wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

# WATER AND WASTE WATER MANAGEMENT PLAN

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **KZ10061** |
| **VERSION:** | **V2.0** |
| **REPORT NUMBER:** | **MM1** |
| **STATUS:** | **FINAL** |

**POLYMETAL**

**KYZYL PROJECT**

# WATER AND WASTE WATER MANAGEMENT PLAN

**October 2016**

**PREPARED BY:**

| | |
|---|---|
| Bertrand Burnet | Hydrologist |
| Peter Dunn | Associate Hydrologist |

**APPROVED BY:**

| | |
|---|---|
| Alex Gallagher | Technical Director |

.....





ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Background ..... 1
1.2 Scope and Limitations of this Management Plan ..... 1
1.3 Hydrology ..... 1
1.4 Hydrogeology ..... 2
**2 WATER MANAGEMENT OVERVIEW ..... 2**
2.1 Water Supply ..... 2
2.2 Waste Water ..... 3
**3 SURFACE WATER MANAGEMENT ..... 4**
3.1 Surface Water Abstraction ..... 4
3.2 Surface Water Diversion and Drainage System ..... 4
3.3 Overburden Stripping and Compaction inside Project Perimeter ..... 6
3.4 Manual and Automated Monitoring of Surface Water and Data Management ..... 6
**4 GROUNDWATER MANAGEMENT ..... 7**
4.1 Existing Mine Monitoring Borehole Network ..... 7
4.2 Groundwater Abstraction ..... 8
4.3 Open Pit Area ..... 8
4.4 Waste Rock Dump ..... 10
4.5 Tailings Storage Facility ..... 10
4.6 Overburden ..... 11
4.7 Hardstanding Areas/Impermeable Surfaces ..... 11
4.8 Oils, Lubricants, Chemicals, and Fuel ..... 11
4.9 Manual and Automated Monitoring of Groundwater, and Data Management ..... 11
**5 SUGGESTED DATA REVIEW AND ANNUAL REPORT ..... 12**

# 1 INTRODUCTION

## 1.1 Background

The Kyzyl (Bakyrchik) gold deposit is currently operated by Bakyrchik Mining Venture LLP (BMV), a subsidiary of Polymetal International PLC. The Project is located in the north-eastern sector of the Republic of Kazakhstan (RoK), adjacent to the settlement of Auezov in Zharminsky District, East Kazakhstan Oblast. The deposit is situated 90km south-west of the regional capital Ust-Kamenogorsk.

Wardell Armstrong International Ltd (WAI) has been instructed by Polymetal to develop a Water and Waste Water Management Plan (WWW MP), as part of the Environmental and Social Impact Assessment (ESIA) process for BMV to support the re-commissioning of the mine, which has officially been in Care & Maintenance since 1997.

## 1.2 Scope and Limitations of this Management Plan

This document should be read in conjunction with the water resources (hydrology and hydrogeology) section of the WAI's ESIA. The objective of the WWW MP is to guide Polymetal International PLC in its management of water and waste water at the Project such that any adverse environmental impacts resulting from Project activities can be minimised. In order to achieve this, the WWW MP will:

- Identify Project activities requiring active water and waste water management;
- Specify monitoring activities required;
- Outline best practise options for management of water and waste water at the Project.

This document does not identify exceedance trigger levels or define exceedance response procedures, mitigation and contingency measures, quality assurance, data collection targets, or other procedures for managing problems with the monitoring network. This document does not detail specific design concepts of any suggested monitoring points. In the absence of specific Kazakhstan legislation on the reporting of hydrological/hydrogeological data, this management plan dictates that review/and or reporting should be conducted in accordance with international best practise. This document provides a framework to be developed and must be updated with specific monitoring requirements of each asset as the monitoring network evolves and more monitoring points are established.

## 1.3 Hydrology

Mean annual precipitation in the warm period (April to October) is 233 mm and in the cold period 102mm, potential evaporation is 910 mm. The drainage network in the general area of the Bakyrchyk mine is well developed with several streams draining the project area, notably Akbastaubulak brook. The main river in the area is known as the Kyzylsu River. There are also a number of surface water bodies in the vicinity of the mine site: four open pits (West, Central and East and Dalneye pits), the Alaaigyr reservoir and the Kyzylsu water supply reservoir. Watercourses flow mainly in the spring, when they are fed by snowmelt and can dry up in the summer.

## 1.4 Hydrogeology

The main aquifer in the general area of the mine is the Lower Carboniferous bedrock aquifer. It predominantly consists of sandstone and siltstone. It is present across the entire area of the mine and its total thickness may be up to 2,800m. Due to its large extent, its significant thickness and its reasonable capacity for groundwater storage, it represents the main source of groundwater. Groundwater flow and storage occurs predominately within the top 100 m and is dominated by secondary porosity (weathered bedrock and the fracture system).

The Pavlodar Clay is present in the valley of the Kyzylsu River and at the mouth of the valleys of some brooks. It rests unconformably on the Lower Carboniferous bedrock aquifer and the thickness of the sediments can reach several tens of meters. Where present, the Pavlodar Clay acts as an aquitard and confines the bedrock aquifer.

The superficial alluvial aquifer is developed in the valley of the Kyzylsu River and in the lower valleys of its right-bank tributaries. It rests on the Pavlodar Clay aquitard and is unconfined. Due to its limited extent and thickness, the superficial alluvial aquifer has limited storage and is considered as a minor aquifer not suitable for the water supply of the mine site.

# 2 WATER MANAGEMENT OVERVIEW

The site wide water balance for Stage 1 (open pit mining) and Stage 2 (underground mining) of the project is shown in Drawings 3.5 and 3.6, and should be referred to while reading Section 2 on water supply and management.

## 2.1 Water Supply

### *2.1.1 Raw Water*

Raw water used for the supply of potable water to the Auezov settlement will be sourced from the Kyzylsu water supply reservoir on the Kyzylsu river, located south of the mine site. Reservoir water will be pumped via a newly constructed water pipeline to the existing Pump and Filtration Plant (PFP). The existing PFP will be linked with a newly constructed water tower. The Auezov village will still have the possibility to be supplied with water from the Kyzyltu wellfield, if necessary, but this would only happen under exceptional circumstances when water supply from the Kyzylsu reservoir is cut off.

Potable water, used for the mine facilities, will be sourced from the Kyzyltu wellfield located in the Kyzyltu River valley, north of the mine site. The daily water intake during Stage 1 will be about 91$m^3$/d rising to about 184 $m^3$/d in Stage 2. Groundwater will be treated in a second PFP dedicated to the mine facilities and separate from the existing PFP located at the Auezov settlement.

### *2.1.2 Industrial (Processing) Water*

Water for processing needs will be sourced as a combination of the following:

1. water from pit dewatering;
2. water reclaimed from the new Tailings Storage Facility.

*Water from Pit Dewatering*

There are groundwater inflows into the current mine workings, which originate from the fractured bedrock aquifer. Dewatering will be undertaken in order to allow open pit mining to take place. Water flowing into the open pit will be pumped to the open pit water settling pond - the disused Eastern pit (or Pit 2) located east of the new proposed open pit workings. The shape of the Eastern pit is long and narrow, and a dam wall will be constructed to prevent water draining from the pond back into the mine workings. From 2018 all water will be pumped from the water settling pond to the process water tank at the ore processing facilities. Prior to 2018 water in the settling pond will be discharged to Akbastaubulak brook after being treated to IFC guideline standards (see Table 2.3 ESIA Chapter 2).

*Water Reclaimed from the New Tailings Storage Facility*

The other main source for processing water will be reclaim water from the new tailings storage facility, which will be constructed as part of Stage 1 construction activities. Water will be pumped out of the tailings facility and returned to the process water tank at the ore processing facility.

Evaporative water losses are expected from the water supply storage areas. When necessary, water from the Kyzyltu wellfield will be used to make up for water losses in the process water system, or in an emergency for fire-fighting. The primary use for water abstracted from the Kyzyltu wellfield will be as the source of potable and household water for mine facilities. To distribute this water around mine facilities, a new pump house will be built west of the new ore processing facilities.

## 2.2 Waste Water

The mine site and settlement household effluents are transported by gravity flow sewers to a sewage pumping station and then pumped to biological treatment facilities at a volume of about 45 $m^3$/day and 122 $m^3$/day during Stages 1 and 2, respectively. No accurate data covering the existing flow rate from the current WWTP is available, however Auezov village draws approximately between 1,000$m^3$ and 1,600$m^3$ per day from the local well field as a result, it can be assumed that a large percentage of this will pass through the WWTP. The household effluents treatment plant is located close to the western outskirts of Auezov village and uses mechanical and biological treatment, as well as anti-bacterial decontamination to treat mine site and settlement household effluents. After treatment, the effluents are discharged into the Akbastaubulak brook just west of the village of Auezov. The quantity and quality of the effluent will be monitored: quantity by developing 'v' notch weir and a stage

discharge relationship, and quality by automated monitoring of hydro-chemical parameters pH and electrical conductivity and monthly sampling.

# 3 SURFACE WATER MANAGEMENT

## 3.1 Surface Water Abstraction

Surface water will be abstracted from the Kyzylsu reservoir for supply to Auezov village. The volume of water abstracted will be monitored continually at the reservoir, as well as at the Pump and Filtration Plant, to allow for any potential losses during transfer to be established.

During the operation of the mine, the water level in the Kyzylsu reservoir will be at least measured manually on a monthly basis and preferably on a daily basis by logger/transducer.

## 3.2 Surface Water Diversion and Drainage System

### *3.2.1 Open pit Area*

Run-off from the project area has the potential to flood the open pit during heavy rainfall and snowmelt events. In order to protect operations at the open pit during periods of significant rainfall or snowmelt, appropriately sized stormwater and snowmelt control channels and bunds will be constructed.

Section 4.3 outlines the issues relating to the management of acid rock drainage within the open pit.

The water pumped out of the pit as part of mine dewatering operations will be collected within an in-pit drainage water settling pond (Open Pit 2 pond), where water quality will be monitored using an automated pH and electrical conductivity probe and quarterly sampling as a minimum. Thereafter, water will be transferred for use in the process plant and any excess water sent to the tailings storage facility. Prior to 2018 water will be discharged via a treatment facility to the Akbastaubulak brook. The quality of the water discharged to Akbastaubulak brook will need to meet IFC Environmental, Health, and Safety Guidelines for water quality in Mining (Table 2.5.1 in Chapter 2). Compliance with these guidelines will be checked by regular monitoring of water quality and quantity upstream and downstream of the discharge outlet in Akbastaubulak brook as described in Section 3.4.

The mine dewatering discharge and discharge of treated household effluent into Akbastaubulak brook will partially compensate for the removal of water by the diversion upstream of waste dumps. However, the quantity of mine water discharge may change seasonally and with time in response to changes in rainfall and mine water management. The effect of changes to the flow regime downstream of the outlet will need to be reviewed after one year of operation. This will require an accurate record of discharge and water quality at the crossing point downstream of the mine site along with aquatic and topographic surveys focussed on the Akbastaubulak brook between the mine

site and Kyzylsu river confluence. The quality and quantity of water discharged from the mine and Auezov waste water treatment plant will also require monitoring.

Winter inspection and clearance of debris/ice from a nearby culvert downstream of the mine dewatering discharge outlet will be required. Blockage of the culvert could potentially impede the passage of unfrozen mine water discharge leading to the possible inundation of the roadway with adverse consequences for road users.

### *3.2.2 Waste Rock Dump*

The waste dump footprint will intersect the Akbastaubulak and Kyzyltu brooks. A protection dyke has been constructed across each of the two brooks north of the waste rock dump. The dyke will cause two settling ponds to be formed north of the waste dump (settling pond No 1 and 2). The water that collects in the settling ponds will be conveyed westwards into the Holodniy Klyuch brook via a stream diversion channel.

Drainage ditches will be constructed around the perimeter of the waste dump to manage runoff from the dump. This drainage will be conveyed to settling ponds located to the north and south of the dump which will overflow into the diversion channel and Akbastaubulak brook, respectively.

The risk of acid rock drainage occurring in surface runoff will be reduced by the placement of potentially acid forming rock away from the edges of the dump and encapsulating it within non-acid forming rock.

