accordance with a Material Management Plan.</i>
	Excavated soils from the construction of the bentonite plant slab excavations that do not meet the standards for re-use under a Material Management Plan ¹ .
	Waste diaphragm wall support slurry.
	Excess water from the desanding spoil heap and support slurry plant operation
	Timber (from packaging and broken pallets)
	General waste (packaging)
	Waste engine/hydraulic oil (from workshop and plant operations)
	COSHH materials (from workshop, including used filters, grease cartridges, aerosols, oily rags etc.)
Operation of the concrete batching plant	Concrete (surplus or 'out of specification' batches)
	Concrete truck washout waters

¹ It is anticipated that the majority of soils excavated as part of the guide wall construction will be suitable to be re-used on Site within landscaped bunds, as defined in a Material Management Plan. The suitability of this material to be re-used will be confirmed via soil sampling conducted in accordance with a Material Management Plan.

² The material generated from the bentonite plant desander will be predominantly excavated soil/rock materials from the diaphragm wall panels with minor bentonite content and potential trace amounts of slurry additives.

Construction Activity	Type of waste material
	General waste (packaging, pipework off cuts etc.)
	Waste engine oil and greases (from generator and plant operations)
Excavation and construction of the diaphragm walls, including cutting of overlapping panels to form the circular diaphragm walls, construction and installation of reinforcement cages, concreting of panels.	<i>Limited excavated soils from the diaphragm wall excavations (limited material generated at the panel location) are not defined as 'waste' (depths unlikely to intersect pyritic mudstone classified as a NHNI material). This material will be re-used on site in accordance with a Material Management Plan.</i>
	Waste diaphragm wall support slurry/concrete mix (formed at the panel locations and from the clean out of the delivery lines).
	Scrap metal (panel cage manufacture and set up).
General Site Operations	Recyclable waste from office and welfare areas.
	General waste from office and welfare areas.
	Domestic wastewater.
	Sanitary waste.

Section 15.0 outlines the anticipated volumes/mass of above wastes likely to be generated as part of the Phase 4 Construction Works.

11.0 MINIMISATION OF WASTE IN LINE WITH WASTE HIERARCHY

From the planning stages, opportunities to minimise wastes produced on Site have been considered. Design teams, Contractors and suppliers are tasked with looking at ways to minimise the amount of waste associated with the Phase 4 Construction activities.

During the Phase 4 Construction activities, wastes will be minimised through adoption of the following procedures:

- Soils excavated as part of the guide wall and diaphragm wall installation will be re-used on Site in accordance with a Material Management Plan in predefined mounds and are therefore not considered to be waste (as defined by the CL:aire The Definition of Waste CoP). This will reduce waste soils significantly, with only soils out of specification considered for off-Site disposal.
- Opportunities will be taken to separate fine particulate matter from used support fluids to optimise re-use options for the support slurry.
- Appropriate procurement of materials (volumes and options to use recycled materials).
- Use of 'Just in Time' delivery of raw materials to ensure that raw materials (aggregate and concrete for guide wall construction etc.) are not wasted or lost to the environment.
- Operation of a take back scheme for excess materials.
- Procedures for energy management and sustainable use of plant and fuels.

12.0 SEGREGATION AND STORAGE

Specific waste compound(s) will be laid out and labelled to facilitate the separation and storage of materials for re-use, recycling, and disposal.

The wastes generated will be temporarily stored in suitable containers, skips or controlled areas (where possible this will be located on hard standing). The skips or waste storage areas will be clearly marked and segregated and suitable to contain the waste being stored.

For the small volumes of hazardous wastes likely to be generated (e.g. oils and greases) these will be stored separately in suitable containers and clearly marked/labelled to identify the contents and control measures required to handle and dispose of the waste.

13.0 MANAGEMENT OF WASTES

Waste materials will not be stored within an individual location for more than 28 days, in line with the Permitted Development Rights³. Where materials cannot be re-used, recycled, or recovered, this waste will be disposed of to an appropriately permitted Site. No materials will be stored on land within a Site of Specific Scientific Interest/Specific Area of Conservation (SSSI/SAC).

Records of waste transfer notes will be maintained within the SWMP folder.

13.1 Excavated Soils/Rock

Soil/rock being excavated as part of the guide walls and the diaphragm wall construction are not considered to be classified as 'waste'. Soils generated from the Phase 4 construction works will therefore be retained on-Site in accordance with a Material Management Plan in landscaped mounds.

Excavated soils that do not meet the specification for re-use on-Site (either environmentally or geotechnically) will be stockpiled, tested and an appropriate disposal option defined (either re-use on-Site following treatment or disposed off-Site).

13.2 Waste Support Fluid

The support slurry is a mixture of water combined with bentonite and polymer additives. As part of the diaphragm wall construction process, the returning support slurry is circulated through the desanding system in order to remove suspended soil/rock particles prior to being recycled for subsequent batches.

Depending on the soil/rock properties excavated as part of the diaphragm wall excavation and returned within the support slurry to the desander and the impact of concrete (from overlapping panels), the efficiency of the support fluid will be impacted and the exhausted support slurry will require disposal as waste. The returned support slurry will also be treated with a decanter to reduce the volume of waste slurry.

The waste support fluid will be temporarily stored in tanks prior to disposal off-site to a licensed facility.

13.3 Recyclable Waste

AMC UK will aim to maximise the recycling opportunities and will separate waste streams to facilitate this. Scrap metal, wood and general recyclable waste from the construction activities and the office and welfare areas will be segregated and stored in appropriate skips located in defined waste storage areas. The locations of these waste storage areas / skips will be presented on Site plans clearly displayed in the various Site offices and welfare buildings. Recyclable materials will be removed from Site by an appropriately licensed waste contractor for recycling.

³ The Town and Country Planning (General Permitted Development) (England) Order 2015, Part B Temporary Use of Land.

13.4 Oils and Greases and other Hazardous Wastes

Although it is not anticipated that significant quantities of hazardous waste will be generated on Site, all such waste will be stored separately from non-hazardous waste in fully sealed containers. Different streams of hazardous waste will be stored separately to prevent cross contamination before being disposed of in accordance with the legislation governing the storage, transportation and disposal of hazardous waste.

13.5 Vehicle Washings

Sirius Minerals will operate a Site wide vehicle/wheel washing facility at the mine Site entrance. All vehicles associated with the Phase 4 Construction works will use this facility as they leave the Site.

13.6 Concrete Residues

Concrete wastes (surplus or out of specification batches, washout water from the trucks etc.) will be stored in skips or proximal to the concrete batching plant for either re-use on Site as engineering material or disposed off-Site via an agreed disposal route. Truck wash out waters (collected in the truck washout facility) will be temporarily stored in tanks prior to either disposal off-site or re-use in the batching plant.

13.7 General Office Waste

General waste will be stored within labelled skips and disposed or recycled through a permitted waste facility.

13.8 Domestic Wastewater

Domestic wastewater will be collected in waste tanks and will be removed from Site on a regular basis via tanker and disposed of to a suitably permitted facility.

13.9 Sanitary Waste

Sanitary waste will be temporarily stored in temporary effluent tanks and will be removed from Site on a regular basis via tanker, and disposed of to a suitably permitted facility.

14.0 REGISTER OF WASTE CARRIER LICENCES AND PERMITS

Where waste has to be transported off Site, registered waste carriers will be employed, ensuring all waste is sent to appropriately permitted Sites via agreed routes.

Waste consignment or transfer notes will be retained to provide a robust audit trail. All waste will be classified according to current legislative requirements, industry best practice, and the European Waste Catalogue Code.

Table 3: Example of Waste Records to be Collected

Waste description	EWC Code	Origin (who produced the waste)	Waste Carrier Name	Waste Carrier Licence Numbers

15.0 FORECASTING WASTE PRODUCTION

15.1 Mobilisation of Plant, Cranes and Machinery

The following presents a summary of the anticipated waste volumes likely to be generated from the mobilisation process.

Table 4: Forecast of Waste Streams from the Mobilisation

Type of waste material	Estimated quantity	Material condition	Place waste generated
Timber (from pallets)	1 skip	Waste timber, old pallets	Locations where plant and machinery is unloaded.
General waste (packaging) from mobilisation process	1 skip	Waste plastics and packaging	Locations where plant and machinery is unloaded.

15.2 Construction of Guide Walls

The following presents a summary of the anticipated waste volumes likely to be generated from the construction of the guide walls.

Table 5: Forecast of Waste Streams from the Guide Wall Construction

Type of waste material	Estimated quantity	Material condition	Place waste generated
Guide wall excavated material	500 m ³	Dry/wet excavated ground	<u>Not defined as waste</u>
Guide wall excavated material (out of specification material)	<u>Volumes unknown – (assumed to be minimal)</u>	Dry/wet excavated ground	Guide Wall location
Timber	3 skips	Off cuts from form work	Guide Wall location
Scrap metal	5 skips	Rebar offcuts etc.	Guide Wall location
Concrete (surplus out of specification batches)	4 skips	Concrete	Guide Wall location

15.3 Installation, Commissioning and Operation of the Bentonite Plant (including workshop)

The following presents a summary of the anticipated waste volumes likely to be generated from the installation and operation of the support slurry batch plant and associated workshop facility.

Table 6: Forecast Waste Streams from the Support Slurry Batch Plant

Type of waste material	Estimated quantity	Material condition	Place waste generated
Excavated soils from the diaphragm wall excavations (output from desander unit).	26,500 m ³	Dry/wet excavated soil/rock containing trace bentonite residues.	<u>Not defined as waste</u>
Excavated soils that do not meet the standards for re-use under a Material Management Plan	<u>Volumes unknown – (assumed to be minimal)</u>	Dry/wet excavated soil/rock containing trace bentonite residues.	Desander or at panel location
Waste diaphragm wall support slurry (following treatment)	23,000 m ³	Waste support slurry / water	Bentonite plant or at panel locations
Excess water from the desanding spoil heap and support slurry plant operation	5 m ³ per day	Excess water from bentonite plant operations	Bentonite plant
Timber (from packaging)	1 skip	Packaging from raw material deliveries.	Bentonite plant
General waste (packaging)	1 skip	Packaging from raw material deliveries.	Bentonite plant
Waste engine/hydraulic oil (from workshop and plant operations)	100 l per week	Waste engine/hydraulic oil from machine maintenance	Workshop
COSHH (from workshop, including used filters, grease cartridges, aerosols, oily rags etc.)	1 drum per week	Used filters, grease cartridges, grease buckets, aerosol cans, oily rags etc.	Workshop

15.4 Operation of the Concrete Batch Plant

The following presents a summary of the anticipated waste volumes likely to be generated from the operation of the concrete batch plant.

Table 7: Forecast Waste Streams from the Concrete Batch Plant

Type of waste material	Estimated quantity	Material condition	Place waste generated
Concrete (surplus or 'out of specification' batches)	1 m ³ per day	Concrete	Returned concrete batches to the concrete batch plant facility.
Concrete truck washout waters	5 m ³ per day	Sediment loaded water	Concrete truck wash out facility.
General waste (packaging, pipework off cuts etc.)	1 skip	Waste plastics and packaging.	Concrete batch plant
Waste engine oil and greases (from generator and plant)	100 l per month	Waste engine/hydraulic oil from machine/plant maintenance.	Concrete batch plant

15.5 Construction of Diaphragm Walls

The following presents a summary of the anticipated waste volumes likely to be generated from the excavation and construction of the Diaphragm Walls.

Table 8: Forecast Waste Streams from the Construction of the Diaphragm Wall

Type of waste material	Estimated quantity	Material condition	Place waste generated
Excavated soils from the diaphragm wall excavations (at panel locations).	500 m ³	Dry/wet excavated soil/rock containing trace bentonite residues.	<u>Not defined as waste</u>
Waste diaphragm wall support fluid	5 m ³ per panel	Sediment loaded water	Washout of bentonite lines
Scrap metal (cage manufacture and installation)	5 skips	Cage offcuts etc.	Diaphragm wall

15.6 General Waste

The following presents a summary of the anticipated waste volumes likely to be generated as general waste streams from the offices and welfare facilities.

Table 9: Summary of Forecast General Waste Streams

Type of waste material	Estimated quantity	Material condition	Place waste generated
Sewage from welfare unit	From 20 person welfare unit, estimated 1000 l per day	Liquid sewage	Welfare block
Mixed waste	1 skip per week	Mixed waste	Welfare/workshop
Paper/cardboard	1 skip per month	From office & packaging	Welfare/office/workshop
Plastic	1 skip per month	From packaging	Welfare/office/workshop

15.7 Waste Targets

AMC UK has defined its Waste Targets for the project. These are included below:

- Maximise beneficial re-use of excavated materials arising from construction activities;
- Adopt segregation of waste to manage and optimise recycling and re-use options;
- Minimisation of waste generation via effective site management; and
- Monitor energy and water use and undertake a review following six months of operations;

Relevant monitoring programmes and record keeping will be implemented by the Environmental Manager and reviewed by the Package Manager. Progress against these targets will be reviewed monthly by the Environmental Manager and reported in the environmental review meetings.

16.0 IMPLEMENTATION OF THE SWMP

The following checklist should be completed by the AMC UK Environmental Manager and those managing the works.