Monitoring of flow and water quality will be carried out at a number of locations, including the settling ponds at the outlets of perimeter diversion drains and at the inlet and outlet of the diversion channel. Monitoring of flow in Holodniy Klyuch brook upstream of the diversion outlet and at its confluence with the Kyzylsu river. Monitoring should be carried out during the construction, operation and closure phases, as defined in Section 3.4.

### *3.2.3 Tailings Storage Facility*

The Tailings Storage Facility footprint will intersect the Bezymyanny brook, which flows into the Alaaigyr brook. An embankment (Dam No.1) has been constructed to redirect the flow in the Bezymyanny brook around the eastern side of the Tailings Storage Facility and into a diversion ditch where after flow eventually find its way into the Alaaigyr brook.

Monitoring of flow and water quality will be carried out at the downstream end of the diversion ditch during the construction, operation and closure phases, as defined in Section 3.4.

### 3.3 Overburden Stripping and Compaction inside Project Perimeter

Overburden stripping and compaction may result in a reduction in surface infiltration and a consequent increase in surface water runoff during storm events or in response to snowmelt. Any additional runoff will be channelled into a drainage/soakaway system and allowed to infiltrate into the ground without any change in the net water balance of the Project.

In general, stormwater runoff from mine affected areas will be separated from 'clean' runoff and directed to settling ponds before overflowing to the downstream environment, tailings storage facility or recycled to the process plant, whichever is appropriate.

### 3.4 Manual and Automated Monitoring of Surface Water and Data Management

For each stream flow monitoring location (including the Kyzylsu reservoir) water level measurements will be made monthly, unless stated otherwise, and the date and time of measurement noted.

In addition to monthly manual monitoring transducers / data loggers will be installed at key locations (including the Kyzylsu reservoir) in order to measure the stream stage/water level. The number and location of these key monitoring points will be defined during the Construction Phase but will at least involve locations on watercourses immediately upstream and downstream of the mine site. Data loggers will be set to record at hourly intervals, unless stated otherwise, and will be checked and the data downloaded on a monthly basis.

A stage-discharge relationship will need to be derived for stage monitoring locations so that values of discharge may be estimated from measurements of stage. Flow gauging to develop the stage-discharge curve is required for the full range of water levels and flows that can be expected during spring-summer-autumn.

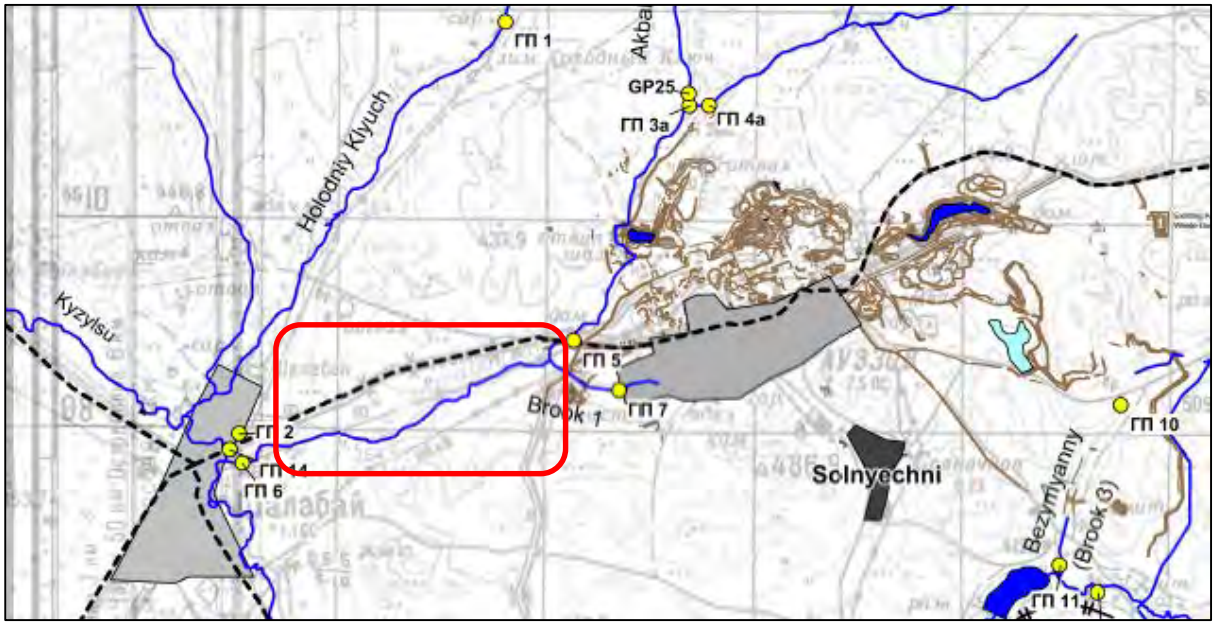
Stage will be monitored on a daily basis during the entire period of spring snow melt and at 6-hourly intervals over several days during summer rainstorms until flow has returned to pre-storm levels. During low flow periods in summer and autumn monitoring will reduce to a bi-weekly frequency.

Monitoring of surface water quality upstream and downstream of the mine dewatering discharge outlet will be required to confirm compliance with environmental controls and water quality objectives for the Akbastaubulak brook. As a minimum this will entail daily visual inspection for turbidity and discolouration in the brook and measurements of pH and salinity. Additional sampling and testing of a comprehensive suite of determinants including major ions, hardness, EC, total organic carbon and dissolved oxygen will be invoked should the daily monitoring results indicate a potential pollution event. These results will be compared to IFC guideline concentrations (see Table 2.5.1 of Chapter 2) to confirm a pollution event and to trigger appropriate actions to identify and remedy the cause of pollution. The incidence of deformities in fish identified during annual aquatic ecological surveys will also provide evidence of pollution.

An aquatic ecological survey of watercourses impacted by the mine to record the distribution of sensitive species (biocriteria) such as Caddis Flies, Common Minnow, Gudgeon, Siberian Loach and larvae of Diptera and Tench will be implemented as recommended by the Baseline Ecological Survey (Appendix 4.6, Chapter 4). The results of annual surveys will highlight changes in the distribution of species and provide an indication of the health of watercourses downstream of the mine site. It will also identify the possible bio-accumulation of contaminants in fauna that may not be apparent from regular water quality monitoring.

An environmental data management system will be used for the management of hydrogeological and surface water data. Other documentation related to groundwater and surface water monitoring will also be retained in an appropriately accessible archiving facility.

If it can be demonstrated that land downstream of the project, either side of the Akbastaubulak brook, is used for agricultural purposes during the operation of the mine, then the impact upon these areas will be monitored. The areas potentially subject to this monitoring are broadly indicated in red on the inset drawing below. These areas will have access to the increased water flow from the WWTP at Auezov. However, should degradation occur in the areas highlighted as result of poor irrigation caused by the Kyzyl project, then alternative irrigation will be sourced from the Holodniy Klyuch located to the north.




## 4 GROUNDWATER MANAGEMENT

### 4.1 Existing Mine Monitoring Borehole Network

A network of purposefully designed monitoring boreholes has already been installed around the various existing installations of the mine site (open pit, TSF, wellfield and arsenic waste dump)

between 1996 and 2007. Water levels and water quality are being monitored on a regular basis. Details of the monitoring data are presented in Section 5.9 of the original ESIA Environmental and Social Baseline. The purpose of the boreholes is as follows:

- Open pit area boreholes - Understand the impacts to groundwater as a result of open pit excavation and dewatering.
- Kyzyltu wellfield boreholes - Assess the impact of groundwater abstraction from the wellfield on the aquifer.
- Tailings Storage Facility (TSF) boreholes - Monitor the aquifer water level and quality to assess any potential impact from the TSF.
- Arsenic waste dump boreholes - Monitor the aquifer water level and quality to assess any potential impact from the arsenic waste dump.

## 4.2 Groundwater Abstraction

Groundwater will be abstracted from the Lower Carboniferous bedrock aquifer by the Kyzyltu wellfield located to the north of the mine site to a maximum rate of 94 $m^3$/d in Stage 1 and 184 $m^3$/d in Stage 2. The wellfield has four operational production boreholes. A single borehole will be needed to abstract the required quantity. The three other boreholes will be on standby.

To assess the impact of groundwater abstraction on the aquifer it is recommended that manual and automated monitoring is carried out at the abstraction boreholes and the nearby monitoring boreholes as detailed in Section 4.9.

## 4.3 Open Pit Area

Seepage of water into the pit will be affected by the increased permeability of the excavated/blasted rock and the continuity of pit dewatering, particularly during storm events and during spring thaw when flows are likely to be at their maximum.

Acid Rock Drainage (ARD) may occur to the open pit as sulphide-rich material is exposed to air in the pit wall and flushed to the pit-sump by spring snowmelt, summer rainfall or fluctuating groundwater levels. Geochemical studies suggest that some >0.5% sulphide material may be non-acid generating and that there is sufficient neutralising material to buffer any ARD produced. However, further studies will seek to refine these estimates such that a more accurate measure of potentially acid-generating material and arsenic leaching is quantified prior to mining of high risk material.

### *4.3.1 Open Pit Monitoring Network*

A total of 5 monitoring boreholes were constructed to a depth of about 50m north of the existing open pit area to understand impacts to groundwater as a result of open pit excavation and dewatering. The new open pit will be more extensive than the existing pit and the new WRD will cover a large area just to the north of the new open pit. As a consequence, three of the existing monitoring boreholes will

be lost and additional monitoring boreholes will be needed. The new boreholes will be constructed to a greater depth of about 100m to intercept the water table which will be lowered during dewatering. The updated monitoring network will include at least three strategically located boreholes up hydraulic gradient of the new open pit, and at least three down hydraulic gradient. It is recommended that manual and automated monitoring at the abstraction boreholes and the nearby monitoring boreholes is carried as detailed in Section 4.9. An annual review and report is recommended.

### *4.3.2 Dewatering Water*

During operations the water pumped out as part of open pit dewatering will be collected within the pit drainage water settling pond (Open Pit 2 pond). Prior to 2018 water will be discharged to Akbastaubulak brook after being treated to IFC water quality guideline standards (see Table 2.3 Chapter 2). After to 2018, all water will be transferred to the process water tanks for reuse in the process plant.

It is recommended that the daily volume of water pumped out of the open pit is recorded on a daily basis. The daily water level in Open Pit 2 pond should be recorded manually on a daily basis and automatically with a transducer/data logger at hourly intervals.

In order to assess acid rock drainage potential, the water collecting in the active open pit and Open Pit 2 pond will be monitored using an automated and calibrated pH and electrical conductivity probe and sampled on a quarterly basis and more regularly if the automated measurements indicate that acid rock drainage is occurring. As a result of the ongoing dewatering the hydraulic conditions at the open pit are such that, locally, groundwater flows will be into, and not from the pit. This is known as 'hydraulic containment' and, together with the transfer to the processing plant of groundwater collecting in the open pit sump, will limit the potential impact of acid rock drainage during the operational stage.

### *4.3.3 Closure Phase*

Post-closure, a small perennial lake is expected to form in the open pit. The water level will stabilise as equilibrium is reached between the rate of inflow to the pit, and the evaporation from it. Given the relatively high rate of evaporation compared to precipitation it is uncertain whether water levels in the pit will equilibrate with the surrounding water table. Should water levels remain below the surrounding water table then the pit will continue to act as a groundwater sink and thereby prevent the migration of potential contaminants away from the mine.

The extent of final pit shell wall rock exposure of sulphides and arsenic-rich rock will be known for some years prior to closure as production continues from underground. This will allow progressive refining of water quality predictions and evolving closure strategies. Continued studies will also investigate water inflow sources/pathways to determine the likely post-closure hydraulic connectivity and the potential for groundwater flow away from the pit.

Upon cessation of mining, quarterly monitoring of the open pit water and of groundwater in the nearby monitoring boreholes is recommended for at least five years as required by Kazakhstan legislation. This will monitor the potential incidence of acid rock drainage and any remaining contamination in the groundwater resulting from mining operations.

### 4.4 Waste Rock Dump

The risk of acid rock drainage from the waste rock dump will be reduced by operational management of the waste rock. This will delineate any high risk, potentially acid forming rock, in the pit as part of the geological grade control system. Potentially acid forming rock material will be preferentially placed away from the edges of the waste rock dump footprint, effectively encapsulating it within the majority non-acid forming rock.

A network of purposefully designed monitoring wells will be installed around the waste rock dump to identify impacts of acid rock drainage formation in groundwater. These will be installed to a depth of 50-100 m as required to intercept the water table in the weathered bedrock aquifer. Water from monitoring wells will be sampled on a regular basis. The water level in these boreholes will be recorded as detailed in Section 4.9. An annual review report is recommended.

### 4.5 Tailings Storage Facility

Mine tailings can contain concentrations of metals and minerals, which could potentially leach from the base of the tailings storage facility into the underlying groundwater. A range of measures will be put in place to limit operational impacts to the environment, groundwater and surface water quality. Sustainable surface water diversion channels to divert non-contact surface water around the tailings storage facility will be installed to avoid contamination of groundwater and surface water, and provide protection to other environmental receptors.
A network of purposefully designed monitoring wells will be installed around the tailings storage facility to understand any impacts of the release of contaminants to groundwater. These will be installed to a depth of 50-100m as required to intercept the water table in the weathered bedrock aquifer. The monitoring network will include at least three strategically located bores up hydraulic gradient, and at least three down hydraulic gradient to detect any potential leaks from the tailings storage facility.

Water from monitoring wells will be sampled on a regular basis. The water level in these boreholes will be recorded as detailed in Section 4.9. An annual review report is recommended in accordance with international best practise. Further mitigation measures, for example containing leaks, will be implemented as required.

### 4.6 Overburden

The disturbance of overburden during construction could lead to increased transport of suspended solids and adsorbed pollutants to groundwater. This impact will be decreased substantially by limiting or protecting the amount of exposed overburden during construction work via:

- Phasing of construction to minimize exposure of unprotected soil;
- Appropriate location of topsoil stockpiles away from ephemeral stormwater channels;
- Covering (revegetating) topsoil stockpiles; and
- Designing flow paths to facilitate interception of silt-containing runoff in filter barriers and/or silt traps.

### 4.7 Hardstanding Areas/Impermeable Surfaces

Construction activities including top soil removal and soil compaction due to vehicle movement may lead to increased runoff volumes particularly during storm events. Any additional runoff will be channelled into a sustainable drainage/soakaway system and allowed to infiltrate into the ground. To restore ground conditions as much as possible and allow infiltration into the underlying aquifer, areas of hardstanding and infrastructure will be removed at the cessation of mining, wherever possible.

### 4.8 Oils, Lubricants, Chemicals, and Fuel

Plant and machinery used in construction, operation and decommissioning of the various Project facilities will use various oils, lubricants, chemicals, and fuel. Accidental spillage of any of these has the potential to impact environmental receptors such as groundwater, surface water and artificial standing water bodies. This risk will be mitigated by the provision of controls such as:

- Bunding of fuel and chemical stores, with bunded areas providing a minimum of 110% of tank capacity so that any spills are fully contained. Workers will be trained in the safe handling of substances, and strict protocols will be put in place to verify proper handling;
- Using double-skinned tanker vehicles for transport of these materials. Any vehicles used during construction will be maintained and inspected regularly for leaks;
- Making available equipment on site to expeditiously deal with minor spills. An Emergency Response Plan will be put in place to deal with more significant events, and workers will be trained in spill prevention and emergency response and clean-up procedures;
- Installing sediment/grease traps on drains in vehicle park/storage areas;
- Recycling used water from the vehicle washes to the plant/process water system; and
- Capturing sewage effluent from temporary construction in sealed tanks. These tanks will be regularly emptied and disposed of in a suitable and environmentally protective manner. A treatment unit is proposed for the sewer wastewater from the facility.

### 4.9 Manual and Automated Monitoring of Groundwater, and Data Management

For each abstraction and monitoring borehole, groundwater levels will be manually measured, with a monthly frequency as a minimum. For each pumped abstraction borehole, the volume of abstracted groundwater will be manually recorded each month (at the same time as the water level is measured).

Transducer/data loggers re required in all abstraction boreholes and in a number of key monitoring boreholes to record groundwater level. Also, a continuous flow meter should be installed on all abstraction boreholes to record the volume of abstracted groundwater. The number and location of key monitoring boreholes will be defined during the Construction phase. Data loggers will be set to record at hourly intervals and will be checked and the data downloaded on a monthly basis. Consideration will be given to battery life, memory capacity, and logging interval of the data logger, and if a non-vented data logger is used, there is a requirement to record barometric pressure.

An environmental data management system will be used for the management of hydrogeological and surface water data. Other documentation related to groundwater and surface water monitoring will also be retained in an appropriately accessible archiving facility.

## 5 SUGGESTED DATA REVIEW AND ANNUAL REPORT

All data collected should be reviewed monthly for evidence of errors, faulty equipment and adverse trends.

An annual water monitoring report will be produced that summarises trends in water levels, surface water and groundwater quality, and presents abstraction data. The report will assess these trends against relevant legislation and environmental permits, as appropriate, and note any pollution events. Raw data will be provided in appendices.

The annual report will also include a section on the monitoring methodology, schedule and infrastructure. Any changes to the monitoring schedule or the location of monitoring points, for example newly drilled boreholes, will be recorded in the report and shown on accompanying plans.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**CULTURAL HERTIAGE MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **6** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER** | **MM11** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL PROJECT**

# CULTURAL HERTIAGE MANAGEMENT PLAN

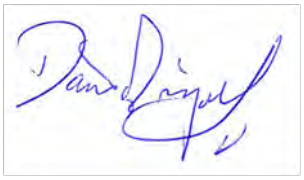
**OCTOBER 2016**

**PREPARED BY:**

| | |
|---|---|
| Edvard Glücksman | Senior Environmental Social Specialist |
| Elizabeth Adey | Principal Environmental Social and Community Specialist |

**APPROVED BY:**

| | |
|---|---|
| David Brignall | Technical Director |







ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Objectives and Purpose ..... 1
**2 LEGISLATION ..... 1**
**3 COMMUNITY CONSULTATION ..... 2**
3.1 Consultation during the Project ESIA ..... 2
3.2 On-going Management ..... 2
**4 PREVIOUS ARCHAEOLOGICAL SURVEYS AND ASSESSMENTS ..... 3**
**5 MANAGEMENT OF CULTURAL HERITAGE – EXHUMED GRAVES ..... 3**
5.1 Chance Find Procedure ..... 3
**6 REVIEW ..... 4**
**7 CONCLUSION ..... 5**

# 1 INTRODUCTION

The Kyzyl (Bakyrchik) gold deposit is currently operated by Bakyrchik Mining Venture LLP (BMV), a subsidiary of Polymetal International PLC (PI). The Project is located in the north-eastern sector of the Republic of Kazakhstan (RoK), adjacent to the settlement of Auezov in Zharminsky District, East Kazakhstan Oblast. The deposit is situated 90km south-west of the regional capital Ust-Kamenogorsk and 117km south-east of the town of Semey. The village of Shalabay is located 6km to the west of Auezov and Shalabay municipality surrounds the territory of Auezov.

The Kyzyl deposit was discovered in 1945 and open pit production commenced in 1956. Five major open pits were mined at the first production stage, complemented by ore from four smaller pits in the surrounding area. Underground mining was conducted between 1963 and 1997, after which no mining activities were undertaken and the site was run according to a Care & Maintenance regime with the aim of being able to quickly restart mining operations. Currently, the open pits do not operate and some of them are backfilled whereas others serve as water reservoirs.

BMV as a company was founded in 1955 under the name Bakyrchik Gold Mine. It was subsequently called the Bakyrchik Mining and Metallurgical Company (Bakyrchik GMK), taking on the BMV name in 1995.

## 1.1 Objectives and Purpose

The objective of this plan is to describe cultural heritage management measures that will be implemented at the Kyzyl Project. This management plan includes:

- A protocol for consultations with local community groups; and
- Chance finds procedure.

This management plan has been prepared to assist Polymetal in the implementation of appropriate environmental management measures during the construction and development of the Project.

# 2 LEGISLATION

In accordance with Kazakhstan legislation, the provisions of the ‘Subsoil Use’ license state that the Company is obliged to ‘preserve objects cultural and historical legacy’.

The provisions relate to the following legislation in Kazakhstan:

- Land Code dated June 20 2003; and
- Law of Protection and use of cultural and historical legacy dated July 2 1992.

In addition the Company is committed to meeting international best practice in line with the following guidelines:

- 'Physical Cultural Resources' World Bank (OP 4.11, July 2006);
- 'Cultural Heritage' International Finance Corporation (IFC) Performance Standard 8 (January 2012); and
- 'Cultural Heritage' European Bank for Reconstruction and Development (EBRD) Performance Requirement 8.

# 3 COMMUNITY CONSULTATION

## 3.1 Consultation during the Project ESIA

To date stakeholder engagement has been undertaken in relation to the Kyzyl ESIA and has focused on public hearings, meetings with authorities and community meetings at the Akimats of Auezov and Shalabay. Informal stakeholder engagement has been undertaken by WAI specialists regarding the cultural heritage features identified at the Kyzyl Project, which has included discussions with local community members in Auezov and Shalabay, including the local imam, village elders, and teachers based in the village.

As part of the ESIA, a Stakeholder Engagement Plan (SEP) has been developed which outlines how Polymetal will communicate with project stakeholders who have an interest in the development of the Kyzyl project throughout different project stages, including construction, operation and post mining.

In addition Polymetal have developed a formal public grievance mechanism which will enable project stakeholders to raise grievances and receive answers relating to any aspect of the project including concerns/issues relating to cultural heritage.

## 3.2 Ongoing Management

EBRD Performance Requirement 10 states that information disclosure should be meaningful, transparent and timely, with regular consultation carried out with all stakeholders.

The following outlines the strategy and recommendations for continued consultation and engagement with communities:

- Develop a community liaison committee (CLC) to help to improve overall engagement and disclosure of information to local community members and community groups in relation to cultural heritage. It will provide a mechanism for ensuring the views and ideas of local people are included;
- Newsletters – distributed in communities and published in newspapers providing information on; the general project related information and activities such as the

regular updates on monitoring reports, project news, the grievance procedure, but also issues and developments relating to cultural heritage; and

- Face to face discussions, public meetings and through other ideas that are appropriate and suggested by stakeholders (e.g. information boards in village amenities).

As mentioned above, Polymetal has a stakeholder grievance mechanism and any comments should be forwarded to Polymetal staff, in particular through their on-site Community Liaison Officer, who acts as the first point of contact.

# 4 PREVIOUS ARCHAEOLOGICAL SURVEYS AND ASSESSMENTS

Field reconnaissance relating to archaeology and cultural heritage in the Project area was undertaken by JSC Avalon in August 2013, by Polymetal during January-May 2015, and by WAI in June-July 2015. All the surveys to date indicate that, within the mining license area, there are currently no objects of identified historical and cultural value as defined by Kazakh legislation.

# 5 MANAGEMENT OF CULTURAL HERITAGE – EXHUMED GRAVES

The exhumed remains from both burial sites were relocated during August-October 2014 to a newly-built Muslim mausoleum (Photos 4.10.3-4.10.7 and Drawing 4.10.1) located adjacent to the Muslim cemetery serving Auezov and Shalabay and near the Christian cemetery serving both settlements. The land is officially within Shalabay municipality.

During the initial surveying processes, Polymetal came across a Muslim cemetery dating back to the late 19th/early 20th century, located 100m north of the BMV offices close to Open Pit 4. Among these graves was that of the locally notorious discoverer of the Bakyrchik deposit, Bakyrchik Kazkhy Mamai Uly. Polymetal carried out a full investigation according to Kazakh law before commissioning a contractor to exhume the remains of 15 bodies and move them to a newly built mausoleum located in Shalabay administrative territory adjacent to town's Muslim cemetery. Bakyrchik's tombstone was also moved to the new mausoleum, along with the remains of community members buried in the 1930s-1950s found in an undocumented burial area located in the territory that is set to lie within the Project's TSF facility.

## 5.1 Chance Find Procedure

Despite the fact that at the present time no objects that represent historical importance have been identified within the Project area, objects that are culturally important to local residents, including the tombstone of Mr Bakyrchik, have been identified. There is also the potential that in the future, during the implementation of any exploration/excavation/production work, historical and cultural objects may be encountered. Consequently, Polymetal developed a 'Chance Finds Procedure', a document which establishes the procedure for actions in case of discovering objects that are classified as archaeological findings.