Item	Actions	Yes / No	Comment: If 'yes', what action has been taken? If 'no', why not?
1	Has SWMP administration and planning been fully completed?		
2	Have all key wastes been prioritised and forecasted?		
3	Have re-use/recycling/disposal options been identified for all waste streams?		
4	Have all off Site waste destination details been verified?		
5	Have data reporting procedures been agreed with relevant waste management contractor(s)?		
6	Has a waste collection/segregation area been prepared?		
7	Has the waste area been adequately labelled/signposted?		
8	Has an SWMP planning/review meeting been set?		
9	Has SWMP document control and filing system been set up?		
10	Have all necessary Site staff and contractors received and understood the SWMP?		
11	Have all SWMP training needs been met?		
12	Have waste management targets/KPIs been set?		
13	Has the SWMP been approved by (insert relevant people)?		

17.0 FORECAST VERSUS ACTUAL QUANTITIES

The following summary is to be monitored during the works and completed at the end of the project along with a review of the efficacy of the SWMP process.

Waste Materials	Forecast quantity (m ³)	Actual quantity (m ³)	Reason for variance	Target met/failed (quantity or procedural targets) if relevant
Mobilisation of Plant, Cranes and Machinery				
Timber (from pallets)	1 skip			
General waste (packaging) from mobilisation process	1 skip			
Construction of Guide Walls				
Guide wall excavated material	500 m ³			
Guide wall excavated material (out of specification material)	<u>Volumes unknown – (assumed to be minimal)</u>			
Timber	3 skips			
Scrap metal	5 skips			
Concrete (surplus batches)	4 skips			
Installation, commissioning and operation of the bentonite plant (including workshop)				
Excavated soils from the diaphragm wall excavations (output from desander unit).	26,500 m ³			
Excavated soils that do not meet the standards for re-use under a Material Management Plan	<u>Volumes unknown – (assumed to be minimal)</u>			
Waste diaphragm wall support fluid (following treatment to reduce waste volumes)	23,000 m ³			
Excess water from the desanding spoil	5 m ³ per day			

Waste Materials	Forecast quantity (m ³)	Actual quantity (m ³)	Reason for variance	Target met/failed (quantity or procedural targets) if relevant
heap and support slurry batch plant operation				
Timber (from pallets)	1 skip			
General waste (packaging)	1 skip			
Waste engine/hydraulic oil (from workshop and plant operations)	100 l per week			
COSHH (from workshop, including used filters, grease cartridges, aerosols, oily rags etc.)	1 drum per week			
Operation of the Concrete Batch Plant				
Concrete (surplus or 'out of specification' batches)	1 m ³ per day			
Concrete truck washout waters	5 m ³ per day			
General waste (packaging, pipework off cuts etc.)	1 skip			
Waste engine oil and greases (from generator and plant)	100 l per week			
Construction of Diaphragm Walls				
Excavated soils from the diaphragm wall excavations (at panel locations)	500 m ³			
Waste diaphragm wall support fluid (treated)	5 m ³ per panel			
Scrap metal (cage manufacture and installation)	5 skips			

Waste Materials	Forecast quantity (m ³)	Actual quantity (m ³)	Reason for variance	Target met/failed (quantity or procedural targets) if relevant
General Waste				
Sewage from welfare unit	From 20 person welfare unit, estimated 1000 l per day			
Mixed waste	1 skip per week			
Paper/cardboard	1 skip per month			
Plastic	1 skip per month			

18.0 LESSONS LEARNT

To be completed at the end of the project.

APPENDIX E

Minimum Pollution Prevention Guidance

PPG 001 'Fuel & Oil Storage and Handling'

PPG 002 'Cementitious Material Storage and Handling'

PPG 003 'Excavation and Stockpile Activities'

PPG 004 'General Housekeeping'

PPG 005 'Support Slurry Production, Storage and Handling'

FUEL & OIL STORAGE AND HANDLING (PPG - 001)

This Pollution Prevention Guidance (PPG) provides guidance on the storage and handling of fuels (diesel or petrol) on-site. The aim of this PPG is to set minimum standards to reduce potential risks arising from the loss of fuels to ground or to water bodies (surface or groundwater). Other measures may be required on a case by case basis.

1.0 LEGISLATIVE REQUIREMENTS

The storage of oil or fuel will comply with the requirements of the Control of Pollution (Oil Storage) (England) Regulations 2001.

These regulations apply to any kind of container which is being used and stored above ground and situated outside a building - meaning a fixed tank, intermediate bulk container, drum (oil drum or similar container used for storing oil) or mobile bowser – with a storage capacity which exceeds 200 litres.

The Regulations above may contain specific requirements and these should be referenced to ensure full compliance.

2.0 PRACTICE

2.1 General Information on Fuel Storage Requirements

The majority of Phase 4 work activities will require the delivery, storage and handling of fuels (predominantly diesel to supply power to plant and generators). Fuel will be stored in either the fuel tanks of the mobile plant and machinery or in static fuel tanks linked to power generators.

2.2 Siting of Fuel Storage

The siting of the fuel storage facilities will be based on the requirement for ease of access (delivery and use), locality to required generators, plant and machinery; and locality to high risk locations or receptors. These high risk locations, or receptors, include:

- within 50 metres of a spring or well;
- within 10 metres of a watercourse; or
- areas where unplanned fuel releases could enter open drains boreholes, or soak into the ground, where it could pollute groundwater or surface water.

The storage of fuels on-site will include one or more of the following:

- storage of fuel within mobile plant and vehicles (fuel tanks);
- static fuel storage tanks linked to static plant, such as generators; and
- backup mobile fuel bowsers.

The siting of the static fuel storage tanks and backup mobile bowsers will take into account pollution prevention and health and safety aspects of filling the storage tank, including safe access and egress of the fuel tanker, the alignment of delivery pipes and access to the tank.

The static fuel tanks powering the generators and the storage location for mobile bowsers will be positioned in order to minimise the risk of damage from collision with mobile plant.

Tanks shall be located taking into consideration any potential security threats e.g. theft and acts of vandalism. In any event all tanks will be locked to protect from unauthorised use.

All static fuel tanks and bowsers will be **integrally banded tanks**. These have a primary container manufactured with integral secondary containment that holds a minimum of 110% of the volume of the inner tank and offer improved levels of pollution prevention. Ancillary equipment will be positioned within the

secondary containment. Static fuel tanks (such as those linked to generators) will be sited on sealed level ground adjacent to the generators.

All storage tanks are to be installed by suitably qualified and experienced personnel, in accordance with the manufacturer's instructions.

All storage tanks should be type tested to a recognised standard and produced to that standard under a quality assurance system complying with ISO 9001.

All storage tanks will display appropriate labels with details of the contents, tank manufacturer, make, model and capacity markings.

The number and location of the static fuel tanks shall be clearly shown on site layout drawings and distributed to all relevant workers.

Fuel will also be stored in the fuel tanks of the mobile plant and machinery distributed within the works area.

2.3 Fuel Deliveries

Prior to organising the fuel delivery the Site Supervisor will assess the:

- Fuel levels within the fuel tanks will be routinely monitored by AMC UK's Supervisor and fuel deliveries booked accordingly to demand.
- Weather forecasts shall be monitored and, when inclement weather is expected, fuel levels deliveries shall be brought forward or delayed, as required.

The following outlines guidance on the process for managing the delivery of fuels to site.

- Fuel will be delivered to the Woodsmith Mine via fuel tankers by registered fuel supply organisations.
- On arrival the delivery driver will be inducted and sign in to the site. They will meet with the Site Supervisor to confirm the locations of fuel tanks and plant requiring fuel, the volumes and type of fuel to be delivered, the nature of construction works being undertaken and confirm understanding of the hazards (human health and environmental) and control measures outlined in the Fuel Delivery RAMS (supplied by the delivery organisation).
- Where appropriate, the delivery driver will then be escorted by a support vehicle (containing additional spill kits and fire extinguishers).
- At each delivery location an exclusion area will be set up and the fuel tanks and plant refuelled in accordance with the Fuel Delivery RAMS.

2.4 Refuelling

- Refuelling will be undertaken in accordance with the guidance provided in the Safe Working Procedure SWP 008 'Refuelling' and the Fuel Delivery RAMS. Care will be taken to ensure there is no potential source of ignition (flame, electrical, static, etc.).
- Delivery of fuel will be supervised at all times and checks will be made to ensure that the correct type and quantity of fuel is being delivered. This fuel supervisor will also control the keys to the locked tanks.
- The delivery driver will ensure that the delivery lines and connection to the tank fill point and the tanker are correct and secure prior to commencing the refuelling process.
- Fuel vapours are flammable. To prevent the possibility of personal injury, the refuelling of plant or generators will only be undertaken when the plant or generator is shut off. Appropriate PPE should be used during refuelling (as defined in the RAMS).

- Signs detailing the refuelling procedures will be posted in the area with information relating to the location of the nearest oil spill kit. Personnel trained in the deployment of spill kits will be present during all fuel delivery and re-fuelling activities.
- Refuelling of plant and machinery on site will be undertaken using drip trays and plant nappies to ensure that any minor spillages (drips) are contained. In the event of a fuel spillage, this will be cleared up using oil spill kits.
- Overfill prevention devices will form part of the refuelling safeguards. These can be electronic or mechanical which either sound an alarm and/or give a visual warning or automatically stop the fuel delivery into the tank (such as a trigger nozzle).
- During refuelling, monitoring of the condition of fuel lines, fuel tanks and the generators will be made.
- A notice giving details on safe delivery procedures (SWP 008) and what to do in an emergency will be sited at the delivery point.

2.5 Inspection and Maintenance

All tanks will be maintained in accordance with the manufacturer's specification, but as a minimum, will be inspected as follows:

- Visual inspection for leaks, loose joints and oils staining, prior to re-fuelling any machinery or plant or receiving a fuel delivery;
- Visual inspection for leaks, loose joints and oils staining undertaken monthly, as part of any routine site inspections; and
- Maintain annually, or as part of any routine maintenance as recommended by the manufacturer.

Inspections and maintenance shall be carried out by a suitably qualified and competent person.

2.6 Record Keeping

In order to monitor fuel consumption and potential losses of fuel, records will be made and maintained at the site for the duration of the works. Such records include the following:

- Fuel usage and fuel delivery volumes;
- Maintenance and Inspection reports;
- Fuel spillages (reported in line with the Environmental Incident Reporting Procedure).

3.0 CONTROL MEASURES

The following outlines control techniques to manage potential releases of fuel to ground or surface water from the storage, handling and use of fuels on-site.

Topic	Nature of impact	Environmental Mitigation Measures Identified
Delivery of Fuels	Fuel spilled during transportation of fuels on-site	<ul style="list-style-type: none"> ■ Access to site will be controlled and supervised. ■ Delivery of fuel and oil will be supervised at all times and checks will be made to ensure that the correct type and quantity of fuel is being delivered. ■ Vehicle movements on site (fuel tankers and plant) must adhere to site traffic management controls (speed and traffic routes).

Topic	Nature of impact	Environmental Mitigation Measures Identified
		<ul style="list-style-type: none"> ■ Vehicles must be maintained to a suitable standard.
Storage of fuels in static tanks	Fuel spilled during storage	<ul style="list-style-type: none"> ■ Static tanks will be double skinned with at least 110% secondary containment. ■ All tanks will be sited in an accessible, safe and level location. ■ All tanks will be secured and maintained. ■ All pipelines and fuelling points will be protected from vandalism and unauthorised interference, and will be turned off and locked when not in use. ■ Fuel should not be stored in larger volumes than is required for the operation of the plant and machinery.
Refuelling	Fuel spilled during refuelling	<ul style="list-style-type: none"> ■ Refuelling of plant and machinery will be undertaken in accordance with the relevant RAMS and the Refuelling Procedure. ■ Refuelling lines will have automatic or trigger shut offs. ■ Any drains or access points to surface water in the vicinity of the refuelling point will be blocked off to ensure that any spillages cannot wash into the drainage system or any adjacent watercourses. ■ Plant and machinery will be regularly inspected and well maintained so that leakages do not occur on refuelling (or during use).

4.0 EMERGENCY PROCEDURES

- If safe - Stop the source of the leak or spill using the cut-off valves/taps or contain the leak in a bucket.
- Inform the Emergency Response Coordinator via the site radio.
- Spill kits will be available on-site and at the static tank locations in the event of a spill or leak. These should be deployed by trained personnel.
- Spills must not be washed down into a drains or gully, as these could discharge into a watercourse. Never wash into the ground.
- Do not use detergents to clean up spilt oil; it could cause a worse pollution incident. The detergent itself is likely to be a pollutant and mixes oil into the water.
- Care will be taken to ensure that ignition of released fuel is not possible. If fire starts, commence the Fire Emergency Plan (outlined in the Emergency Response Plan, appended to the CPHSP)
- Fuel spillages will be cleaned up by trained staff in accordance with their training. They will ensure that the oil or fuel contaminated spill kits are disposed of in accordance with the Control of Substances Hazardous to Health Regulations 2002 (as amended).

- Records of the incident will be recorded in accordance with site procedures, including an estimate of losses to the environment.
- Inform relevant stakeholders of incident.
- Implement investigation and corrective or preventative measures.

5.0 REFERENCES

This PPG has been prepared with reference to the following:

- The Control of Pollution (Oil Storage) (England) Regulations 2001. Oils covered by these regulations include petrol, diesel, vegetable, synthetic and mineral oils. They apply to most industrial, commercial and institutional sites storing oil in containers over 200 litres.
- Environment Agency Pollution Prevention Guideline *Above Ground Oil Storage Tanks*: PPG2 (Pollution Prevention Guidelines (PPGs) published by the Environment Agency were withdrawn in December 2015; however, they still form a basis for good operational practice).
- Environment Agency Pollution Prevention Guideline *Dealing with spills*: PPG22.

CEMENTITIOUS MATERIAL STORAGE AND HANDLING (PPG - 002)

This Pollution Prevention Guidance (PPG) applies to Site activities related to the storage and handling of the cement. The aim of this PPG is to set minimum standards to reduce potential risks arising from fugitive dust emissions and loss of cement and wash out materials to the environment. Other measures may be required on case by case basis.

1.0 LEGISLATIVE REQUIREMENTS

The installation, commissioning and operation of the concrete batching plant is covered under planning controls defined for the Woodsmith Mine.

Relevant guidance on general construction activities are outlined in the *Environmental Good Practice – Site Guide (Fourth Edition)* (CIRIA C741).

2.0 PRACTICE

2.1 Commissioning and Operation of Concrete Batching Plant

For the commissioning and operation of the concrete batching plant, fugitive dust emissions will be prevented whenever practicable.

All spillages of dry cement powder to ground which may give rise to dust emissions will be cleaned up promptly, normally by wet handling methods.

2.1.1 Transport of Raw Materials

The cement for the batching plant will be supplied by road tanker or truck by a registered supplier.

No concrete products (cement or aggregate) will be delivered to the site other than by use of a sheeted or enclosed vehicle to minimise particle emissions.

The delivery of cement to site must adhere to the site Traffic Management Plan, including the use of agreed transport routes.

The batching plant slab will have a concrete and bitumen surface capable of being cleaned. They should be kept clean in order to prevent or minimise fugitive dust emissions.

If necessary to prevent visible dust being carried off site, wheel-cleaning facilities will be provided and used by vehicles before leaving the site.

2.1.2 Transfer of Cement to Silos

The delivery of cement must follow the site silo filling procedure and the approved RAMS provided by the cement supply company. These procedures will provide as a minimum information on the following:

- The reporting procedure for the delivery;
- The maximum pressure under which the tanker can discharge to the silo;
- The maximum flow rate for material allowed;
- Procedure for connection to the silo;
- Details of the alarm and pressure release measures and when to stop deliveries;
- Procedures to follow in the event of an incident/release;
- Procedure for venting of residual pressure in the tanker;
- Procedure for locking out of the silo;
- Reporting procedure at the end of the delivery.

The transfer of powdered materials from the tanker to the storage silos will be through a closed system of heavy duty hoses. The delivery of powder from road tankers generally relies on a compressor (blower) mounted on the tanker lorry. The pressure required to fill the silo is dependent on the height of the silo and the pipe length and diameter, this maximum pressure will be pre-defined in the procedures and RAMS.

During the transfer of the cement powder to the silo, the tanker driver must maintain a constant flow of material into the silo without exceeding the flow capacity of the filter system or exerting excessive pressure in the silo (which is not a pressure vessel).

The silo will be installed with automatic protection systems to control the delivery of material from the tanker. The silo will include a pressure relief valve to protect the silo or filter unit. The pressure relief valves will be maintained to prevent pressurisation (the valve needs regular maintenance to prevent cement dust blocking the valve). The silo filter should be able to handle the flow rate of air generated during the delivery process (refer to filter manufacturers supply information on the pressure drop across filters and the filtration rate). The filter systems must also be cleaned to prevent blockages and accumulation of powder in the filter system.

Over pressurisation of the silo can occur due to one or more of the following:

- Increase in flow rate of air from the tanker at the end of discharge;
- Overfilling the silo;
- Failure of the pressure release valve to vent the flow rate from tanker;
- Inadequate flow through the filters;
- Inadequate maintenance or design of the above equipment; and
- Uncontrolled discharge of residual air from the tanker.

The operator should keep a record of the start and finish times of deliveries and report this to the batching plant supervisor.

If dust emission is noted during the filling process, then works will cease and the leak identified and rectified prior to any further delivery.

2.1.3 Operation of the Plant - Start up and Shutdown

Higher risks of dust emissions may occur during the start-up and shut-down of a process. These emissions can be reduced, by minimising, where possible, the number of start-ups and shut-downs and having adequate procedures in place for start-up, shut-down and emergency shut-downs.

All appropriate precautions must be taken to minimise emissions during start-up and shutdown.

2.2 Storage of Aggregate/Sand

The transport, storage and handling of aggregates and sand within the batching plant may also give rise to the potential for dust generation and sediment run-off. These materials will be transported to site in covered trucks and stored in dedicated storage bunds set on hard standing, with dust suppression techniques adopted, if required (such as water mists, covers etc.).

2.3 Concrete Washout

Washout of concrete trucks will occur during both the construction of the initial plant and building slabs (concrete supplied externally) and the construction of the guide walls (externally and internally supplied). This washout will consist of concrete sediment loaded wash water from the cleaning of the trucks. All equipment used for the transport of concrete (internally and externally) will be washed out in a designated washout area specifically designed to contain wet concrete and wash water.

Waste materials from the washout process will be deposited in the truck wash-out system (lined skip or purpose built bunded area) which allows the solids to dry out / settle and overflow water to be collected or filtered for authorised disposal off-site. Wash waters will be stored to allow solids to settle out and where applicable re-circulated to the batch plant to minimise waste and reduce water usage. Solids from the washout process will be reused in subsequent concrete batches or disposed off-site as inert waste.

The concrete wash-out area shall be located well away from any watercourse, drain or other elements sensitive to contamination.

Any wash-water not re-used shall be collected for authorised disposal off-site.

Do not pour or hose down anything from the batching plant into a storm drain or area not covered by the wash-out system.

2.4 Solid Concrete Waste

Solid waste generated from the construction and operation of the batching plant will be managed to ensure that the minimum of surplus solid concrete waste is generated.

The dried solids from the concrete wash out process will be used in subsequent concrete batches. Any additional out of specification material will be disposed of in accordance with the Site Waste Management Plan.

2.5 Inspection and Maintenance

During the construction and operation of the batching plant the contractor/operator will monitor fugitive dust emissions and inspections of the batching plant activities. The following monitoring and emission limits shall be complied with:

Table 1: Summary of Fugitive Air Emission Monitoring - Batching Plant Construction and Operation

Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
Particulate matter	Whole Process	No visible airborne emission to cross the site boundary where harm or nuisance may be caused	Operator observations	At least daily
	Silo inlets and outlets	Designed to emit less than 10mg/m ³	Operator observations. To be recorded in the site Log Book (including start and finish times)	At time of delivery
	Silo inlets and outlets	No visible emission		

All inspections shall be recorded in a log book on a daily basis. Details of visual assessments shall include the following information when a visible emission to atmosphere is apparent:

- 1) Date and time of observation;
- 2) Wind direction;
- 3) Weather conditions;
- 4) Position of observation;

- 5) Assessment of potential cause; and
- 6) Identification of observed plant.

The operator of the batching plant will also continuously monitor for sediment run-off from the batching plant area, especially during periods of heavy rain. The surface water run-off from the batching plant area will be controlled and mitigated via silt traps, drainage ditches, earth bunds, and silt fences.

2.6 Record Keeping

Records will be kept and maintained at the site for the duration of the works. Such records include the following:

- Delivery records of plant and raw materials;
- Commissioning, Maintenance and Inspection reports;
- Cement or material losses (fugitive dust or sediments) (reported in line with the Environmental Incident Reporting Procedure); and
- Disposal records of wastes, including concrete washout wastes and out of specification batches.

3.0 CONTROL MEASURES

The following outlines control techniques to manage fugitive dust and sediment run off.

Table 2: Summary of Control Measures

Activity	Nature of Impact (Sources of dust)	Environmental Mitigation Measures Identified
Delivery of materials to site	Potential fugitive dust emissions, from non-contained sources such as roads and other surfaces	Sheeted or enclosed vehicles to be used for all deliveries Dust suppression (water tankers)
	Loading and unloading processes	Use of containment and suppression of dust using water or proprietary suppressants
	Transfer of cement to mixer	The cement to mixer transfer is contained
	Double handling transfer points	Site and process design

Activity	Nature of Impact (Sources of dust)	Environmental Mitigation Measures Identified
Delivery of cement to silo	<p>Unplanned releases to ground or dust emissions to air</p> <p>Overcharging of silos can cause the pressure relief valve to lift, thereby causing an unacceptable emissions</p>	<p>The silo management system will include the high level alarms, arrestment plant and pressure relief device.</p> <p>Careful delivery by trained personnel will avoid materials being blown into silos at a rate which is likely to result in pressurisation of the silo, especially towards the end of the delivery when the quantity of material entering the ducting is reduced.</p> <p>Deliveries to silos from road vehicles should only be made using tankers with an on-board (truck mounted) relief valve and filtration system.</p> <p>Care should be taken to avoid delivering materials to silos at a rate which is likely to result in pressurisation of the silo. If compressed air is being used to blow powder into a silo then particular care is required towards the end of the delivery when the quantity of material entering the ducting is reduced and hence the air flow is increased.</p> <p>Silos should be fitted with an automatic system to cut off delivery in the event of pressurisation or overfilling.</p>
Silo Operation	Dust generated from the operation of the silos	Use of Dust arrestment, including bag filters and cartridge filters
Aggregate and sand storage	<p>Dust generated from aggregate and sand stockpiles.</p> <p>Sediment run-off from storage areas.</p>	<p>Wind dynamics management, including the use of fencing, bunding, stockpile profiling etc. and storage bays for aggregate stockpiles. Stockpiles should not be higher than the external walls of the bay and should not be forward of the bay. If necessary, covers or dust suppressants should be used.</p> <p>Reduced drop heights.</p> <p>Suppression techniques (water and/or suppressants).</p> <p>Covering materials including below ground or covered stock bins, dust covers and housing indoors.</p> <p>Storage areas should have vehicle hard standing, which should be kept in good repair.</p>

Activity	Nature of Impact (Sources of dust)	Environmental Mitigation Measures Identified
Concrete truck washout	Generation of liquid and solid waste from washing out of the trucks.	Washout of trucks will be undertaken in a controlled manner, with all washout water captured in a 'washout area or facility'. Water from the washout process will be recycled (where applicable) and the solid waste solids reused in subsequent mixes or disposed off-site to a licensed facility.
Concrete waste	Concrete waste generated from the management of spilt cement (wet method control) or surplus material.	Excess concrete (either brought to site or generated in the batching plant) will be minimised by correct ordering of concrete supplied and through the management of construction works. Cement powder lost to the batch plant slab during the commissioning or operation of the batching plant will be wetted and transferred to the washout area or facility for storage and disposal.

4.0 EMERGENCY PROCEDURES

- If safe - stop the delivery of cement.
- Inform the Emergency Response Coordinator via the site radio.
- Minor spillages of cement powder to the batch plant slab should be cleaned up promptly, normally by wet handling methods
- Major spillages shall be dealt with on the same day using, for example, wet handling methods or a vacuum cleaning system (for dry powders). It shall not normally be necessary for a vacuum cleaning system to be available on site at all times, provided that such equipment can be obtained in the event of a major spillage on the same day that it occurs. If this is not practicable measures to minimise fugitive dust emissions, such as dampening the surface to create a crust, shall be taken immediately.
- Records of the incident will be recorded in accordance with site procedures, including an estimate of losses to the environment.
- Inform relevant stakeholders of incident.
- Implement investigation and corrective or preventative measures.

5.0 REFERENCE

- Defra Process Guidance Note 3/01 (12) Statutory Guidance for blending, packing, locating, unloading and use of cement.

EXCAVATION AND STOCKPILE ACTIVITIES (PPG - 003)

This Pollution Prevention Guidance (PPG) applies to construction activities including excavation and stockpiling works. These excavation and stockpiling works relate predominantly to the excavation and construction of the surface guide walls and diaphragm walls at the Production, Service and Mineral Transport System (MTS) shafts.

The aim of this PPG is to reduce the risks arising from fugitive dust emissions and sediment and surface water impacts from excavation and stockpiling activities.

1.0 LEGISLATIVE REQUIREMENTS

The Environmental Protection Act 1990 provides legislation on the control of emissions into the environment from site activities.

Relevant guidance on general construction activities are outlined in the *Environmental Good Practice – Site Guide (Fourth Edition)* (CIRIA C741).

Pollution Prevention Guidelines (PPGs) published by the Environment Agency were withdrawn in December 2015; however, they still form a basis for good operational practice. Relevant PPGs include the following;

- PPG1 – Understanding your environmental responsibilities;
- PPG6 – Working at Construction and Demolition Sites.

2.0 PRACTICE

2.1 Excavations

The following sections outline how potential environmental impacts from surface water, sediments and dust will be managed during any excavation and stockpiling activities associated with the Phase 4 Construction works.

2.1.1 Surface Water Run-off into Open Excavations

Surface water management within the works area needs to be managed to prevent the ingress of surface water (with potential high sediment loading) entering and eroding open excavations (such as the guide wall excavations). To minimise this, excavation works will be planned to avoid periods of heavy rain.

Surface water drainage ditches will be constructed by Sirius Minerals across the Woodsmith Mine site, including around the works area and shaft pads. Surface water run-off from the works area and the wider site will therefore be captured and managed via this drainage system.