The sequence of actions if an archaeological finding is discovered are as follows:

1. Stop all works.
2. Inspect the object without displacing it from the ground; assess the objects historical, scientific, artistic and other cultural value (remains of settlements, structures, tools, utensils, dishes, and graves).
3. Mark/ identify boundaries of the area of the finding.
4. Inform a supervisor who ensures information is passed on to the site manager and social expert/environmental officer.
5. The social expert/ environmental officer register the coordinates of the area and Photographs the finding.
6. Inform the authorized state agency in charge of protection and use of historical and cultural legacy" (article 39 of the Law of Protection and use of historical and cultural legacy).
7. The authorised state agency ensures evaluation of the finding.
8. The area is fenced; warning signs are installed.
9. Further actions are determined according to instructions of the authorized state agency. In case the finding cannot be moved, corresponding changes to be made to the project.
10. Mining and construction works can be restarted after decision of the authorized state agency in charge of protection and use of objects of historical and cultural legacy.
11. In case contract operations are postponed due to the archaeological finding the contract company can apply for prolongation of the Contract for the period of the delay, unless specified by the Contract. However the contract company is not entitled to request any indemnities or claims, except those directly related to archaeological works that include moving and protection of a historical and cultural object.

All employees and contractors must be made aware of the Chance Find procedures.

## 6 REVIEW

The Cultural heritage Management Plan will be reviewed and if necessary updated on a regular basis including consultation with local people of any changes, by the Community Liaison Officer or Environmental Officer. This should be carried out on a regular basis during construction work (every 3 months or more frequently if appropriate) with annual checks during operation and closure. The following principles need following:

- Ensuring the management plan is communicated to and developed further in accordance with the wishes of the local community;
- Should any incidents occur on site relating to cultural heritage management that issues are resolved as soon as possible in full consultation with local people if they are involved or if incidents are applicable to them;
- When there are changes to the project licence/operations (such as activity at Karyernoye deposit); and
- In response to a relevant change in legislation.

# 7 CONCLUSION

This document aims to provide a strategy for ensuring that site conservation is carried out to protect local cultural heritage. Consultation with stakeholders about the maintenance of the newly built mausoleum, including any grievances that members of the local community may have, needs to be held on a regular basis, actively involving and integrating the considerations of the community in all aspects of how the cultural heritage management measures are developed further and implemented on site.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

**APPROVED BY**
General Director
Bakyrchik Mining Venture LLP

_____
Y. Ovchinnikov

«_____» _____ 2015

# ARCHAEOLOGICAL CHANCE FIND PROCEDURE

## for the mining, geological and land allotment of Bakyrchik Mining Venture LLP

Auezov Settlement, 2015

**1 Prepared by** Bakyrchik Mining Venture LLP

**2 Prepared by** Head - Environmental Safety Department

_____ G. Chudina «___» _____ 2015

**Wardell Armstrong have reviewed the following procedure against IFC Performance standards and provided comments and suggestions where relevant.**

**Our suggestions are based on achieving compliance according to IFC standards (in particular Section 8), which require the definition of a qualified Chance Finds Team to monitor discoveries and to implement the CFP.**

## 1. Introduction

BMV LLP respects the cultural and historical heritage of the Republic of Kazakhstan. The company has developed this Archaeological Chance Find Procedure, as it is aware of archaeological artifacts or remains of ancestors, which might be discovered in the course of mining or construction work on land leased for the Bakyrchik project.

This document establishes the discovery procedure for any objects that have signs of archaeological finds.

**In the introduction, explain why you have developed the Chance Finds Procedure, i.e.** *in order to deal with tangible cultural heritage remains which may be currently unknown but discovered during the course of mining and construction work.*

**Finally, to strengthen compliance with international standards, add:**

*"This CFP defines a series of steps to minimize the impacts on undiscovered cultural heritage resources of the mining or construction work carried out as part of the Bakyrchik project. The CFP does this by providing a process for conducting archaeological monitoring of ground disturbing activities and responding to any tangible cultural heritage encountered during Project construction or operation. These unexpected discoveries are known as Chance Finds. The protocols and procedures in the CFP outline the actions to be taken if any Chance Finds are encountered during construction and operations. The CFP will be applicable to any ground disturbing works associated with the Project during the pre-construction, construction, operational, and closure and post-closure phases."*

## 2. Legal Basis

Under the provision of the Subsoil Use Contract, the Company has undertaken to "**preserve objects of cultural and historical significance"** (paragraph 7.2.14 of the Contract).

This provision is supported by the legislation of the Republic of Kazakhstan:

- Land Code of the Republic of Kazakhstan of June 20, 2003;
- Republic of Kazakhstan Law "On protection and use of historical and cultural heritage" of July 2, 1992 No. 1488-XII

Furthermore, the Company is guided by:

- Operational Manual 4.11 - Physical Cultural Resources by World Bank Group (OP 4.11, July 2006);
- Performance Standard 8: Cultural Heritage by International Finance Corporation (January, 2012).

## 3. Main Provisions

There were no officially registered historical and cultural monuments in the project area as of the time this procedure was developed.

***Add:*** *There are currently no officially registered historical and cultural monuments.*

During the project implementation, any mining and construction contractor will be notified of the Archaeological Chance Find Procedure for the project site, and will be called upon to follow it.

**List which Project participants have specific roles and responsibilities outlined in the CFP, i.e:**

- *BMV LLP;*
- *Contractors and other service providers;*
- *Cultural Heritage Consultants and Cultural Heritage Monitors who will form the Chance Finds Team;*

## 4. The Sequence of Actions if an Object is Discovered

**Archaeological Monitoring Execution Procedure**

***Chance Finds Response Procedures***

*The response to Chance Finds and possible Chance Finds initially falls on the Chance Finds Team. Most finds will be categorised in the field by the Chance Finds Team as "non-archaeological" or "insignificant archaeological/cultural heritage find" depending on the nature of the discovery. Such instances require a brief cessation of work in the immediate vicinity of the discovery while the archaeological monitor(s) working for the Cultural Heritage Monitor collects data related to the chance find and completes a Chance Find Form. In those instances where the archaeological monitor(s) categorises the chance find as "non-archaeological" or "insignificant archaeological find," work can resume as soon as the archaeological monitor(s) has completed the field records of the chance find. Such finds are to be included in the internal documentation of the CFP but need not be reported beyond the members of the Chance Finds Team present in the field. For those chance finds that are considered by the archaeological monitor(s) to be of potential cultural heritage significance, the Chance Finds Team will develop recommendations for further assessment, excavation, and/or mitigation of the chance find."*

The sequence of actions if an object with some features of archaeological finds is discovered:

1. Mine foreman or other person responsible for onsite operations should stop the ongoing work at the site.
2. The person responsible for onsite operations should then inform the Head of Environmental Safety Department of the discovery.
3. A representative of the Environmental Safety Department should take the following measures:
4. Examine the object with respect to any sign of historical, scientific, artistic or other cultural value (the remains of settlements, buildings, tools, utensils, dishes, burials) without extracting it from the earth and destroying.
5. Outline / mark the boundaries of the site where the object was discovered.
6. Log location coordinates and take photos of the finds.
7. "... natural and legal persons are obliged to suspend operations and inform the authorized body for protection and use of historical and cultural heritage" (Art. 39 of the Law "On Protection and Use of Historical and Cultural Heritage").
8. An authorized body shall evaluate the finds;
9. The territory will be fenced and warning signs will be placed around it.

10. Further actions are agreed with the competent authority, and a plan of protective measures is prepared. If the finds cannot be moved, then the decision on introducing changes in the design is made.

11. Mining and construction can be resumed only after the authorized body's decision on protection and use of historical and cultural heritage.

12. In case of delays due to an archaeological discovery, affecting the overall schedule, a contractor may apply for an extension of the Agreement proportional to the delay, unless other provisions are specifically set forth in the Agreement. However, a contractor will not be entitled to any compensation or claims other than those directly related to archaeological work on extraction and protection of historical and cultural finds.

**In order to cover for some of the circumstances outlined in the international standards, add:**

*The collection of archaeological artefacts or other cultural heritage objects should be minimal as most artefacts should be left where they are found whenever possible. Those retained because they are accidentally unearthed or broken free of their soil matrix will be retained with precise notation of their original location, and with photographs taken of their original context. No artefacts or cultural heritage objects should be discarded or removed as souvenirs by any Project personnel.*

*Artefact photos and site photos are useful for consultation regarding chance finds and should be taken as soon as possible. Artefacts and associated notes and photographs taken by any project personnel should be given to the members of the Chance Finds Team.*

**APPROVED BY:**

Deputy General Director - Operations
_____ K. Isaev «___»_____2015.

## LIST

## of Bakyrchik Mining Venture LLP employees, who have read and acknowledged this document

| Name | Position | Signature/Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**SOCIAL MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER:** | **MM13** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL PROJECT**

# SOCIAL MANAGEMENT PLAN

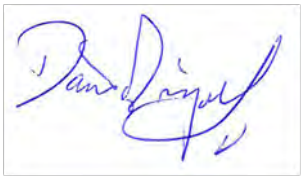
**OCTOBER 2016**

**PREPARED BY:**

Edvard Glücksman — Senior Environmental and Social Specialist
Elizabeth Adey — Principal Environmental and Social Specialist

**APPROVED BY:**

David Brignall — Technical Director







ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**GLOSSARY OF ACRONYMS** ..... **1**
**1 INTRODUCTION** ..... **2**
1.1 Overview ..... 2
1.2 General Aims and Structure of Social Management Plan ..... 2
1.3 Project Overview ..... 3
1.4 Community Liaison Officer ..... 4
1.5 Guidelines, International Standards, and National Legislation ..... 5
**2 COMMUNITY DEVELOPMENT** ..... **11**
2.1 Introduction ..... 11
2.2 Objectives ..... 11
2.3 Scope ..... 11
2.4 Fundamental Principles ..... 12
2.5 The Need for Community Development ..... 13
2.6 Management of Community Action ..... 13
2.7 Social Management Structure ..... 14
2.8 Community Management Plan ..... 15
**3 HUMAN RESOURCES & EMPLOYMENT MANAGEMENT** ..... **22**
3.1 Introduction ..... 22
3.2 Regulatory Requirements and Recommendations ..... 23
3.3 Approach to Recruitment, Employment and Training ..... 26
3.4 Recruitment and Training ..... 27
3.5 Employment ..... 28

**TABLES**

Table 2.1: Pre-Construction - Mitigation or Enhancement Measures already in Place at Kyzyl ..... 18
Table 2.2: Pre-Construction: Recommended Mitigation Measures ..... 19
Table 2.3: Construction-Initiated Actions: Mitigation Or Enhancement Measures Already in Place at Kyzyl ..... 20
Table 2.4: Construction-Initiated Actions: Recommended Mitigation Measures ..... 20
Table 2.5: Operation-Initiated Actions: Mitigation Or Enhancement Measures Already in Place at Kyzyl ..... 20
Table 2.6: Operation-Initiated Actions: Recommended Mitigation Measures ..... 21

**GLOSSARY OF ACRONYMS**

| | |
|---|---|
| BMV | Bakyrchik Mining Venture |
| CDP | Community Development Plan |
| CDT | Community Development Toolkit |
| CLC | Community Liaison Committee |
| CLO | Community Liaison Officer |
| EITI | Extractives Industry Transparency Initiative |
| ESIA | Environmental and Social Impact Assessment |
| fCDP | Framework Community Development Plan |
| ICMM | International Council of Mining and Metals |
| IFC | International Finance Corporation |
| PS | Performance Standards |
| RoK | Republic of Kazakhstan |
| SEP | Stakeholder Engagement Plan |
| SME | Small and Medium Enterprises |
| SMP | Social Management Plan |
| TOT | Training of Trainers |
| UNDP | United Nations Development Programme |
| USAID | US Agency for International Development |
| WAI | Wardell Armstrong International Ltd |
| WBG | World Bank Group |

# 1 INTRODUCTION

## 1.1 Overview

Wardell Armstrong International Ltd (WAI) has been instructed by Polymetal to develop a Social Management Plan (SMP), as part of the Environmental and Social Impact Assessment (ESIA) process for the Bakyrchik Mining Venture LLC (BMV) gold project at the site of the Kyzyl deposit ('the Project', henceforth) in the north-eastern part of the Republic of Kazakhstan (RoK).

Based on the results of community consultation, socio-economic baseline, socio-economic impact assessment, and recognised best practice, this chapter details key procedures and actions necessary to develop the operator's SMP. The SMP should evolve over the course of the project and be developed further with the involvement of stakeholders. In addition, stakeholders, including local people and NGOs, should actively be involved in establishing participatory monitoring programmes as part of the overall social management process, and stakeholders should be provided with regular updates about the SMP.