If required, swale drains and/or raised mounds may be constructed up topographic slope of open excavations or work areas to redirect surface water flows. The sediment loading of this surface water leaving the works area should be as low as is reasonably practicable. Consequently, sediment mitigation measures such as straw or heather bales, geotextiles or silt curtains may be installed as part of the temporary surface water mitigation measures to manage sediment loads in the surface water run-off.

If surface water enters open excavations it will be pumped to an area down gradient of the excavation and controlled by the site drainage system. The pumped discharge will pass via sediment reduction measures to minimise sediment loads entering the site drainage system.

A framework for monitoring and inspecting the surface water drain system around the works area is outlined in the *Silt and Surface Water Management, Inspection and Maintenance Plan* (attached to this document).

2.1.2 Sediment and Surface Water Run-off from Stockpiled Material

It is anticipated that material generated from the various excavation activities will either be temporarily stockpiled in proximity to the excavation (stockpiled for use as backfill material or placed as a surface water

control measure for the open excavation) or transferred directly to its proposed re-use location (i.e. the planned earthen/rock mounds surrounding the mine site).

Stockpiles will be constructed (size, shape and location) in such a manner as to minimise sediment run-off and erosion of the stockpiles. They will be constructed such that the faces are compacted, stable and minimise the opportunity for slippage.

Surface water run-off from the stockpile(s) will be managed via the construction of temporary drainage controls around the base of the stockpile areas (such as bunds, swale drains, straw bales etc.).

Surface water and sediment controls will be installed around the temporary and permanent stockpile areas.

2.1.3 Dust Generation from Excavations

The potential for dust to be generated from excavations will be mitigated through the planning of works (avoiding days with high wind and dry conditions), dust suppression methods (water sprays), reducing excessive plant movements and reducing drop heights for the placement of materials (into vehicles or direct into stockpiles).

2.1.4 Dust Generation from Stockpiled Material

The potential for dust to be generated from temporary stockpiles or engineered mounds will be mitigated via the construction methods of the stockpiles (such as constructing the stockpiles with compacted surfaces, alignment to the prevailing wind and in less exposed locations etc.).

During the construction of the stockpiles the drop height of materials from the excavator will be minimised as far is practical to reduce dust generation. Dust suppression techniques (such as water sprays and covers) will be adopted in dry and dusty conditions.

Stockpiles will be monitored and if required will be dampened or covered to mitigate dust generation.

2.2 Inspection and Maintenance of Excavations and Stockpiles

The contractor or sub contractor undertaking the excavation and civil works will undertake routine monitoring and inspections for fugitive dust emissions and sediment and surface water run-off from the excavation and stockpile areas. Table 1 sets out the monitoring and emission limits that shall be complied with.

Table 1: Summary of Monitoring and Emission Limits

Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
Surface Water	Surface water drainage into open excavations	Minimal surface water entering into open excavations	Visual evidence of surface water impacts.	Continuous - Daily Monitoring
	Flooding or site inundation	Management of surface water discharged to the site drainage system to an acceptable level		
Sediment	Excavation activities	Minimal sediment loading in surface water discharged to the site drainage system.	Site observations	Continuous - Daily Monitoring
	Stockpile construction			
	Stockpile management			
Dust	Excavation activities	No visible airborne	Site observations	Continuous visual monitoring with the

Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
	Stockpile construction	emission to cross the site boundary where harm or nuisance may be caused.		works area (completed by AMC UK). Dust monitoring and sampling in accordance with the site wide Dust Management Plan (completed by Sirius Minerals).
	Stockpile management			
	Engineering backfill around guide wall			

All inspections shall be recorded on a daily basis (via pre-defined checklists). Details of visual assessments shall include the following information when a visible emission to atmosphere is apparent:

- 1) Date and time of observation;
- 2) Weather conditions;
- 3) Dust, surface water and sediment observations;
- 4) Assessment of potential cause; and
- 5) Identification of immediate rectification measures.

The nature of the works and the potential environmental risks will be identified prior to commencing work each day as part of the Daily Pre Shift Briefing (i.e. assessment of work practices and weather conditions).

2.3 Record Keeping

Records will be kept and maintained at the site for the duration of the construction works. These records will include the following:

- Records of the daily site inspections;
- Records of health & safety and environmental incidents and Near Misses;
- Records of modification or rectification to procedures and processes; and
- Records of temporary works and design changes.

3.0 CONTROL MEASURES

The following outlines control techniques to manage fugitive dust and surface water / sediment run off.

Table 2: Summary of Control Measures

Activity	Nature of Impact	Environmental Mitigation Measures Identified
Excavation	Surface water quality and sediments	<p>Create a temporary surface water drainage system around open excavations to mitigate surface water run-off into open excavations.</p> <p>Surface water removed from open excavations will be directed to the site drainage system. Use of temporary bunds, swale drains, silt fences or traps to manage sediment loads (refer to <i>Silt and Surface Water Management, Inspection and Maintenance Plan</i>).</p>
Stockpiling	Surface water quality and sediments	<p>Construct all stockpiles to minimise surface water run-off and sediment loading (e.g. limit footprint, compacted faces etc.)</p> <p>Install surface water control measures around the stockpile areas. Including the use of temporary bunds, swale drains, silt fences or traps to reduce sediment levels.</p> <p>No loading of excavated materials to stockpiles during adverse weather conditions.</p>
Excavation	Dust generation	<p>Minimise excavation activities during periods of dry/windy weather conditions.</p> <p>Use dust suppression techniques at excavations to reduce dust generation.</p> <p>Limit traffic movements where possible and use the wheel wash for the vehicles.</p> <p>Schedule work to reduce delays between stages of earthworks, where practical (i.e. reduce the duration of temporary stockpiles on-site).</p>
Stockpiling	Dust generation	<p>Locate stockpiles in sheltered locations and near the point of re-use (minimisation of double handling of spoil).</p> <p>Construct stockpiles to minimise dust generation.</p> <p>Use dust suppression techniques during dry windy conditions (as required).</p>

4.0 EMERGENCY PROCEDURES

For excessive dust generation due to work practices or weather conditions:

- Stop works, assess the cause of dust generation, cease or change working practices and/or employ dust suppression measures;
- Record the incident in accordance with site incident reporting procedures;

- Inform relevant stakeholders of incident; and
- Implement investigation and corrective or preventative measures.

For increased sediment and surface water run-off from the stockpile areas due to weather conditions:

- Stop works, review the efficacy of the surface water and sediment mitigation measures around the stockpiles, if required install additional mitigation measures. Monitor stability of the stockpiles and undertake remedial works if required;
- Record the incident in accordance with site incident reporting procedures;
- Inform relevant stakeholders of incident; and
- Implement investigation and corrective or preventative measures.

For flooding of open excavation:

- Stop works, make the works area safe, review the efficacy of the surface water measures around the excavation, if required deepen or install additional mitigation measures. Monitor excavation stability and pump the excavation;
- Record the incident in accordance with site incident reporting procedures;
- Inform relevant stakeholders of incident; and
- Implement investigation and corrective or preventative measures.

For heavy rainfall / flooding conditions across the wider site:

- Stop works, make the works area safe, review the efficacy of the surface water and sediment mitigation measures, if required install additional mitigation measures. Only recommence excavation works if safe to do so and where the works will not cause additional adverse environmental impacts;
- Record the incident in accordance with site incident reporting procedures;
- Inform relevant stakeholders of incident; and
- Implement investigation and corrective or preventative measures.

5.0 REFERENCE

Environmental Good Practice – Site Guide (Fourth Edition) (CIRIA C741).

PPG1 – Understanding your environmental responsibilities;

PPG6 – Working at Construction and Demolition Sites.

Attachment: AMC UK *Silt and Surface Water Management, Inspection and Maintenance Plan.*

1.0 OBJECTIVES

The objective of the silt and surface water management plan is to provide detail of the scope and frequency for the inspection and maintenance of the proposed silt and surface water system for the area of the site for which AMC UK has control and responsibility.

2.0 MANAGEMENT RESPONSIBILITY

Management and maintenance of the silt and surface water system within the AMC UK's Phase 4 works area (only) will be the responsibility of AMC UK. However, all sub-contractors working on the site have a responsibility to ensure that there are no unplanned releases of pollutants into the silt and surface water system and that any such event, or breach of the system, is reported immediately to their Site Supervisor.

To ensure the reliability of the silt and surface water system, it should be inspected, maintained and repaired as required on a regular on-going basis. In particular inspections should be undertaken prior to, during and after significant rainfall or fluvial flooding events on Site.

A suitably experienced and competent staff member shall be appointed by AMC UK to take responsibility for the management and maintenance of the drainage system.

3.0 INSPECTION AND MAINTENANCE PROGRAMME

An Inspection and Maintenance Programme for the silt and surface water drainage infrastructure within the Site is provided within Table 1. Only sections of the drainage system relevant to the AMC UK Phase 4 works area are covered by this Inspection and Maintenance Programme.

Table 1: Inspection and Maintenance Programme

Item	Description	Frequency
Silt and Surface Water System Inspection		
Routine site inspection of the silt and surface water system	Inspection of the components of the silt and surface water management system (within the AMC UK works area) to identify where deficiencies exist and where maintenance and/or repair is required.	Weekly and before/after heavy rainfall or fluvial flooding events within the site.
Attenuation Ponds (not considered part of the AMC UK Phase 4 works area). To be managed by others		
Attenuation pond	Inspection and cleaned of silt/sediment.	Monthly and before/after heavy rainfall or fluvial flooding events within the site.
Sediment forebay	Inspection for scour and cleaned of silt/sediment.	
Attenuation pond discharge control structures/outlets	Inspection of outlet pipes/channels and cleaned of silt/sediment and debris.	

Item	Description	Frequency
Spillway/Slipway	Inspection and cleaned of silt/sediment and debris.	Quarterly, after spillway operation events and fluvial flooding events within the site.
Pond Liner	Draw down of pond and inspection of pond liner.	Annually
Drainage channels and Swales (infiltration channels)		
Channels and swales	Inspection for scour and cleaned of silt/sediment and debris.	Monthly and before/after heavy rainfall or fluvial flooding events within the site.
Rock check dams (if used)	Upstream of dams to be cleaned of silt/sediment and repair to rock dams where damaged or scoured.	
Road Culverts		
Culvert pipework	Inspection for pipe blockages and cleaned of silt/sediment and debris.	Monthly and before/after heavy rainfall or fluvial flooding events within the site.
Culvert inlets and outlets	Inspection for scour and cleaned of silt/sediment and debris.	
Sediment Control Devices		
Silt Fences	Inspection and cleaned of silt/sediment and debris	Monthly and before/after heavy rainfall or fluvial flooding events within the site.

4.0 INSPECTION AND MAINTENANCE RECORDS

A written record of routine inspections and maintenance shall be maintained on site throughout the construction activities and should include, as a minimum, the following:

- Date;
- Personnel;
- Items inspected/maintained;
- Maintenance/remedial action undertaken;
- Recommended replacement/maintenance/remedial action that couldn't be completed on record date (if any); and
- Recommendations for further inspections.

5.0 REVIEW OF PLAN

An assessment of the adequacy of the inspection programme should be undertaken by AMC UK after three, six and twelve months following commissioning of the silt and surface water management system. Based on this assessment a more (or less) frequent inspection and maintenance programme may be more appropriate and should be implemented as required.



SILT AND SURFACE WATER MANAGEMENT CHECKLIST

Project:	Woodsmith Mine Site
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Review of Silt and Surface Water Management	
Inspection carried out by:	
Date of Inspection:	Date Report Issued:

Weather Conditions at Time of Inspection
Describe weather conditions (e.g. sunny, cloudy, raining, dry) and temperature:
Other Observations (e.g. activities on site):

Date	Time	Duration	Rainfall (mm)	Discharges Occur (Y/N)

	Yes	No	N/A	Action Required
Drainage System (Site-Wide)				
1. Is water flowing, unimpeded through the drainage system?				
2. Are all channels free from silt and debris?				
3. Are all sediment traps undamaged and free from silt and sediment?				
4. Is the wheel wash operating such that it does not flood and overspill sediments?				
5. Are any sand bags / earth bunds used to contain silt/sands/soils from temporary works, stockpiles or other areas installed correctly or showing signs of damage?				
6. Is there any evidence of drains being incorrectly connected?				



SILT AND SURFACE WATER MANAGEMENT CHECKLIST

	Yes	No	N/A	Action Required
Attenuation Pond (if required)				
1. Does water pond around the inlet when it rains?				
2. Is there sediment or debris accumulated around the inlet?				
3. Is there adequate scour protection at points of concentrated discharge?				
4. Is there evidence of damage to any scour protection measures?				
5. Is there evidence of scour at inlets and outlets?				
6. Is there evidence of contamination at the pond e.g. oil sheen on water?				
7. Is the pond ready to be cleaned of sediments?				
Drainage Channels and Culverts				
1. Are culverts free from sediment and obstacles to prevent backing-up and flooding?				
2. Is there evidence of scour or deposition at upstream and downstream sides?				
3. Is there damage to culverts or bank erosion in channels?				
Silt Fencing				
1. Is silt fencing installed in accordance with design drawings (e.g. correct depth, on the contour)?				
2. Is silt fencing pulled tight with no sags or tears?				
3. Are the end posts brought upslope of the rest so as to prevent run-of being diverted around them?				
4. Are there new areas that would benefit from silt fences being installed?				
5. Is there any evidence of erosion being caused by silt fences?				
Comments				

GENERAL HOUSEKEEPING (PPG - 004)

This Pollution Prevention Guidance (PPG) applies to general Site management and housekeeping. The aim of this PPG is to set minimum standards to reduce the environmental impacts from general site construction activities.

1.0 LEGISLATIVE REQUIREMENTS

The Health and Safety at Work Act 1974 legislates the requirement for employers to ensure, so far as reasonably practicable, the health and safety of their employees, other people at work and members of the public who may be affected by their work. This includes the need to maintain a safe working environment. The Environmental Protection Act 1990 provides legislation on the control of emissions into the environment from site activities.

The practice of good site housekeeping helps maintain both a safe working environment and minimises the opportunity for fugitive emissions from operation to occur. Relevant guidance on general construction activities are outlined in the *Environmental Good Practice – Site Guide (Fourth Edition)* (CIRIA C741).

2.0 PRACTICE

AMC UK recognises that effective housekeeping can eliminate some workplace hazards and is an integral part of accident and fire prevention, efficient performance and environmental management.

2.1 Housekeeping

AMC UK is committed to embedding the following good housekeeping practices throughout their operations to manage both health and safety risks and environmental impacts:

- Safety signs, equipment and emergency exits must never be obstructed.
- Fire escapes and means of access and egress throughout work areas must be kept clear and unobstructed at all times.
- Work shall be carried out in an area suitably configured and sized for the activity. Suitably demarcated and separated vehicle and pedestrian access routes will be set up within the Site.
- Work areas, storage areas and amenities shall be maintained in a clean, orderly, hygienic manner.
- Materials shall be sorted and located appropriately for the frequency of their usage.
- Storage containers will be suitable to the materials within them, banded as applicable and located in safe locations. Clear access to storage areas will be maintained.
- Cleaning of offices, welfare facilities and workshops shall be undertaken regularly, as required.
- Suitable mitigation measures will be set up and maintained to minimise environmental impacts from noise, vibration, light, dust, sediment and surface water run-off.
- All spills must be cleaned up immediately and cleaning materials disposed of appropriately. Spill kits will be available at defined locations.
- Tools, equipment, machinery and work areas shall be stored and maintained in a clean and safe manner. Defects and unsafe conditions must be reported.
- Maintenance of equipment will be undertaken in line with manufacturer's specifications and the Site preventative maintenance programme.
- Compressed air and fire hoses will not be used for any housekeeping activity.

AMC UK employees and sub-contractors are all accountable for retaining good housekeeping standards.

2.2 Inspection and Maintenance

All employees associated with the Phase 4 construction works will undertake continuous monitoring of site conditions and general Site housekeeping in order to prevent potential health and safety hazards (such as trips and slips etc.) and opportunities for adverse environmental impacts (such as noise, vibration, light, dust, sediment and surface water run-off).

The AMC UK Environmental Manager and Health & Safety Manager will undertake regular formal Site Inspections to identify potential risks, contravention to the EMP and RAMS, good working practice, and any required corrective actions. The AMC UK Environmental and/or Health & Safety Manager will be responsible for ensuring that all corrective actions arising from formal inspections are implemented in an agreed timescale. These inspections will be documented and records maintained on Site.

2.3 Record Keeping

Records will be kept and maintained at the site for the duration of the Phase 4 construction works. These records will include the following:

- Records of site inspections;
- Records of health & safety and environmental incidents and Near Misses;
- Records of modification or rectification to procedures and processes; and
- Records of training.

3.0 CONTROL MEASURES

The following outlines control measures to manage environmental impacts from the Phase 4 Construction Activities.

Topic	Nature of impact	Environmental Mitigation Measures Identified
Housekeeping	Adverse environmental impacts (such as noise, vibration, light, dust, sediment and surface water run-off).	<ul style="list-style-type: none"> ■ Adequate planning and design of works considerate of environmental impacts. ■ Clean up of spills. ■ Validation (visual/olfactory/sampling) following the clean-up of spills. ■ Prompt cleaning of internal roadways during excavation and construction works. ■ Adequate storage facilities for the storage of fuels and raw materials. ■ Provide adequate facilities for segregation and disposal of wastes. ■ Efficient and effective management of wastes generated on-site. ■ Appropriate use and maintenance of plant and machinery.
Training	Low environmental awareness of staff can result in unreported environmental impacts and poor environmental management at the Site.	<ul style="list-style-type: none"> ■ Staff awareness training and induction.

4.0 EMERGENCY PROCEDURES

Good Site housekeeping is a preventative approach to minimising the risks of injury and environmental releases. As such no emergency procedures are documented in this PPG.

If an incident does occur due to poor housekeeping practices, emergency response procedures outlined in the CPHSP Emergency Response Plan (Health and Safety focussed) or the Environmental Emergency Preparedness Plan will be enacted.

All Near Misses will be reviewed and if required corrective or preventative measures adopted.

5.0 REFERENCE

Environmental Good Practice – Site Guide (Fourth Edition) (CIRIA C741).

DIAPHRAGM WALL SUPPORT SLURRY PRODUCTION, STORAGE AND HANDLING (PPG - 005)

This Pollution Prevention Guidance (PPG) applies to Site activities related to the production, storage and handling of the diaphragm wall support slurry required to stabilise the diaphragm wall trenches during panel excavation and construction. The support slurry is a mixture of water combined with bentonite and polymer additives.

The aim of this PPG is to set the minimum standards required to reduce potential risks arising from the loss of support slurry to the surface and sub surface environment. Other measures may be required on case by case basis. Refer to Bauer *Support Slurry Management (Bentonite)* document for further guidance.

1.0 LEGISLATIVE REQUIREMENTS

The installation, commissioning and operation of the bentonite batch plant is covered under planning controls defined for the Woodsmith Mine and the method statements and risk assessments for the operation of the support slurry batching plant.

Relevant guidance on general construction activities are outlined in the *Environmental Good Practice – Site Guide (Fourth Edition)* (CIRIA C741).

2.0 PRACTICE

As part of diaphragm wall construction, the support slurry used to stabilise the open trench excavation is mixed in the slurry plant and stored in large tanks prior to transfer to the diaphragm wall. During panel excavation, the slurry is continuously fed to the trench (pumped) to maintain a head of slurry within the trench excavation.

The slurry is then circulated back from the panel trench back to the bentonite plant with the excavated material, which is subsequently removed by the desanding units (refer to Figure 1).

As part of the construction of the batching plant, the dry silos and fluid tanks will be lifted in position and fixed onto the slurry plant slab using mechanical anchors. The remaining equipment, including pumps, screw conveyors, mixing plants, agitation tanks, desanding units and decanters/filterpress will be installed and arranged as per the slurry plant layout drawing.

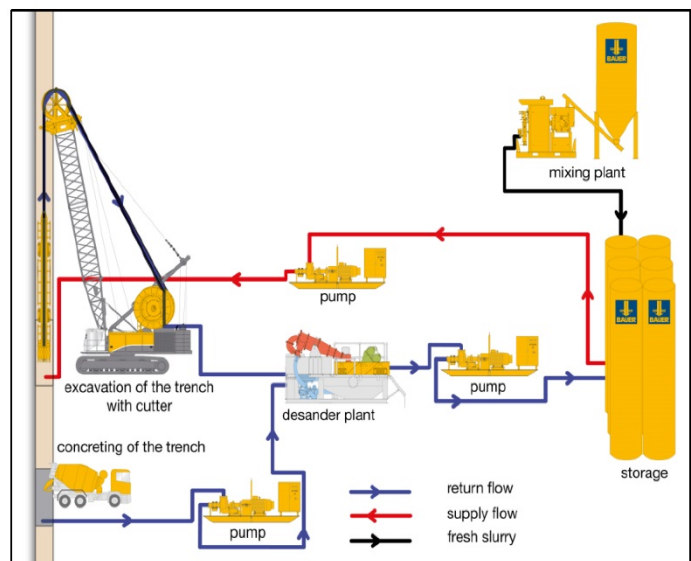


Figure 1: Schematic of Support Slurry Transfer

2.1 Commissioning and Operation of Support Slurry Batching Plant

For the commissioning and operation of the support slurry plant¹, the key environmental risks relate to fugitive dust emissions from raw materials and excavated spoil and loss of support slurry to ground and surface water.

2.1.1 Transport and Storage of Raw Materials

The key components of the support slurry are stored in dry silos (bentonite), palletised bags and drums (polymer and additives) and water tanks within the batching plant area. Dry bentonite powder will generally

¹ A Commissioning and Operations Plan for the Batching Plant will be developed by the plant operator.

be delivered by an articulated bulk tanker and blown via appropriate transfer pipes into the storage silos using air pressure (including suitable overfill controls/measures).

Polymer and additives will generally be delivered in covered palletised bags or as liquid in 20l drums.

The delivery of raw materials to site will adhere to the site Traffic Management Plan, including the use of agreed transport routes.

The batching plant will be founded on a concrete surface capable of retaining spillages and being cleaned. This work area shall be kept clean in order to prevent or minimise fugitive dust emissions and run-off to the surface water drainage system proximal to the batching plant.

2.1.2 Mixing and Storage of Support Slurry

In order to mix the support slurry, dry bentonite powder, polymer and water shall be combined through a flow mixer. The resulting slurry is temporarily stored in a small agitation tank for testing and then pumped into tanks.

The mixing of the support slurry must follow the approved RAMS and the approved Mixing and Testing procedures. These include procedures for the emergency shutdown of the mixing plant and appropriate mitigation measures to be adopted to minimise impacts to the environment in the event of a release.

As the storage, transfer and mixing of raw materials is contained within a sealed system the opportunity for fugitive dust emissions is limited.

Testing of the support slurry will ensure that the mix specification is met. If the slurry does not comply with the specification it will be remixed and refined until the specification is fulfilled (i.e. minimisation of waste).

2.1.3 Transfer of Support Slurry to Diaphragm Wall

Once the slurry is mixed, it will be temporarily stored at the batch plant location from where it will be pumped via dedicated rigid and flexible pipes to the diaphragm wall location(s), as required.

During the excavation of the diaphragm wall, the trench excavation remains filled with 'fresh' support slurry while the cutter unit simultaneously pumps slurry and excavated material back to the batching plant where the excavated material is separated from the support slurry in the desanding unit. Feed and return lines will be laid across the site to reach the diaphragm wall construction areas. The feed/return lines will underpass haul roads through dedicated protected ducting. Where misinterpretation of the flow direction is possible, pipes will be marked with arrows to indicate the correct flow direction.

As this is a sealed transfer system the risk of losses of support fluid to ground and potentially the site drainage system will be low. The main potential for losses from this transfer system is at pipe joints (specifically at the pump and cutter locations, where connections are temporarily disconnected for operational and maintenance activities). Procedures will be set up to manage the disconnection of transfer lines to ensure residual slurry in the pipes are contained and controlled.

An inspection of the transfer pipe alignments (to and from the batching plant and the diaphragm wall cutter units) will be undertaken prior to operation and if necessary additional mitigation measures (such as dams and heather silt barriers) will be installed in the surface water drainage system to mitigate impacts from potential releases of support slurry.

2.1.4 Desanding Unit

The returned support slurry from the cutting unit will pass through the desanding unit to separate the excavated material (varying particle size) from the support slurry. The 'cleaned' slurry will be transferred back to the storage tanks or directly back to the diaphragm wall trench.

The separated excavated material will fall from the desanding unit into a purpose built concrete lined chamber prior to excavation and removal to a stockpile (refer to Figure 2). This concrete lined chamber will manage water run-off from the desanding unit, with any excess water built up being pumped to temporary storage and disposed off-site or recycled in the batching process. No discharge will be permitted to the site drainage system.



Figure 2: Typical Desanding Unit

As the separated excavated material from the desanding unit will be damp from the slurry the potential for fugitive dust generation from the desanding process, storage and transfer to stockpile will be minimised.

2.1.5 Operation of the Plant - Start up and Shutdown

Higher risks of dust emissions and fluid losses may occur during the start-up and shut-down of a process. These emissions can be reduced, by minimising, where possible, the number of start-ups and shut-downs and having adequate procedures in place for start-up, shut-down and emergency shut-downs.

All appropriate precautions must be taken to minimise emissions during start-up and shutdown.

2.1.6 Exhausted Support Slurry Disposal

After completion of the panel excavation to the final depth of the wall, the entire panel volume will be desanded by circulating support slurry through the trench and back to the desanding unit until the slurry parameters indicate that the trench is suitable to be concreted. If the slurry is too heavily sediment loaded, the entire panel volume can be exchanged (replaced with fresh slurry) in order to facilitate the start of reinforcement installation. In this instance, the excavation material/support slurry will be cleaned later by circulation between temporary storage tanks and desanding unit.

When the thick support slurry is too heavily loaded that it can neither be cleaned by the desanding units nor reinstated by incorporation of additives, it will be stored in a waste slurry tank and disposed off-site using tanker wagons.

As the trench is installed and concreted, the displaced support slurry will be collected and pumped back to the batch plant. The last of the support slurry recovered at the end of a concrete pour will be pumped into a dedicated skip next to the panel to segregate this support slurry/concrete mix. This support slurry/concrete mix will be disposed off-site using tanker wagons.