The purpose of this plan is to establish the roles and responsibilities of proponents, government, stakeholders, and communities throughout the life of the Project. These aims will be achieved by mitigating and managing social impacts and opportunities during construction, operation, and decommissioning of the Project.

## 1.2 General Aims and Structure of Social Management Plan

Specifically, the Kyzyl SMP aims to:

- Reflect key findings of the SIA, as well as issues and opportunities raised by stakeholders during WAI's site visit carried out in June-July 2015;
- Present a comprehensive set of mitigation measures and action plans minimising impact and maximising benefits of the project for local stakeholders and, in particular, for those living nearest to the Bakyrchik mining in the Settlement of Auezov and surrounding villages;
- Leverage the experience and knowledge of existing local forums and provide transparent and accountable governance for implementation of the plan;
- Demonstrate a general positive contribution to the wider East Kazakhstan region.

This Plan is first and foremost designed to ensure that the Project contributes beyond direct mining activities, to the social and economic well-being of the host communities in which it operates. To that end, the broad aim of the Plan is to ensure that local communities around Auezov Settlement and in East Kazakhstan region as a whole will be better off as a result of the Project, through improved economic conditions, a diversification of income opportunities as well as by building local leadership capacities to carry out development responsibilities and improve livelihoods and quality of life.

This document outlines Polymetal's commitment to community development and social management, and how it will be pursued in the future. The SMP forms part of a set of management and monitoring plans alongside the ESIA and focuses on sustainable long-term initiatives to support the existing and future community in Auezov Settlement as well as nearby Solnyechni and Shalabay villages. Implementing community development programmes will contribute to enhancing the positive impacts of the project and also resonates with many of the mitigation measures outlined in the ESIA.

In addition, this Plan is designed to ensure that the Bakyrchik Project protects the health, safety and security of the workforce it both directly and indirectly employs. This includes shift and visiting workers as well as those residing in the communities within the vicinity of the mine site and along transport routes, including to the nearest urban centres of Ust-Kamenogorsk and Semey. Worker health and safety protection is of prime importance to the Bakyrchik Project; consequently, Polymetal has developed specific measures to ensure that worker rights are maintained and that they are not adversely affected by on-site incidents or other hazards that may occur as a result of the Project activities.

### 1.3 Project Background and Overview

The Kyzyl gold deposit sits in Auezov municipality within Zharminsky District in the region of East Kazakhstan. The deposit was discovered in 1945 and surface drilling began in 1955 before open pit production commenced a year later. Underground mining was conducted between 1963 and 1997. No mining activities have been undertaken since 1997, and the mine has officially been in Care & Maintenance since then.

The exploration and mining company Bakyrchik Gold Mine was established in 1955 for development and mining of the Bakyrchik deposit. It was subsequently renamed Bakyrchik Mining and Metallurgical Company (Bakyrchik GMK) before it changed owners in 1995 and was renamed the Bakyrchik Mining Venture LLP (BMV LLP).

The Project is located in the context of a historical mining area, adjacent to Auezov town and within commuting distance of Solnyechni and Shalabay villages. According to 2010 figures, Auezov, Solnyechni, and Shalabay have populations of approximately 2,800, 45, and 1,230, respectively, though these figures may have been reduced as a result of out-migration since the Project entered Care and Maintenance. The settlement pattern reflects the Project's presence: while much of Zharminsky District is agricultural, the majority of land within Auezov Settlement is classified as industrial. Shalabay, the neighbouring (and surrounding) municipality, is predominantly agricultural. Outside of work with the Project, livelihood streams are limited in the area, which is generally remote in terms of transport and market access, job prospects, and educational opportunities.

BMV LLP provides vital services and utilities for Auezov village, though it currently makes no profit from the Bakyrchik deposit. During Care & Maintenance, the mine's open pits do not operate, some

of them are backfilled and others serve as water reservoirs. All mine maintenance activities are aimed at enabling a quick start-up of operations.

The Kyzyl Project Schedule will be developed in two stages:

- Stage 1 – Open Pit method (2016 – 2024); and
- Stage 2 – Underground (developed under pit 2025 - 2039).

Each stage will have a construction and operational element to it. At the end of Stage 2, the mine will undergo decommissioning, reclamation, and closure.

The full project implementation schedule, to the level of detail required for the feasibility study is provided in Drawing 3.2. The level of detail in Drawing 3.2 is greater than that described in this ESIA project description. For the full technically detailed description of the project schedule, refer to the Kyzyl Project Bakyrchik Gold Deposit Feasibility Study, Volume 5.

### 1.4 Community Liaison Officer

A vital component of this Plan is Polymetal's Community Liaison Officer (CLO), tasked with establishing links between Polymetal and local communities. On-going engagement with the CLO will be essential in (a) keeping Project community members informed of on-going changes in Project activities (b) Managing issues and grievances as they arise (c) Monitoring the effectiveness of environmental and social mitigation and compensation. This is also central to the process of defining, developing, and fulfilling, the detailed objectives of the SMP. These objectives will be linked to the SMP's overarching policy, and, at this stage, ensure that:

- The on-going identification, mitigation, and monitoring of any residual, cumulative, unforeseen or longer term Project socio-economic impacts, and the management of these impacts in ways that are sympathetic and appropriate to community expectations, desires and needs;
- All mine developments, throughout the Project's life cycle, are implemented and managed in ways that are responsive to the community and compatible with, and respectful of, their dignity, human rights and cultural uniqueness;
- The grievance mechanism that has been established is reviewed regularly to ensure it addresses concerns promptly, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected communities, and at no cost and without retribution. The mechanism will not impede access to judicial or administrative remedies. The operator will inform the affected communities about the mechanism in the course of its community engagement process;

- Wherever logistically feasible, the Project undertakes measures to identify and enhance its positive impacts, and to identify and assist with community needs, so that they receive further culturally compatible social and economic benefits;
- A Social Action Plan (SAP) is further developed to manage community issues and impacts arising over the life of the operation and post-closure. The measures developed within the SAP will reflect the outcomes of consultation on socio-economic impacts and the proposals to address these impacts. The SAP will be integrated and aligned with external affairs and business plans and should include the following:
  - Actions to implement mitigation measures and corrective actions;
  - Prioritisation and setting targets and responsibilities for these actions;
  - Setting a budget and time-line for the implementation of these actions; and
  - Schedules and mechanisms for disclosure of implemented actions.
- An assessment of the priority development needs of the community is undertaken in partnership with experienced social specialists and with the participation of the communities themselves. This 'needs assessment' will be informed by the SIA undertaken as part of the Project ESIA in the pre-financing phase of the Project.

## 1.5 Guidelines, International Standards, and National Legislation

### *1.5.1 World Bank Group*

Polymetal aims to align its social management efforts in a manner that is appropriate to the structure and culture of Auezov municipality and in accordance to international sustainable development initiatives. The main international initiatives that will guide the development and implementation of the SMP are:

- The World Bank Group's (WBG) International Finance Corporation Performance Standards and guidelines;
- The IFC 'Strategic Community Investment: A Good Practice Handbook'; and
- ICMM Community Development Toolkit.

The World Bank Group (WBG) provides guidance and signposts to best practice, ensuring that revenues from extractive industries contribute to the development of surrounding communities, thereby helping to make a Project socially sustainable. This body of guidance focuses on the following:

- Channelling government and private revenues into development or linkage projects for communities;
- Ensuring long term environmental and social benefits, expanding links between large projects and small and medium enterprises (SMEs), supporting community development in line with the Company's corporate social responsibility; and

- Capacity building both at local government and community level, in the areas of healthcare, education, agricultural and agribusiness support, microenterprise development; information and awareness campaigns.

The WBG's International Finance Corporation (IFC) sets out Performance Standards (PS) to manage social and environmental risks and impacts and to enhance development opportunities through its private sector financing. According to the International Finance Corporation (IFC), "community development programmes aim to promote sustainable economic growth, environmental protection, education, skills building and the health and welfare of people who live near or are affected by the company's operations."

The IFC's advice on promoting community development programmes emphasises:

- The importance of high-level corporate support and timely public consultation;
- Recognition that 'Local license to operate' is a key aim of community development programmes;
- Stakeholder identification and mapping and targeting programmes to key affected people;
- Community development programmes that align with the social impact assessment findings;
- Involving community members in the decision-making process;
- Linking key business activities in an area to community development;
- Integrating community development concerns;
- Creating collaborative partnerships;
- Building capacity at various levels; and
- Learning from relevant IFC completed or ongoing projects.

In addition, the IFC Performance Standards for Social and Environmental Sustainability set out a range of recommendations with regard to community health, safety and security (Performance Standard 4), which Polymetal will comply with.

Performance Standard 1 outlines the management system approach expected of companies including the development of plans to address social risks and impacts generated by the Project. Performance Standard 5 addresses the manner in which involuntary resettlement (both physical and economic displacement) should be addressed. The Community Development Plan needs to be cognisant of and reflect these expectations.

In addition, the IFC handbooks 'Investing in People: Sustaining Communities through Improved Business Practice' and 'Strategic Community Investment: A Good Practice Handbook' provide additional practical advice to companies on developing corporate community development programmes. Key features of these documents are as follows:

- Emphasis on the importance of certain high level corporate commitments which would underpin a good fCDP, including: management level commitment, recruitment of experienced and knowledgeable staff, deployment of appropriate level of resources to community development, responsibility and accountability, and timely public consultation;
- Recognition that obtaining the 'local licence to operate' is a key aim of community development programmes;
- Stakeholder identification, as well as defining and mapping what the company means by 'community' are key steps. Programmes should recognise the various sets of potential stakeholders and the relationships between them, e.g. Project Affected Persons, all local residents, vulnerable groups, interest groups. This would help to determine the target beneficiaries of community development programmes;
- Community development programmes should reflect social and economic impact assessment findings;
- Emphasis on strategic approach and sustainability;
- Identification and definition of key programme areas using available information and participative methods;
- Linking core business activities with community development; includes local procurement and recruitment initiatives;
- Integrating community development concerns into internal business decision-making processes;
- Creating development partnerships, which offer a good balance of capacity, knowledge, credibility and financial management ability;
- Building government capacity at various levels;
- Building participation and sustainability into community development programmes and the Project as a whole; and
- Learning from relevant IFC completed or on-going projects.

### *1.5.2 International Council on Mining and Metals (ICMM)*

ICMM's vision is a viable mining, minerals and metals industry that is essential for modern living and a key contributor to sustainable development[1]. To this end, the ICMM published a toolkit for community development (CDT) in 2005. The CDT is comprised of various tools that companies can use to further community development goals. These tools and the advice within the toolkit indicate a set of clear directions for companies in the field of community development:

- Community development should be an integral component of mining activity from exploration through to closure and beyond. It should be aligned with other organisational processes and strategies – including risk and impact assessment, communications and consultation, employment and local business development;

[1] www.icmm.com

- Strategic planning should be used, whereby the company reflects internally on why it wants to contribute to community development, its development objectives, how it plans to achieve them and how the company will recognise and measure success e.g. through developing Key Performance Indicators to evaluate how successful community development programmes are. Eventually strategic plans will need to be reviewed in consultation with regional partners to ensure consistency with regional plans;
- Companies should use competent people with suitable skills and understanding to run community development programmes and would need to give community development staff the training support they need to perform their jobs well;
- A robust social baseline is essential for community development programmes. Companies should invest reasonable time and resources in developing this, with expert external help where relevant;
- The CDT defines stakeholders as: 'persons or groups who are affected by or can affect the outcome of a Project'. They may include local residents, politicians, commercial and industrial enterprises, labour unions, academics, religious groups, national social and environmental groups, public sector agencies, NGOs and the media. Companies should be as inclusive as possible when identifying stakeholders. Stakeholder analysis is a secondary step to identification, where stakeholders' interest levels in the Project and related community development activities should be explored and established;
- Companies should view the social and environmental impact process as an exercise in identifying opportunities for community development, and should build on and enhance potential positive impacts. This is particularly important in terms of land use and companies need to acknowledge that community perception of space, ownership and boundaries is also important to consider;
- Companies need to take a careful approach towards selecting partners to work with in delivering community development programmes;
- Companies should be prepared for conflict and should have conflict management measures in place. The CDT recommends grievance mechanisms to start with, but other channels of communication and means of resolution are needed for conflicts if they escalate; and
- Community development is essentially a long term agenda, and the ideal end result is that the company's role in development would diminish to nothing over a period of time.