2.1.7 Significant Loss of Support Slurry to Rock Formation

The support slurry is designed to temporarily stabilise the trench excavation with minimal losses to the ground, however greater slurry losses will initially occur in any permeable strata.

To ascertain the use of slurry in the trench excavation as part of the normal soil clogging and filter cake formation, the slurry level in the excavation will be monitored visually by the cutter operator and cutter banksman. The cutter operator will regulate the feed flow through the use of a remote controlled feed pump. During excavation of the panels, some slurry loss is expected due to filling of pores in the ground and creation of the filter cake. The associated minor losses can't generally be recorded (note that the excavation process circulates approximately 300 m³ of slurry per hour through the desanding plant between cutter return and the feed line). Only major and sudden drops of the slurry level in the trench can be recognized and will be recorded

in the operators report and daily supervisors report. Major losses start a contingency plan which typically consists of the following steps:

- 1) Increase feed volume of slurry to trench.
- 2) Recover cutter.
- 3) Fill sand into trench.
- 4) Backfill panel with sand, muck or backfill concrete.

2.2 Inspection and Maintenance

During the construction and operation of the support slurry batching plant the contractor/operator will monitor the batching plant activities and any fugitive emissions. The following monitoring and emission limits shall be complied with during the works:

Table 1: Summary of Fugitive Emission Monitoring – Support Slurry Plant Construction and Operation

Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
Dust and particulate matter.	Whole Process.	No visible airborne emission to cross the site boundary where harm or nuisance may be caused.	Operator observations.	At least daily.
	Silo inlets and outlets, slurry mixing unit and desanding unit.	No visible dust emission.	Operator observations. Monitoring of high level alarms and batch plant instrumentation To be recorded in the site Log Book (including operational start and finish times).	Continuously during operation.
Dust and particulate matter.	Excavated material – output of desander unit.	No visible dust emission.	Operator observations. To be recorded in the site Log Book (including operational start and finish times).	Continuously during operation.
Support slurry (liquid).	Mixing unit and transfer lines to and from diaphragm wall.	No visible fluid emission to ground or surface water drainage system.	Operator observations. To be recorded in the site Log Book (including operational start and finish times).	Continuously during operation, especially after heavy rain or following disconnection of delivery lines.
Support slurry (liquid).	Waste support fluid storage and disposal.	No visible fluid emission to ground or surface water drainage system.	Operator observations.	Continuously during storage and disposal operations.

Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
Support slurry (liquid).	Loss of support fluid to permeable geological units.	Observed loss of support fluid to the sub surface.	Operator observations of slurry levels in the trench. Monitoring of groundwater monitoring wells (turbidity and pH).	Continuously during operation. Real time monitoring of specific wells, with additional routine monitoring and analysis.

All inspections shall be recorded in a log book on a daily basis. Details of visual assessments shall include the following information when an emission is apparent:

- 1) Date and time of observation;
- 2) Wind direction;
- 3) Weather conditions;
- 4) Position of observation;
- 5) Information on plant, personnel and/or systems operating; and
- 6) Assessment of potential cause.

2.3 Record Keeping

Records will be kept and maintained at the site for the duration of the works. Such records include the following:

- Delivery records of plant and raw materials;
- Commissioning, Maintenance and Inspection reports;
- Support slurry or material losses (fugitive dust, sediments or slurry) (reported in line with the Environmental Incident Reporting Procedure).
- Disposal records of wastes, including liquid wastes and out of specification batches.

3.0 CONTROL MEASURES

The following outlines control techniques to manage fugitive dust and sediment run off.

Table 2: Summary of Control Measures

Activity	Nature of Impact (Sources of Emissions)	Environmental Mitigation Measures Identified
Delivery of materials to site	Potential fugitive dust emissions, from non-contained sources such as roads and other surfaces.	Dust suppression for unsealed roads and surfaces (water tankers)
	Loading and unloading processes	Covered or enclosed vehicles to be used for all deliveries Use of sealed transfer systems (i.e. tanker to silo transfer), with high level alarms and control systems. Careful unloading and storage of palletised bags and drums to designated and sealed storage areas.
Support slurry mixing and preparation.	Unplanned releases of support slurry to ground or surface water drainage.	Correct construction and operation of the mixing plant, located on sealed concrete slab. Suitable procedures and controls for mixing support slurry.
Transfer of support slurry.	Unplanned releases to ground or surface water drainage. Failure of transfer pipeline or connections.	Correct construction and alignment of the support slurry transfer pipelines to ensure that they are protected and located away from sensitive receptors. Suitable procedures and controls for disconnecting pipelines and draining transfer lines. Suitable emergency shutdown procedures in the event of a leak.
Diaphragm wall construction	Significant loss of support fluid to the sub surface.	Monitoring of support slurry levels in panel excavations and the presence of slurry indicators in groundwater in adjacent monitoring wells (refer to Appendix F, EMP) will be used to assess the occurrence of support fluid losses to the sub-surface. If identified then mitigations measures will be followed in accordance with the <i>Bauer Support Slurry Management (Bentonite)</i> plan.
Support fluid cleared out of cutter system at the end of panel installation.	Generation of liquid and solid waste (support slurry and concrete).	Segregation and collection of co-mixed support slurry and concrete generated during the final stages of panel construction (collected in dedicated skip / tank prior to off-site disposal).

Activity	Nature of Impact (Sources of Emissions)	Environmental Mitigation Measures Identified
Excavated material storage and handling (output of desanding unit).	Fugitive dust from excavated material generated from the batch plant desanding unit.	The excavated material (if suitable from an environmental and geotechnical perspective) will be re-used on-site in accordance with the Material Management Plan. The material will be kept damp to mitigate fugitive dust generation during storage and transfer.

4.0 EMERGENCY PROCEDURES

- If safe - stop the operation of the batching plant.
- Inform the Emergency Response Coordinator via the site radio.
- Major spillages of support slurry will be contained and remediated as soon as possible, using an excavator and pumps. The recovered materials may be re-introduced into the slurry system or disposed of. Where the spillage is due to a blockage in the pipes, all pumps will be turned off until the blockage has been removed and the joints have been resealed. Any major spillages of support slurry will be dealt with in line with Emergency Procedures.
- Records of the incident will be recorded in accordance with site procedures, including an estimate of losses to the environment.
- Inform relevant stakeholders of incident.
- Implement investigation and corrective or preventative measures.

APPENDIX F

Monitoring Programme for D-Wall Slurry Losses

This document outlines a telemetrically connected monitoring program to be installed prior to diaphragm wall construction, and monitored in real-time during the proposed construction activities through the Ravenscar Group formation.

The monitoring wells are proposed to reach a depth of 60m, commensurate with the depth of the Phase 4 diaphragm walls and the depth of the local groundwater abstraction wells screened in the Cloughton Formation. Based on the Hydrogeological Baseline Report, all of the noted springs of concern at the site are within the Moor Grit, Scarborough and Cloughton Formations within the surface 60 m.

- The proposed program will be comprised of two nests of three, 2-inch diameter PVC standpipe piezometers installed with three screened intervals of up to 10 m in length per nest, within each proposed, 8-inch diameter borehole. The individual monitoring response zones will be separated from one another by a bentonite plug. The length and vertical alignment of the six screened response zones, will be designed specifically for that location and targeted on the Moor Grit, Scarborough and Cloughton aquifer units to provide designed response zones across the full 60 m depth of diaphragm walling
 - The figures showing the wells location and construction are attached in Appendices 1 and 2. The actual locations at which the network of monitoring wells surrounding the diaphragm walls will be installed, will be determined based on available access, so as to not interfere with other construction activities planned to be carried out on site.
- The groundwater monitoring, for the potential migration of bentonite based support slurries (with limited polymer additives), will be carried out using AquaTROLL400 or AquaTROLL600 Multiparameter Probe. It may be possible to use those probes to monitor pH in real time (AquaTROLL 400 or AquaTROLL 600) but this would need to be confirmed, via the proposed testing program, with the cooperation of Bauer previously to the on-site works. The specifications of these two instruments are attached in Appendices 3 and 4.
 - The AquaTROLL400 probe contains six water quality sensors housed in a 1.85-inch OD unit, measuring actual and specific conductivity, salinity, total dissolved solids, resistivity, density, dissolved oxygen, ORP, pH, temperature, water level and water pressure at high frequency intervals.
 - The AquaTROLL600 probe, also housed in a 1.85-inch OD unit, can be configured to measure temperature, conductivity, turbidity, optical RDO, pH/ORP, vented or non-vented level water level.

The proposed configuration, including near-field and far-field (sentinel) monitoring locations, at approximately 50m distance from the diaphragm wall and in proximity to the property line, respectively, will allow for continuous monitoring during construction activities. However, to prove the adequacy of the proposed system, some preliminary confirmatory testing will be necessary. The proposed testing approach involves the following:

- Rental of an AquaTROLL400/600 Multiparameter Probe from In-Solution and shipment of the probe and associated software to a facility to perform the testing.
- Batching of the full suite of proposed support slurries, and measuring (and videoing) the increase in multiple parameters by:
 - a. Filling a minimum of 20 L container with clean water.
 - b. Starting the video recorder
 - c. Immersing the AquaTROLL400/600 into the water.

-
- d. Slowly pouring batched mud into the pail of clean water, and monitoring parameter increases with time and increasing “concentration” of support slurry
 - e. Stopping the video recorder
 - f. Removing, cleaning and re-calibrating the probes (as necessary)
 - g. Repeating Steps (a) to (f) for each, alternative mix design incorporating various, proposed admixtures/additives
- In examining the TDS and MSDS information provided by Bauer, and based on the water chemistry information presented in Sections 7.5.3 (Moor Grit), 7.6.3 (Scarborough), 7.7.3 (Cloughton) and 7.8.3 (Saltwick) of the FWS Consultants Ltd., Doc. No. 1433MineOC15C/September 2014, “Hydrogeological Baseline Report for the Dove’s Nest Site, North Yorkshire, we believe that it should be possible to detect increases in:
 - pH and electrical conductivity; and possibly
 - total dissolved solids, density, resistivity and/or salinity.
 - The most sensitive parameter to each mix design will be identified. The entire suite of mix testing repeated, on-site, using sampled groundwater from the developed monitoring wells, prior to commencing diaphragm wall cutting activities.
 - Additionally, while carrying out the above mix testing program, it would also be possible to determine dynamic viscosity and yield stress values using a coaxial viscometer for calculations of potential penetration distances in various aperture sizes away from the diaphragm wall.

Appendices:

Appendix 1: 40-AMC-WS-CI-DR-0001 Monitoring Programme

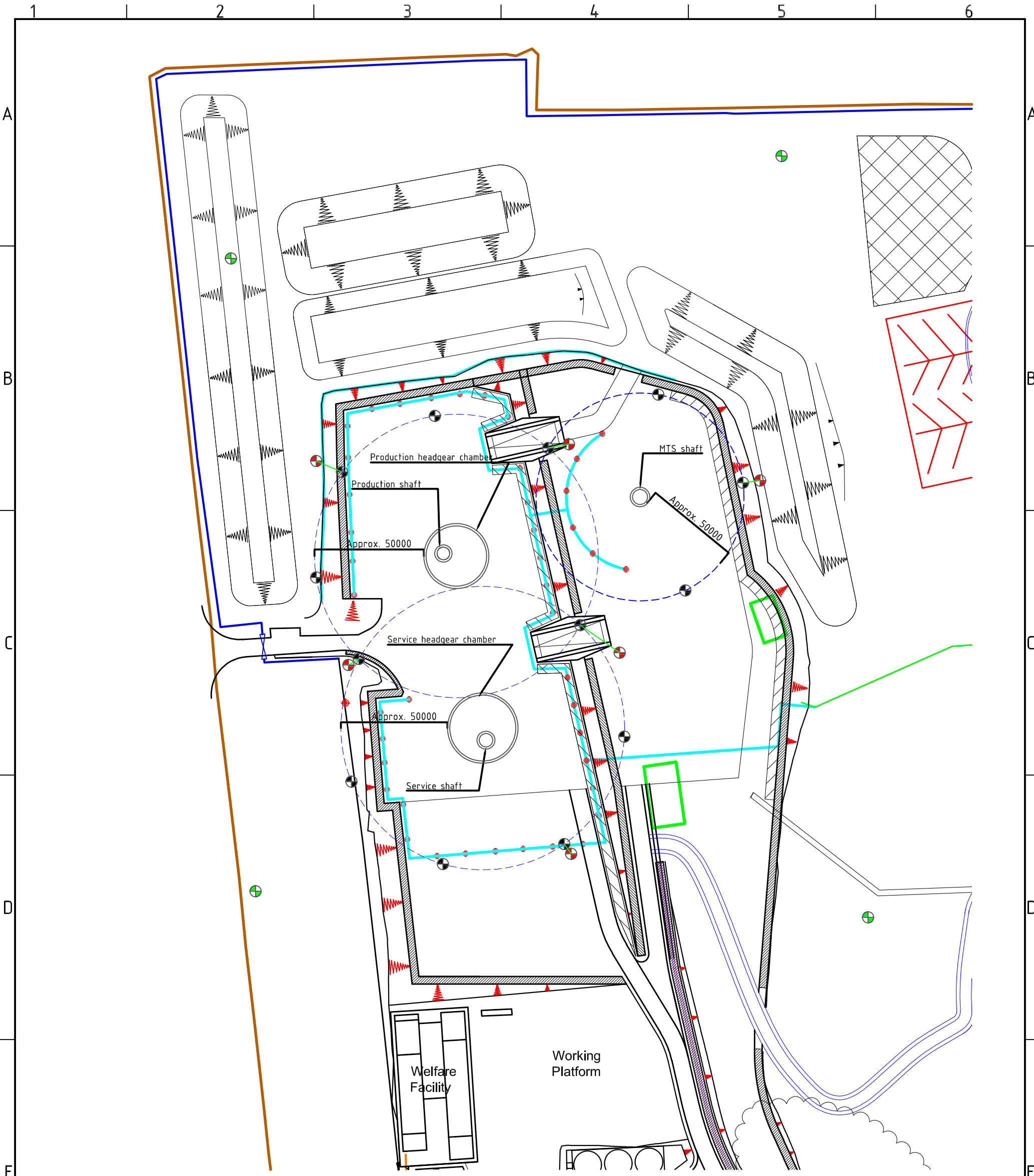
Appendix 2: 40-AMC-WS-CI-DR-0002 Detail of Monitoring Wells

Appendix 3: Aqua TROLL® 400 Multiparameter Probe Specifications

Appendix 4: Aqua TROLL® 600 Multiparameter Sonde Specifications

Appendix 5: Flowchart – Emergency Preparedness Plan for Monitoring Bentonite Losses

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Legend	
	Near-Field Groundwater Monitoring Locations
	Adjusted Near-Field Groundwater Monitoring Locations
	Far-Field Groundwater Monitoring Locations

Rev.	Revision Description	Drawn by	Date	Checked by	Date	Approved by	Date
0	Issued for Sirius M. Information	Berber	26.05.2017				
A	Issued for Sirius M. Review	Dobr	16.05.2017				

Client:		Consultant:		Consultant DRAWING NO.:	

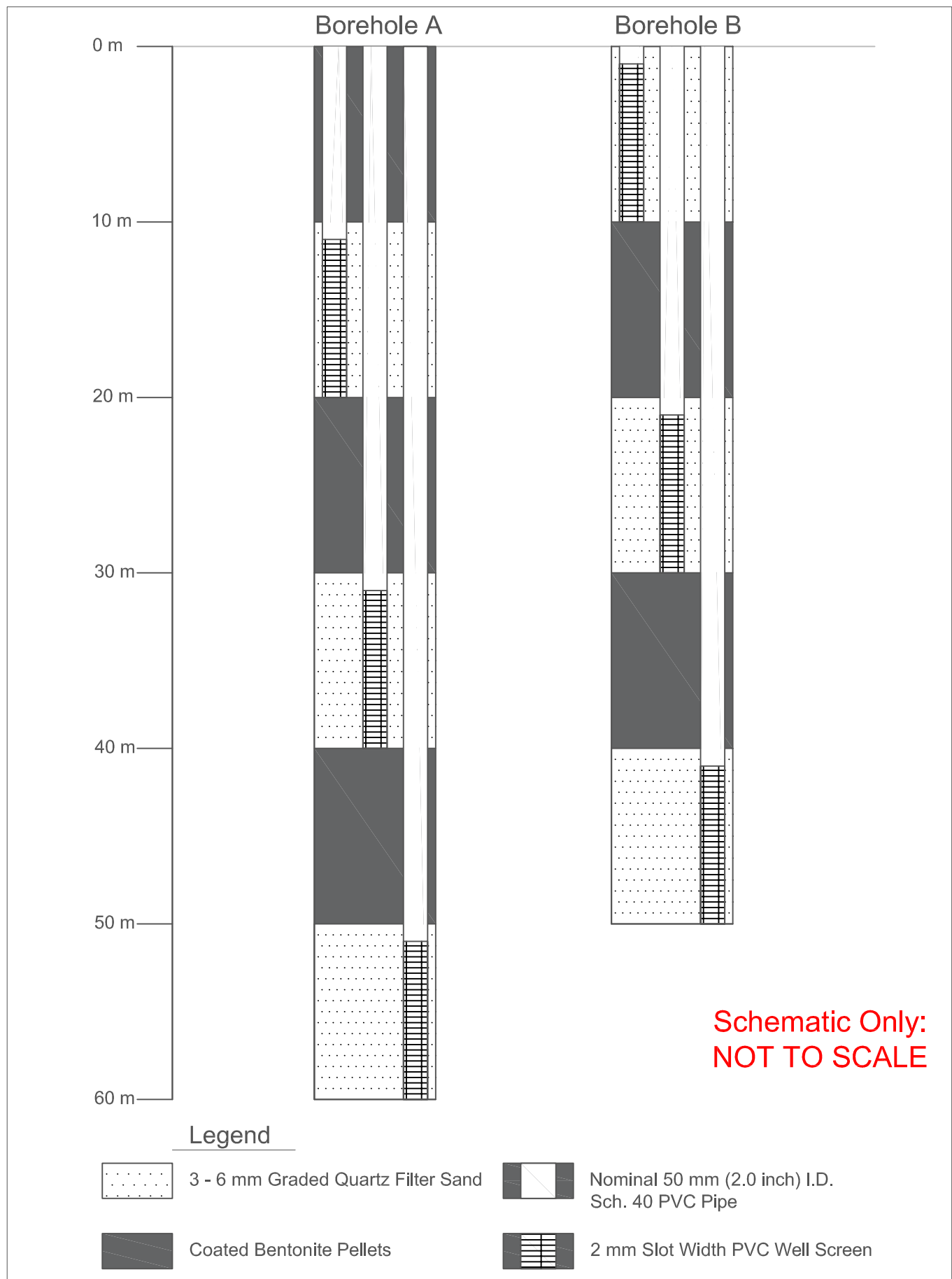
NORTH YORKSHIRE POLYHALITE PROJECT - MINE SHAFT
EARLY CONTRACTOR INVOLVEMENT
CIVIL ENGINEERING
Monitoring Programme Layout

Drawn by: Dobr	Checked by:	Approved by:	SMP Approved by:	SCALE 1:2000	SIZE A3H	DRAWING NO. 40-AMC-WS-10-CI-DR-0001	REV. 0
Date: 16.05.2017	Date:	Date:	Date:				

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Rev.	Revision Description	Drawn by	Date	Checked by	Date	Approved by	Date

Client: **SIRIUS MINERALS PLC** Consultant: **amc uk** Consultant DRAWING NO.: **Golder Associates**

NORTH YORKSHIRE POLYHALITE PROJECT - MINE SHAFT
EARLY CONTRACTOR INVOLVEMENT
CIVIL ENGINEERING
Detail Of Monitoring Wells

**ISSUED FOR REVIEW
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Drawn by: Dobr	Checked by:	Approved by:	SMP Approved by:	SCALE	SIZE	DRAWING NO.	REV.
Date: 17.05.2017	Date:	Date:	Date:		A3H	40-AMC-WS-10-CI-DR-0002	A



Aqua TROLL® 400 Multiparameter Probe

Configuring your instrument can be time-consuming, frustrating, and expensive. The compact Aqua TROLL 400 Multiparameter Process Probe simplifies decision making by offering a standard suite of six water quality sensors, housed in a sub-2 inch unit.

This all-in-one, durable probe continuously measures 12 parameters from six sensors:

1. Actual and specific conductivity, salinity, total dissolved solids, resistivity, and density
2. Dissolved oxygen
3. ORP
4. pH
5. Temperature
6. Water level and water pressure (absolute)

Leveraging proven technologies, like the patented, EPA-approved optical RDO[®] Sensor, the Aqua TROLL 400 decreases setup, calibration, and maintenance time. Ideal for long-term groundwater and surface water monitoring projects, you can deploy the probe for months of unattended operation. Partner with In-Situ to meet the challenges of reduced manpower and 24/7 demand.

Confidence in Your Data

- Field-tested sensor technologies lower your total cost of ownership and provide stable, accurate results.
- Sensors are factory-calibrated with NIST[®]-traceable standards (where applicable).
- DO readings are automatically compensated for salinity. With the Con TROLL[®] PRO System, DO and level readings are automatically compensated for barometric pressure.

Greater Efficiency and Flexibility

- Easy installation reduces errors and training time, while increasing productivity.
- With open communication protocols, the instrument easily interfaces with your current system. Access data anytime with a radio, controller, data logger, sampler, telemetry system, or SCADA/PLC system, or HydroVu[™] Data Services.
- Long-lasting calibrations reduce site visits.
- The narrow-diameter instrument operates in fresh, marine, and process waters.

Outstanding Customer Service

- Application and deployment guidance
- 24/7 technical support is always just a phone call away
- Seven-day service for maintenance and calibration (U.S.A. only)

Applications

- Long-term groundwater and surface water monitoring
- Coastal deployments—estuaries and wetlands
- Real-time water quality monitoring networks
- Remediation and mining
- Stormwater management

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General							
Aqua TROLL 400 Multiparameter Probe							
Operating temp.	-5 to 50° C (23 to 122° F)						
Storage temp.	-40 to 65° C (-40 to 140° F)						
Dimensions and weight	Dimensions: 4.7 cm (1.85 in.) OD x 26.9 cm (10.6 in.) with restrictor installed (does not include connector). Weight: 694 g (1.53 lbs)						
Wetted materials	PVC, 316 stainless steel, titanium, Acetal, Viton®, PC/PMMA						
Environmental rating	IP68 with all sensors and cable attached. IP67 with sensors removed and cable detached.						
Max. pressure rating	112 m (368 ft); 160 psi						
Output options	Modbus/RS485 and SDI-12						
Probe reading rate	1 reading every 5 seconds (no internal logging)						
Power	Required: 8-36 VDC (no internal battery). Measurement current: 16 mA @ 24 VDC. Sleep current: 40 µA @ 24 VDC						
Interface	In-Situ Con TROLL PRO System; In-Situ Tube and Cube Telemetry System; SCADA/PLC; HydroVu Data Services, and third-party data loggers, samplers, controllers, and telemetry systems.						
Cable	Customizable, non-vented (absolute) RuggedCable® System is available in either Tefzel® or polyurethane.						
Standard Sensors	Accuracy	Range	Resolution	Sensor Type	Response Time	Units of Measure	Methodology
Level, Depth, Pressure	Typical ±0.1% FS @ 15° C; ±0.3% FS max. from 0 to 50° C	76 m (250 ft); absolute (non-vented)	±0.01% FS or better	Fixed	Instantaneous in thermal equilibrium	Pressure: psi, kPa, bar, mbar, mmHg Level: mm, cm, m, in., ft	Piezoresistive; ceramic
Conductivity	Typical ±0.5% + 1 µS/cm; ±1% max.	5 to 100,000 µS/cm	0.1 µS/cm	Fixed	Instantaneous in thermal equilibrium	Actual conductivity (µS/cm, mS/cm) Specific conductivity (µS/cm, mS/cm) Salinity (PSU) Total dissolved solids (ppt, ppm) Resistivity (Ohms-cm) Density (g/cm³)	Std. Methods 2510 EPA 120.1
Dissolved oxygen Optical RDO® Classic Cap	±0.1 mg/L ±0.2 mg/L ±10% of reading	0 to 8 mg/L 8 to 20 mg/L 20 to 50 mg/L Full operating range: 0 to 50 mg/L	0.01 mg/L	Fixed with replaceable RDO Classic Sensor Cap	T90: <45 sec. T95: <60 sec.	mg/L, % saturation, ppm, ppO ₂	EPA-approved In-Situ Methods 1002-8-2009 1003-8-2009 1004-8-2009
Interferences: Alcohols >5%; hydrogen peroxide >3%; sodium hypochlorite (commercial bleach) >3%; gaseous sulfur dioxide; gaseous chlorine. Organic solvents and certain petroleum-based hydrocarbons may swell the sensing element and destroy it. Examples include, but are not limited to, acetone, chloroform, methylene chloride, and BTEX compounds.							
ORP	±5.0 mV	±1400 mV	0.1 mV	Replaceable pH/ORP combo sensor	<15 sec.	mV	Std. Methods 2580
pH	±0.1 pH unit	0 to 14 pH units	0.01 pH unit	Replaceable pH/ORP combo sensor	<15 sec., pH 7 to pH 4	pH units, mV	Std. Methods 4500-H ⁺ EPA 150.2
Temperature*	±0.1° C	-5 to 50° C (23 to 122° F)	0.01° C or better	Fixed	<30 sec.	Celsius, Fahrenheit	EPA 170.1
Warranty	2-years						



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Aqua TROLL® 600 Multiparameter Sonde

Reduce operational expenses with this customizable, powerful, and easy-to-use multiparameter sonde. The Aqua TROLL 600 combines unique industry-leading water quality technology, built-in LCD display, and revolutionary smartphone mobility. Low power consumption and advanced antifouling for up to 9+ month deployment supports long-term installation in any application.

The Aqua TROLL 600 water quality platform is rugged in groundwater and corrosion-resistant in surface water, delivering accurate, reliable data in an easy-to-use, flexible instrument that performs for years. Base sensor configuration includes EPA-approved optical dissolved oxygen, pH/ORP, turbidity, conductivity, temperature, and pressure. Integrate with In-Situ telemetry systems and HydroVu™ Data Services for real-time feedback on your remote monitoring sites.