### *1.5.3 RoK National Legislation*

Although no standalone Kazakhstan legislation has been identified directly relevant to the development of a SMP, there are provisions on community in different pieces of legislation on local government and administration, etc. As part of the ESIA process, the SMP is aligned with relevant Kazakhstan legislation on ESIAs.

Covered in full in the Stakeholder Engagement Plan (Appendix 10), OVOS legislation stipulates requirements in terms of stakeholder engagement. Information disclosure and dissemination are part Kazakh legal regulations, as well as public consultation. BMV keeps records of all Public Hearings. The following legislative acts relate to public participation in decision making within Kazakhstan:

1. Environmental Code of the Republic Kazakhstan. No. 212-III of 09.01.2007 (amended on 17.07.2009);
2. Instruction of Environmental Impact Assessment Conduction of Proposed EIA. Other Activities during Development of Pre-planning, Planning, Pre-design and Design Documentation, approved by Order of Minister of Environmental Protection of the Republic of Kazakhstan No.204-p of 28.06.2007;
3. Rules on Public Hearing Conduction, approved by Order of Minister of Environmental Protection of the Republic of Kazakhstan No.135-p of 07.05.2007;
4. Rules on Access to Environmental Information Relevant to Environmental Impact Assessment (EIA) Procedure and Decision-Making Process on Proposed Economical and Other Activities, approved by Order of Minister of Environmental Protection of the Republic of Kazakhstan No.233-p of 25.07.2007; and
5. Rules on Conduction of Public Hearing while Considering Application for Approval or Change of Tariffs (Prices, Rates) of Entities which are Natural Monopolies. Approved by Decree of the Republic of Kazakhstan Government No. 376 of 21.04.2003.

As such, the current legislative system provides guidelines for public consultation and participation in decision-making, although the scale of such activities is dependent on the type and scale of the proposed project and degree of public interest.

Kazakhstan is aligned with the key requirements for the European Union having ratified the Aarhus Convention on the Access to Environmental Information and Public Participation in Environmental Decision Making. The Aarhus Convention was ratified in January 2002 and focuses on three key areas:

- Access to information: ensures that the public can have a system whereby one can request and receive information, thus allowing for informed participation;
- Public participation: provides for public participation early in decision-making on activities that can have significant environmental impact; and
- Access to justice: ensures that the public has legal mechanisms available to review potential violations of access to information and public participation provisions.

A number of legal acts directly or indirectly govern the health and safety in mining. The regulations stipulate that each mining company must have a special person responsible for health and industrial safety and that all workers directly involved in dangerous fields of work must regularly pass different certifications. The major relevant legal acts are[2]:

[2] http://www.iclg.co.uk/practice-areas/mining-law/mining-law-2015/kazakhstan

- General Requirements to Industrial Safety (1 and 2 Parts) approved by the Order dated Dec 2008, #219;
- Requirements to Industrial Safety at Development of Useful Mineral Fields by Open Pit approved by the Order dated Dec 2008, #219
- Requirements to Industrial Safety at Development of Useful Mineral Fields by Underground Means approved by the Order dated July 2008, #132
- Requirements to Industrial Safety at Explosion Works approved by the Order dated Sep 2007, #141
- Industry-Wide Requirements to Industrial Safety (Part 3) approved by the Order dated Oct 2012, #484; and
- Requirements to Industrial Safety at Crushing, Sorting and Beneficiation of Minerals and Agglomeration of Ores and Concentrates approved by the Order dated Oct 2008, #189.

The Aarhus Convention differs from international standards on the basis that responsibility for disclosure, participation and access to justice resides with the host government and not the Project sponsor. However, government representatives can only fulfil the requirements of the Convention if a project sponsor has fully disclosed all information relating to environmental and social impacts. Requirements for Aarhus will be met and exceeded through the implementation of international standards.

# 2 COMMUNITY DEVELOPMENT

## 2.1 Introduction

Based on the results of the community consultation, socio-economic baseline, socio-economic assessment, and recognised best available practice, this section details key procedures and actions necessary to develop the operator's framework plans on general community needs, as well as more specifically around health, safety and security of Bakyrchik Project stakeholders.

This Social Management Plan (SMP) should be flexible, evolving over the course of the project and be developed further with the involvement of stakeholders. In addition, stakeholders, including local people and NGOs, should be actively involved in participatory monitoring programmes established for the SMP and stakeholders should be provided with regular updates of the plan's development. To that end, Polymetal recognises that it is necessary to collaborate with local communities and authorities to develop appropriate health and safety safeguards, in particular in light of the Project's major current and historical importance to local livelihoods.

## 2.2 Objectives

The specific objectives of this Plan are to:

- Establish procedures for identifying community needs, working with the community and other partners, planning and implementing community projects and managing financial arrangements;
- Establish effective plans and procedures for protecting local communities in the Bakyrchik project area from Project-related hazards, as well as those villages/towns along the transport route that may be affected by increased traffic and related hazards from the Project;
- Define Polymetal requirements and procedures to guide employees and other Project stakeholders;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

## 2.3 Scope

This Plan considers the Project's potential for providing potentially adverse as well as positive impacts related to:

- Mitigation of direct Project impacts with a focus on Project-affected communities;
- Integration of the Project within existing regional development plans;
- Improving the health and well-being of local populations, including by way of assessing public access to the site, employee conduct and awareness in the

community, physical and social health and safety hazards, and awareness raising around health issues and maintaining healthy lifestyles; and

- Delivering enhanced local skills to local populations.

## 2.4 Fundamental Principles

The following principles outline how Polymetal should approach community development in context of the Bakyrchik Project:

- Coordination with local government and leaders is critical for successful implementation, hence:
  - Polymetal will work closely with various government agencies and ministries to coordinate local development priorities with regional/national programmes in order to create a coherent development process;
  - Polymetal shall consult with government and local leaders on the best approach to allocate community assistance funds, including how this information should be disclosed to the Project area population and other interested parties.
- Community development initiatives should benefit the community as a whole or a large portion of the community, rather than individuals or individual households;
- Polymetal recognises that individual ventures that have ownership within the community are more likely to deliver in a sustainable manner beyond the life of the mine;
- Building on existing relationships and fostering effective partnerships with affected communities and other stakeholders, to promote long-term economic development;
- Promoting gender equality, considering gender issues and ensuring women's inclusion in community development programmes;
- Developing collaborative synergies from projects working alongside NGOs;
- Building the capacity of local stakeholders, in particular local and regional leaders;
- Initiatives that contribute to or promote the health and well-being of communities are a priority for funding, and vulnerable and disadvantaged groups will also be targeted;
- Community investment projects should be prioritised through: discussions with stakeholders; based on their long-term impact; maximising the number of people who benefit; promoting gender equality, promoting collaborations with state and diversifying employment sources.

Polymetal's community development approach going forward will strictly exclude:

- Paying salaries; however, Polymetal may directly finance physical infrastructure elements;
- Political actions or support for government unrelated to community development;
- Social obligations (such as weddings or funerals) or activities that are directed at individual gain;

- Programmes which are not focused on the communities and residents affected by the mine, although district and regional programmes will be considered;
- Programmes which do not demonstrate a sustainable benefit to the community or are not supported by the community;
- Investing in individual community members or leaders, political parties or religious organisations; and
- Programmes that discriminate according to religion, ethnic group, age or gender (programmes targeted at a particular segment of the population must clearly show why the proposed beneficiaries require special assistance).

Beneficiaries of the CMP should include identified vulnerable groups, emphasising women, children and young people, the elderly, and fishers to reflect their relative vulnerability and potential marginalisation from any benefits arising from the Project.

## 2.5 The Need for Community Development

The Bakyrchik Project is located in a largely rural area, with the wider Zharma district classified as primarily agricultural. The area immediately adjacent to the Project, in Auezov municipality, is characterised by a narrow economic base, which has historically been largely dependent on mining. Apart from work relating to the Project, livelihood streams are strictly limited, though some residents practice subsistence agriculture. The area is generally remote in terms of transport and market access, with basic infrastructure, and job prospects and educational opportunities are clearly lacking. A scoping study carried out by WAI in 2013 focused on the two municipalities of Auezov and Shalabay, including Auezov town as well as the villages of Solnyechni and Shalabay.

## 2.6 Management of Community Action

This Plan will evolve through various stages of proposal, planning, selection, implementation and evaluation and a variety of parties will be involved at each stage. In order to effectively manage community assistance projects, Polymetal will implement the following management processes and practices.

### *2.6.1 Identification of Development Needs*

Community involvement in identifying development needs has taken place as part of the ESIA consultation and social baseline data collection. Social baseline surveys have identified the key needs perceived by the community as being:

- Need for infrastructure improvements, including addressing water availability issues relating to industrial water abstraction from the Kyzyl Su River;
- Need for improved information about the project;

- Reduce adverse environmental impacts of project constructions, operation and closure, including adverse impacts on surface water and groundwater quality, reducing air emissions of contaminants, and soil quality;
- Increase employment opportunities – including for women;
- Monitor and secure sufficient availability of pasture land for local herders as a result of land-take by the mine.

## 2.7 Social Management Structure

Senior Management should receive periodic assessment of the effectiveness of the Plan, based on systematic data collection and analysis. Senior Management should also receive periodic assessments of necessary corrective and preventative actions as well as assessments of the effectiveness of existing mitigation and enhancement measures.

Review should be carried out at least monthly, but can be more often as situations dictate. The scope of the report will be commensurate with the scope of the measures and actions identified and undertaken with the programme and other applicable Project requirements.

Polymetal should establish, maintain, and strengthen, as necessary, an organisational structure that defines roles, responsibilities and authority to implement the plan with sufficient resources to achieve effective and continuous social performance. The management team should also provide training to employees and contractors with direct responsibility for socioeconomic performance so they have knowledge to perform their work, including knowledge of Kazakhstan's regulatory requirements and Project investor requirements.

### *2.7.1 Company Policy*

BMV recognises corporate social responsibility as one of its highest corporate priorities and is committed to long-term development in the affected communities and wider area, helping raise living standards and supporting economic, environmental, and social balance through its initiatives. At present, BMV Community Policy is outlined in the Community Engagement and Sustainable Development Plan, which was developed in September 2010. The Company realises that it is operating in environments with unique cultures, lifestyles and heritage and thus manages community relationships based on respect for these communities, with full transparency and openness in communication.

A Stakeholder Engagement Plan (SEP) has been developed together by WAI with input from BMV. The purpose of the SEP is to guide stakeholder consultations and communications during the period of the main ESIA studies and throughout the life of the Project, including post-ESIA and closure. The SEP will be updated on a regular basis by BMV, not less than annually, providing a roadmap for engagement in monitoring the effectiveness of impact mitigation measures. This SEP has been developed to meet IFC and European Bank for Reconstruction and Development (EBRD) requirements.

## 2.8 Community Management Plan

The Community portion of this SMP should include a monitoring programme to measure changes in the socio-economic environment. This will need to be developed prior to operation to identify any unanticipated socio-economic impacts. A programme for monitoring the effectiveness of socio-economic mitigation and enhancement measures should also be developed, and both programmes will require development of suitable indicators, measurements and an implementation plan/schedule.

Monitoring will be undertaken for the key socio-economic issues and impacts identified as part of the initial ESIA process and for any other socio-economic issues and impacts identified by management, or as part of the on-going Project consultation process. These socio-economic issues and impacts will provide the basis for the development of key socio-economic performance indicators (KPIs), targets and acceptance criteria.

As part of the ESIA and initial consultation process, baseline information related to the communities and their socio-economic environments has been collected alongside the identification of the community's expectations and concerns. This baseline information will be used to provide benchmark data against which the effectiveness of the Community portion of this SMP, and the effects of positive and negative mining Project related socio-economic impacts can be monitored throughout Project development.

To support monitoring, existing and updated socio-economic baseline information should be incorporated into a socio-economic database prior to construction and the advent of further socio-economic impacts. At a minimum, the database should include indicators relating to issues like health and education outlined in the socio-economic baseline. Over time this database can build on the data and analysis already conducted.

In addition to tracking performance and establishing relevant controls, Polymetal should use dynamic mechanisms, such as inspections and audits, where relevant, to verify compliance and progress toward the desired outcomes. Polymetal should also fully document the monitoring results and identify the necessary corrective and preventive actions.