Be Mobile

- **Use the Aqua TROLL 600 anywhere:** Titanium components and vented or non-vented options make it perfect for challenging environments and long-term deployments in fresh and salt water. Every detail has been engineered to be easy, reliable, and cost-effective.
- **Save time in the field:** Intuitive software simplifies instrument configuration, data analysis, and reporting. No training required, and no waiting for sensor warm-up or set-up.
- **Streamline data management:** Set up logs and manage data from the field using the VuSitu™ Mobile App. Consolidate all site information on your mobile device and tag sites with photos and GPS coordinates. Log data to your smartphone and download results in a standard file format for profiling, low-flow sampling, and more.

Be In-Situ

- Receive 24/7 technical support and online resources.
- Order products and accessories from the In-Situ website.
- Get guaranteed 7-day service for maintenance (U.S.A. only).

Be Smart

- **Status in an instant:** LCD display gives you an instant visual indication of sensor status, data log, battery life, and overall functionality to give confidence during deployment. The onboard SD card allows for quick and easy data backup and transfer.
- **No fuss antifouling:** Antifouling to protect all sensors. The only multiparameter sonde to have a sub-2 inch active antifouling system with cleanable conductivity.
- **Get accurate results:** Self-compensating turbidity/RDO/level, smart diagnostics, and stable sensor technology provide minimal drift and increased accuracy with NIST-traceable factory calibration report. Smart sensors store information internally, maintaining data and calibration within the sensor for traceable results.

Applications

- Lake, stream and wetland monitoring
- Stormwater management
- Coastal deployments
- Dam monitoring
- Low-flow groundwater sampling
- Remediation and mine water monitoring

General						
Operating Temperature (non-freezing)	-5 to 50° C (23 to 122° F) ISE: Ammonium & Nitrate 0 to 40° C; Chloride 0 to 50° C		Reading Rates	1 reading every 2 seconds 1 parameter, no wiping		
Storage Temperature	Components w/o fluid: -40° C to 65° C (non-freezing water); pH/ORP: -5° C to 65° C; Ammonium/Nitrate: 0 to 40° C; Chloride: 0 to 50° C		Data Logging	50 logs (defined, scheduled to run, or stored)		
Dimensions	4.7 cm (1.85 in.) OD x 59.2 cm (23.3 in.) (includes connector) With bail: 72.9 cm (28.7 in.)		Logging Modes	Linear, Linear Average, Event		
Weight	1.45 kg / 3.2 lbs (includes all sensors, batteries, and bail)		Logging Rate	1 minute to 99 hours		
Wetted Materials	PC, PC alloy, Delrin™, Santoprene™, Inconel™, Viton™, Titanium, Platinum, Ceramic, Nylon		Hex Screw Driver	0.050, 1.3 mm		
Environmental Rating	IP68 with all sensors and cable attached IP67 without the sensors, battery cover or cable attached		Communication Device	TROLL Com or Wireless TROLL Com		
Max Pressure Rating	Up to 350 PSI		Cable Options	Vented or non-vented polyurethane or vented Tefzel®		
Output Options	RS-485/MODBUS, SDI-12, Bluetooth®		LCD Display	Integrated display shows status of sonde, sensor ports, data log, battery and connectivity.		
Internal Memory¹ Micro SD Card²	16 MB; 8+ GB micro SD card included, user replaceable		Software	Android™: VuSitu through Google Play™, Windows®: Win-Situ 5, Data Services: HydroVu		
Internal Power Battery Life³	2 internal user-replaceable Alkaline D batteries >6 months typical with wiping >9 months typical with no wiping		Interface	Android 4.4, requires Bluetooth 2.0; Win-Situ 5 Software		
External Power Voltage	8-36 VDC (not required for normal operation) Sleep: 0.10 mA typical Measurement: 16 mA typical, 45 mA max		Certifications	CE, FCC, WEEE, RoHS Compliant		
Standard Sensors	Accuracy	Range	Resolution/Precision	Response Time	Units of Measure	Method
Temperature⁵	± 0.1° C	-5 to 50° C (23 to 122° F)	0.01° C	T63<2s, T90<15s, T95<30s	Celsius or Fahrenheit	EPA 170.1
Barometric Pressure	± 1.0 mbars	300 to 1,100 mbar	0.1 mbar	T63<1s, T90<1s, T95<1s	Pressure: psi, kPa, bar, mbar, inHg, mmHg	Silicon strain gauge
pH⁶	±0.1 pH unit or better	0 to 14 pH units	0.01 pH	T63<3s, T90<15s, T95<30s	pH, mV	Std. Methods 4500-H+/ EPA 150.2
ORP⁷	±5 mV	±1,400 mV	0.1 mV	T63<3s, T90<15s, T95<30s	mV	Std. Methods 2580
Conductivity⁸	+/-0.5% of reading plus 1 µS/cm from 0 to 100,000 µS/cm; +/-1.0% of reading from 100,000 to 200,000 µS/cm	0 to 350,000 µS/cm	0.1 µS/cm	T63<1s, T90<3s, T95<5s	Actual conductivity (µS/cm, mS/cm); Specific conductivity (µS/cm, mS/cm); Salinity (PSU); Total dissolved solids (ppt, ppm); Resistivity (Ohms-cm); Density (g/cm ³)	Std. Methods 2510/ EPA 120.1
TDS (derived from conductivity and temp)	-	0 to 350 ppt	0.1 ppt	-	ppt, ppm	-
Salinity (derived from conductivity and temp)	-	0 to 350 PSU	0.1 PSU	-	PSU, ppt	Std. Methods 2520A
Rugged Dissolved Oxygen (RDO) with RDO-X⁹	±0.1 mg/L ±0.2 mg/L ±10% of reading	0 to 8 mg/L 8 to 20 mg/L 20 to 50 mg/L	0.01 mg/L	T63<15s, T90<45s, T95<60s	mg/L, % saturation, ppm	EPA-approved In-Situ Methods: 1002-8-2009, 1003-8-2009, 1004-8-2009
Turbidity	±2% of reading or ±2 NTU, FNU, whichever is greater	0 to 4,000 NTU	0.01 NTU (0 to 1,000); 0.1 NTU (1,000 to 4,000)	T63<1s, T90<1s, T95<1s	NTU, FNU	ISO 7027
TSS (derived from turbidity)¹⁰	-	0 to 1,500 mg/L	0.1 mg/L	-	ppt, mg/L	-
Ammonium (NH₄⁺ - N)^{11,12} Rated to 25m depth	±10% or ±2 mg/L w.i.g.	0 to 10,000 mg/L as N	0.01 mg/L	T63<1s, T90<10s, T95<30s	mg/L, ppm, mV	-
Unionized Ammonia, Total Ammonia (derived from Ammonium & pH sensor)	-	0 to 10,000 mg/L as N	0.01 mg/L	-	mg/L, ppm	-
Nitrate (NO₃⁻ - N)¹¹ Rated to 25m depth	±10% or ±2 mg/L w.i.g.	0 to 40,000 mg/L as N	0.01 mg/L	T63<1s, T90<1s, T95<1s	mg/L, ppm, mV	Std. Methods 4500 NO ₃ D
Chloride (Cl)¹¹	±10% or ±2 mg/L w.i.g.	0 to 150,000 mg/L as Cl	0.01 mg/L	T63<1s, T90<10s, T95<30s	mg/L, ppm, mV	Std. Methods 4500 Cl D
Pressure¹³ (Optional)	±0.1% full scale (FS)	Non-Vented or Vented 9.0 m (30ft) (Burst: 27 m; 90 ft) 30 m (100 ft) (Burst: 40 m; 130 ft) 76 m (250 ft) (Burst: 107 m; 350 ft) 200 m (650 ft) (Burst: 229 m; 750 ft)	0.01% full scale	T63<1s, T90<1s, T95<1s	Pressure: psi, kPa, bar, mbar, inHg, mmHg Level: in, ft, mm, cm, m, cmH ₂ O, inH ₂ O	Piezoresistive; Ceramic
Warranty¹⁴	2 year - Sonde, RDO and sensor cap, temperature/conductivity, temperature only, turbidity (excluding pH/ORP) 1 year - pH/ORP, accessories 90 days - ISE Sensors; Other: see warranty policy (www.in-situ.com/warranty)					
Notes	1) For 30 parameters >100,000 data records, > 3 years at 15 min. interval. A single data record includes timestamp, temperature, RDO, pH, ORP, turbidity and conductivity logged in Linear or Linear Average mode. 2) Log data recorded to SD card in comma delimited variable (CSV) file format. Greater than 32 GB not supported. 3) Logging all sensors at 15 min interval on 2 D Alkaline batteries. Battery life dependent on site conditions and wiping. 4) Dependent on display and wiping. 5) Sensor only, when transferring from air to ambient water temperature. Typical system response time with all sensors and restrictor: T63<30s, T90<3.5m, T95<7.5m. 6) Response time at thermal equilibrium. 7) Accuracy from calibration standard @ 25C, response at thermal equilibrium immediately following calibration measuring from air to +400 mV. 8) Accuracy at calibration points. 9) RDO sensor full range 0-50mg/L, 0-500% sat. EPA-approved under the Alternate Test Procedure process. 10) User-defined reference. 11.) Between 2 calibration points immediately following proper conditioning and calibration. Varies on site conditions and environmental interferences. See sensor summary sheet for potential interferences. 12.) Average response; can be longer with increasing concentrations of ammonium. 13) Typical performance across full temperature and pressure calibrated range. 14) Extended warranty option for sonde only (1 to 3 year extension for up to 5 years total).					
Specifications are subject to change without notice.						



EPA-Approved RDO Method

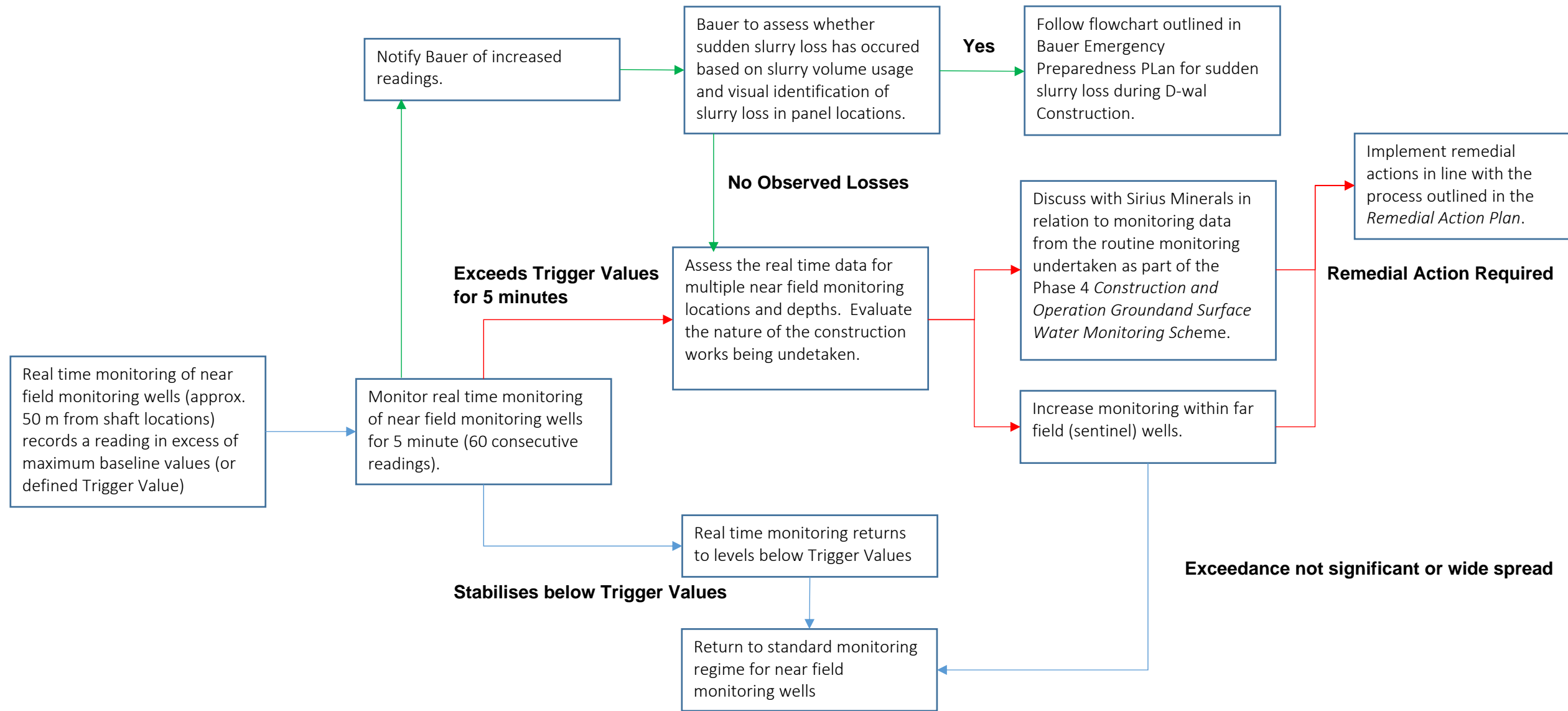


RoHS compliant



NORTH YORKSHIRE POLYHALITE PROJECT - WOODSMITH MINE

Flowchart: Emergency Preparedness Plan for Monitoring Bentonite Losses



Monitoring will involve real time groundwater monitoring in boreholes to 60 m.
 Trigger values based on maximum baseline values or values to be defined based on preliminary testing.