Monitoring will be reviewed and modified annually as part of this Management Plan's auditing procedures and will be adjusted according to performance, experience, and internal and external stakeholder feedback. A community management auditing system will be developed that will effectively test compliance with licence conditions and assess performance against the KPIs, targets, and acceptance criteria, of the Social Management Plan. An award system should be developed to recognise the contribution of individuals when appropriate.

Senior management should receive periodic assessment of the effectiveness of the Social Management Plan, based on systematic data collection and analysis. Senior management should also

receive periodic assessments of necessary corrective and preventive actions as well as assessments of the effectiveness of existing mitigation and enhancement measures.

Reviews should be carried out at least monthly, but can be more often as situations dictate. The scope of the report will be commensurate with the scope of the measures and actions identified and undertaken with the programme and other applicable Project requirements.

Polymetal should establish, maintain, and strengthen, as necessary, an organisational structure that defines roles, responsibilities and authority to implement the plan with sufficient resources to achieve effective and continuous social performance. The management team should also provide training to employees and contractors with direct responsibility for socio-economic performance so they have the knowledge to perform their work, including knowledge of Kazakhstan's regulatory requirements and Project investor requirements.

### *2.8.1 Community Liaison Officer (CLO)*

To successfully attend to the various tasks and responsibilities contained in this Plan, and to support and reinforce communication between the Project and the community, Polymetal have appointed a Community Liaison Officer (CLO) with appropriate qualifications, experience, skills and familiarity with the area.

The CLO will need to be able to work with a Community Liaison Committee (CLC) that is made up of community members who are representative of community interests. The CLC will assist the CLO with oversight and facilitation of the Plan's actions, like community needs assessments, on-going consultation, and community Project implementation and evaluation. Contingent on these requirements, the formation of the CLC needs to take place before construction and be supported by a definition of roles and responsibilities.

Meetings between the CLO and CLC will take place on a regular and timely basis, with the schedule being agreed between the two parties. However, as part of the company's grievance policy, the person appointed to manage the Plan should be accessible and available to the CLC at all times should urgent or pressing community issues and concerns arise between meetings.

A community needs assessment should be conducted prior to Project implementation. Based on the analysis of this assessment and the operator's policies, this will directly inform the Plan and its development. In addition, this will include the areas (i.e. health, agriculture) of proposed assistance, the description of various Projects in these areas (aims, objectives and main strategies) and the identification of agencies responsible for their implementation, as well as an evaluation procedure for each. This proposed programme will need to be discussed and agreed with the community representatives before implementation.

A SEP has been developed and will need regular review for the duration of the construction, operation and closure phases. This programme will build on the consultation processes already initiated or detailed in Chapter 9 (Public Consultation and Disclosure) and the SEP. Information disclosure throughout Project life will help to ensure accountability and transparency while on-going consultation will help identify potential disagreements between stakeholders, ethnic and political tensions, manage expectations and address any emerging social concerns.

Polymetal should disclose the SEP and SMP, and all progress on the plans, to affected communities. The frequency of these reports to communities will be proportionate to community concerns, but not less than annually. Polymetal should also provide periodic reports that describe progress with implementation of the CAP on issues that involve on-going risk to, or impacts on, affected communities, and on issues that the consultation process or grievance mechanism has identified as of concern to the community. If the CAP results in material changes or additions to the mitigation measures or actions described in the SMP on issues of community concern, the updated mitigation measures or actions should be disclosed in a format accessible and understandable to affected communities.

### *2.8.2 Community Management Plan Actions*

Table 2.1-Table 2.6 below outline actions already initiated by Polymetal and recommended mitigation measures by stage of the Project (pre-construction, construction, operation).

**Table 2.1: Pre-Construction - Mitigation or Enhancement Measures already in Place at Kyzyl**

| Mitigation or enhancement measure | Indicators and schedule | Responsibility for managing mitigation |
|---|---|---|
| PM have appointed a Community Liaison Officer with relevant experience, local knowledge, acceptance and qualifications, and a good command of local language. The CLO reports directly to senior management. | Ongoing | Communications Director, General Director, President / Chief Executive Officer |
| PM have consolidated all existing stakeholder identification documentation and outline a definitive stakeholder map. Develop a "master" stakeholder contacts database and procedure for continually updating it. | As soon as possible | Communications Director and CLO |
| PM operate a grievance mechanism detailing complaints reporting and management procedures, including third party arbitration procedure | Ongoing | PR Director and CLO. Also CLC |
| Monitoring road traffic accident rates and introduce further traffic safety controls, extending the Traffic Management Assessment TMA into a Traffic Management Plan. | Ongoing | General Director and Operations Manager |
| PM are signatories to the Extractives Industry Transparency Initiative (EITI). | Ongoing | Chief Executive, General Director, Chief Accountant |
| PM ensure there are explicit Terms of Reference (TORs) and contractual arrangements developed and compliance is monitored throughout their engagement by the operator. | Ongoing | Head of Legal Affairs, Head of Human Resources. |
| PM have commissioned WAI to undertake public notification when the ESIA is complete and make this and a non-technical ESIA summary available to the general public. | Public notification of the ESIA in the media and availability in local authority. One-off verification. | General Director, Communications Director and Operations managers |

| Table 2.2: Pre-Construction: Recommended Mitigation Measures | | |
|---|---|---|
| **Recommended mitigation or enhancement measure** | **Indicators and schedule** | **Responsibility for managing mitigation / monitoring** |
| Quarterly workshop with directly affected stakeholders | Agenda and minutes of workshops and list of attendees. Quarterly. | Communications Director and CLO |
| Establish regular monthly meetings between Community Liaison Committee, the local authority, the Operation Managers and Community Liaison Officers. | Agenda, schedule and minutes of meetings and list of attendees. Quarterly. | Operations Managers and CLO |
| Review and update SEP, on a regular basis. | SEP review on a regular basis. One-off verification. | General Director, Communications Director and Operations managers |
| Include community engagement in annual monitoring reports. | Results and responses of consultation incorporated in monitoring reports. Annual monitoring reports. | Communications Director and Operations managers and CLO |
| Answers to community Frequently Asked Questions (FAQs) about the Project displayed on walls on posters and Project information booklets in the Project information office. | Posters and leaflets with FAQ and answers. One-off verification. | Communications Director, CLO / Information Centre Officer |
| Transparency of the tax basis (including taxes, royalties, production bonuses, signature payments, etc) that are paid and to whom. | Inclusion of tax basis in Project booklet and Information Centre. One-off verification. | Communications Director, CLO / Information Centre Officer |
| Develop an effective monitoring and evaluation programme for any socio-economic assistance provided by the operator to the community. | Performance or process indicators and reporting determined by Project. Frequency and methods determined by CLO. | Communications Director and CLO. The CLC to monitor |
| Ensure local district authorities fulfil their obligation to reinvest Project related tax revenues locally, and specifically in social and health infrastructure. | District authority letter of accountability approved by CLO and CLC. Annual check. | General Director, Finance Director, CLC and CLO. |

| Table 2.3: Construction-Initiated Actions: Mitigation Or Enhancement Measures Already in Place at Kyzyl | | |
|---|---|---|
| **Mitigation or enhancement measure** | **Indicators and schedule** | **Responsibility for managing mitigation** |
| A telephone hotline is available for community members directly to the Community Liaison Team and disclose the number in each community and information office. | Construction initiation at the latest | Communications Director, CLO |
| On-going consultation is undertaken as a vehicle for monitoring the effectiveness of mitigation and enhancement measures implemented. | Construction initiation at the latest | Communications Director, CLO |
| Community grievance mechanisms are disseminated with the CLC and the wider host community members. | Ongoing | Communications Director, CLO |
| Project employment opportunities for women have been actively encouraged by PM in recruiting, including training provision for skilled managerial, technical and administrative roles. To be included in Personnel Recruitment Regulation. | Ongoing | Head of Human Resources, Head of Operations |
| PM operate a partnership strategy with the local authority and Chief of Police on deviancy and crime. Utilise expanded tax base to reinforce existing policing. | Ongoing | CLO, Local Authority, Local Police Chief |
| Fully disclose the company's human resource and recruitment policy and procedures, including worker rights and entitlements. Third party monitor and disclosure of policy and the site recruitment process. | Construction initiation at the latest | CLO, Head of Human Resource, independent third party |
| Polymetal have also developed an employee code of conduct to ensure that local customs, traditions and the community way of life are respected. | Ongoing | Head of Human Resources, Head of Operations |

| Table 2.4: Construction-Initiated Actions: Recommended Mitigation Measures | | |
|---|---|---|
| **Recommended mitigation or enhancement measure** | **Indicators and schedule** | **Responsibility for managing mitigation / monitoring** |
| Aim to achieve all mineworker salaries and bonuses paid directly into savings facility and mineworker course, as part of induction, on personal financial management. | Prior to recruitment | Head of Accounts, Head of Human Resources, Third Party |

| Table 2.5: Operation-Initiated Actions: Mitigation Or Enhancement Measures Already in Place at Kyzyl | | |
|---|---|---|
| **Mitigation or enhancement measure** | **Indicators and schedule** | **Responsibility for managing mitigation / monitoring** |
| Maintain partnership strategy with the local authority and Police on crime. Provide finance for the temporary expansion of policing following closure. | Ongoing | CLO, Local Authority, Local Police Chief |

| Table 2.6: Operation-Initiated Actions: Recommended Mitigation Measures | | |
|---|---|---|
| **Recommended mitigation or enhancement measure** | **Indicators and schedule** | **Responsibility for managing mitigation / monitoring** |
| Review the socio-economic impacts of closure during operation and adjust mitigation accordingly. | At the start of operation with a specific focus on the final year of operation | CLO, independent third party assessors |

# 3 HUMAN RESOURCES & EMPLOYMENT MANAGEMENT

## 3.1 Introduction

This section deals with Polymetal's human resources and employment strategy. It is designed to ensure that local employment, one of the main potential benefits of the Project, is maximised and enhanced through effective recruitment, employment, and training procedures. This plan is to be applied to construction, operations, and closure phases of the Project. This plan applies to all parties involved in performing work at the Kyzyl deposit, including, but not necessarily limited to, mining production, maintenance, labour, and engineering services.

Local employment is a key socioeconomic benefit that the Project can directly bring to people living in the vicinity of the deposit, including the villages and municipalities of Auezov and Shalabay but also more broadly to Zharminsky District and to East Kazakhstan Oblast. It is likely that some employment, in particular for positions requiring additional expertise or experience, will be sourced from regionally important towns such as Ust-Kamenogorsk or Semey.

There is a high expectation of local employment in the villages closest to the Project as well as within the wider East Kazakhstan Oblast. To that end, implementation of this plan is central to managing employment expectations, as it sets out specific actions for the Project to ensure that opportunities for local employment are maximised, and that jobs are fairly distributed. These procedures are vital in maintaining a positive and collaborative relationship between the Project, nearby villagers, and other stakeholders.

### *3.1.1 Objectives*

The objectives of this section are to:

- Establish effective plans and procedures for local/national recruitment, employment, and training;
- Define requirements and procedures to guide Project operating teams, including contractors;
- Define roles and responsibilities;
- Facilitate best practice management of human resources and industrial relations to support the safe, productive, and efficient performance of work on the site;
- Ensure that human resources and industrial relations is managed in a consisted and coordinated fashion on site;
- Define monitoring and reporting procedures.

### *3.1.2 Scope*

This section describes the management of human resources, employment and training processes associated with all phases of the Project. It deals with hiring and training of local/national Kazakh personnel to support development of the Kyzyl deposit mine and ancillary facilities and describes requirements from the assessment of new recruits through to the certification that relevant training has been completed. This section considers potentially adverse as well as positive impacts related to:

- Direct employment;
- Wide distribution of employment opportunities;
- Recruitment processes;
- Employment expectations;
- Working conditions;
- Enhancement of local skills; and
- Enhanced indirect employment opportunities, including local procurement and supply.

The contents of this section are flexible and shall be reviewed on a periodic basis and amended where necessary changes are identified. Polymetal and BMV shall make sure that the plan is available to their own staff and that all procedures/actions included within the plan are recognized, adopted and applied by them prior to commencing construction.

## 3.2 Regulatory Requirements and Recommendations

### *3.2.1 Corporate policy and Code of Conduct*

Polymetal has developed a 'Personnel Recruitment Regulation' document to cover employees and contractors involved in the Project. The company shall ensure that the policy is communicated and distributed to all relevant staff and those seeking employment at the site.

Polymetal have also developed an employee code of conduct to ensure that local customs, traditions and the community way of life are respected. This code, which applies to employees and contractors, is intended to assist with preventing and mitigating impacts to the community and maintaining good relations between local residents and national and international employees. Deviation from this code shall be treated seriously. The Community Liaison Officer (CLO) shall induct all employees and contractors on the requirements of the Code of Conduct.

### *3.2.2 Relevant Republic of Kazakhstan Legislation*

The key RoK legislative text relating to employment is the Labour Code of the Republic of Kazakhstan (Code of 15 May 2007, #251 ), which is based on the country's constitution and consists of the aforementioned Code, laws, and other regulatory and legal acts of the RoK. If an international treaty

ratified by the RoK establishes other rules than those enshrined in the Code, the rules of the international treaty shall be applied.

Applicable Articles and Chapters in the RoK Labour Code include:

- Principles of labour legislation of the RoK (Article 4);
- Inadmissibility of restriction of rights in the sphere of labour (Article 5);
- Freedom of labour (Article 6);
- Prohibition of discrimination in the sphere of labour (Article 7);
- Prohibition of forced labour (Article 8);
- Employment contracts, agreement between parties to a social partnership, collective bargaining agreements, acts of the employer in the sphere of labour (Article 10);
- Acts of the employer (Article 11);
- Liability for violation of the labour legislation of the RoK (Article 14);
- Basic rights and obligations of the employee (Article 22);
- Basic rights and obligations of the employer (Article 23);
- Subject of the employment contract (Article 24);
- Guarantees of equal rights and opportunities on conclusion of the employment contract (Article 25);
- Restrictions on conclusion of an employment contract (Article 26);
- Content of the employment contract (Article 28);
- International Labour Regulations (Chapter 6);
- Working Time (Chapter 7);
- Leisure Time (Chapter 8);
- Labour Rate Setting (Chapter 9);
- Labour Compensation (Chapter 10);
- Occupational Training, Re-Training and Further Training (Chapter 11);
- Guarantees and Compensation Payments (Chapter 13);
- Specifics of Regulation of the Labour of Employees under the Age of Eighteen Years (Chapter 16);
- Specifics of the Regulation of the Labour of Women and Other Persons with Family Responsibilities (Chapter 17);
- Specifics of the Regulation of the Work of Employees Engaged in Heavy Work or Work Under Harmful (Particularly Harmful) and (Or) Hazardous Working Conditions (Chapter 19);
- Specifics of the Regulation of the Work of Employees Engaged in Seasonal Work (Chapter 20);
- Specifics of the Regulation of Rotational Work (Chapter 21);
- Social Partnership in the Labour Sphere (Chapter 29);
- Procedure for Conclusion of Agreements Between the Parties to the Social Partnership (Chapter 30);

- The Collective Bargaining Agreement (Chapter 31).

### *3.2.3 International Guidelines for Best Practice*

International Finance Corporation (IFC) Performance Standards for Social and Environmental Sustainability set out a range of recommendations with regard to labour and working conditions (Performance Standard 2). Polymetal will comply with these recommendations, including by:

- Adopting a human resources policy appropriate to the operation's size and workforce that sets out the approach to managing employees;
- Providing employees with information regarding their rights under national labour and employment law, including their rights related to wages and benefits;
- Providing clear and understandable policy to employees, made accessible to each employee upon taking employment.
- Documenting and communicating to all employees/workers directly contracted about their working conditions and terms of employment, including their entitlement to wages and any benefits;
- Complying with national law in countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing;
- Not discouraging workers from forming or joining workers' organizations of their choosing or from bargaining collectively, and will not discriminate or retaliate against workers who participate, or seek to participate, in such organizations and bargain collectively;
- Not making employment decisions on the basis of personal characteristics unrelated to inherent job requirements;
- Basing the employment relationship on the principle of equal opportunity and fair treatment, and not discriminating with respect to aspects of the employment relationship, including recruitment and hiring, compensation, working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline;
- In countries where national law provides for non-discrimination in employment, the client will comply with national law;
- Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job will not be deemed discrimination;
- Developing a plan to mitigate the adverse impacts of retrenchment on employees, if it anticipates the elimination of a significant number of jobs or a layoff of a significant number of employees;
- Providing a grievance mechanism for workers (and their organizations, where they exist) to raise reasonable workplace concerns and inform the workers of the grievance mechanism at the time of hire, and make it easily accessible to them;

- Not employing children in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development;
- Not employing children below the age of 18 years in dangerous work); and
- Not employing forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty.

### *3.2.4 United Nations and International Labour Organisation Conventions*

The international conventions negotiated through the International Labour Organisation (ILO) are relevant to the Bakyrchik Project and encompassed in the Declaration on Fundamental Principles and Rights at Work. The Declaration covers four fundamental principles and rights at work:

- Elimination of all forms of forced or compulsory labour:
  - Convention 29 on Forced Labour; and
  - Convention 105 on the Abolition of Forced Labour.
- Effective abolition of child labour:
  - Convention 138 on Minimum Age (of Employment); and
  - Convention 182 on the Worst Forms of Child Labour;
- Elimination of discrimination in respect of employment and occupation:
  - Convention 100 on Equal Remuneration; and
  - Convention 111 on Discrimination (Employment and Occupation).
- Freedom of association and the effective recognition of the right to collective bargaining:
  - Convention 87 on Freedom of Association and Protection of the Right to Organize; and
  - Convention 98 on the Right to Organize and Collective Bargaining.

Kazakhstan has signed all of the conventions listed and, to that end, Polymetal will comply with these and other relevant conventions. IFC Performance Standard 2 also references these conventions in its requirements.

## 3.3 Approach to Recruitment, Employment and Training

Polymetal's approach to recruitment, employment and training involves ensuring that the Project is in compliance with the Kazakh Labour Code. Kazakhstan places a statutory requirement on mining companies to use Kazakh employees when it is reasonable to do so. At the same time, Polymetal recognises the need to have experienced and highly qualified mining staff. Their employment strategy, as set out in the 'On Personnel Recruitment Procedure for Bakyrchik Mining Venture' document, addresses the need for some expatriates and the steps to be taken to maximise the employment of Kazakhs. The main elements of Polymetal's approach are:

- Prioritising local recruitment;
- Recruitment from an external and internal candidate pool with direct participation of the executive officers in the recruitment process;
- Transparency through access to information on vacancies and basic qualification requirements for all candidates;
- Provision of equal employment opportunities;
- Review processes for all recruitment carried out by an executive officer of at least two candidates for a manager's vacancy and three candidates for a professional's vacancy.
- Recruitment procedures will be transparent, public, and open to all and shall be publicised in advance, including distribution of information to affected communities and regional stakeholders;
- Training shall be provided to ensure that all recruits have the necessary skill and knowledge levels defined for each position;
- Lists of 'preferred individuals' will not be accepted (i.e. lists provided by non-Polymetal personnel to seek favour of certain individuals outside of the formal recruitment process);
- Employment conditions will meet national laws and international standards and there shall be no discrimination on the grounds of religion, ethnicity, gender or other factors.

### *3.3.1 Categories of Employment*

The following definitions for employee categories apply to this plan:

- Skilled worker: Skilled workers will include experienced staff in categories such as 'Professionals' (e.g. geologists or engineers), "artisans" (e.g. electricians, instrument fitters, technicians, welders, and riggers), and "operators" (e.g. crane, truck);
- Semi-skilled worker: Semi-skilled workers will include experienced drivers, steel men, electrician helpers, security guards, cooks etc.; and
- Unskilled worker: Unskilled workers may include concreters, cleaners, waiters, loaders, sand fillers etc.

## 3.4 Recruitment and Training

Polymetal have developed a number of policies in relation to recruitment and employee working conditions. A key document summarising their policies and procedures is entitled 'On Personnel Recruitment Procedure for Bakyrchik Mining Venture', which reports how need-based recruitment is carried out, starting with an application submitted by the head of a structural division and followed by work done by the company's Human Resources (HR) Department. The HR department selects candidates in two stages, firstly internally among BMV employees followed by externally among residents of Auezov or, if necessary, across the oblast or wider country.

### *3.4.1 Identifying Labour Needs*

Forecasting labour needs in a systematic and consistent fashion will be important to ensuring that sufficient time is allowed to find suitable local/regional candidates, particularly for unskilled positions, which should be readily able to be filled by local residents.

### *3.4.2 Note on Indigenous Peoples*

IFC Performance Standard 7 on Indigenous Peoples recognises indigenous peoples as social groups with identities that are distinct from mainstream groups in national societies. However, in the case of this Project, the term 'indigenous peoples' differs from that as prescribed by the IFC Performance Standards, because the mainstream ethnic group in the RoK is the Kazakhs. According to the national statistics, this group accounts for 65% of the total population.

## 3.5 Employment

The Human Resources Department is responsible for ensuring that all specific employee terms and conditions are adequately identified, documented and made clear to all employees (e.g. details on probation periods, holidays, overtime, sick leave, absences, visitors, visas, travel, etc). In addition to those conditions set out in the employment contract, Polymetal has a staff handbook that it provides to all employees before they commence employment with the Project. The handbook provides further detail and guidance about working conditions.

### *3.5.1 Projected Employment Volumes*

Indirect and direct opportunities for employment will occur in all phases of the Bakyrchik Project, though the phase with the most positive impact of the Project based on employment opportunities will be during operations, when positions will be longer-term and will be predominantly filled by Kazakh nationals. Employment and associated skills training and development is likely to be one of the most significant benefits of the Project. The potential positive effect is increased wage employment for skilled and semi-skilled Kazakh nationals. There will also be a limited number of employment opportunities for unskilled (and predominantly local) people. Development of a competent Kazakh workforce for the Project will likely not be a challenge for Polymetal, given the region's history of mining and deep connections between local communities and the Project site.

### *3.5.2 Labour Relations*

As set out in the IFC PS2, Polymetal shall seek to work in good faith with trade unions and other bodies that employees collectively choose to represent them, within the appropriate local legal framework. The company shall not seek to prevent by any means whatsoever the formation of trade unions or any other legally established worker group. To maintain strong positive relationships with trade unions, Polymetal will act as follows:

- Polymetal and other responsible parties to consult on relevant labour-related regulations and inspections required by government authorities;
- This may include rates of pay, premium payments, election of worker representatives, signing of work contracts, working hours, labour laws, overtime etc.
- Provide facilities to labour union representatives to conduct their labour relations activities at all sites, in accordance with the requirements of current labour conventions and regulations;
- Comply with the RoK Labour Code and any other regulations concerning relations with authorised labour organisations;
- Line management to communicate with trade unions through meetings, as required, and deal with all problems or issues regarding employment;
- Line management and trade union representatives in accordance with site-specific issues, will identify frequency of those meetings;
- Record and discuss the sessions with Polymetal senior management; and
- All issues to be dealt with and responded to in verbal or written manner, with appropriate records maintained.

Although it is unlikely to occur in Kazakhstan, it is legal for workers to strike. In case of a stoppage of work or strike, Polymetal will:

- Ensure relevant managers, contractors, and other parties are involved;
- Arrange meeting with designated labour representatives in order to determine the cause of the work stoppage;
- Discuss potential solutions and, if possible, reach and document resolution;
- Discuss agreed solution with Polymetal management and, if necessary, with labour officials from the government;
- Any agreement to return to work to be signed by the parties involved in the dispute, and, as appropriate, with Ministry officials;
- In the event of a continuing dispute/work stoppage, the relevant requirements of the Labour Code are to be exercised, using intervention and arbitration by lawyers; and
- Prohibit immediate layoffs after a work stoppage or a strike and follow appropriate requirements of the RoK Labour Code.

### *3.5.3 Employee Grievances*

The Bakyrchik project has established a grievance process for employees. The Human Resources Department is responsible for this process. Grievances related to employment and training shall be managed through the following general mechanism:

- The relevant Line Manager informs the Human Resource Department about employment-related grievances raised from his/her employees;

- Upon receiving a complaint, his Department shall ensure that a Complaint Action Form or similar is completed;
- The timelines for possible actions are determined upon the nature of the grievance;
- Line Managers remain responsible for tracking the complaint and ensuring that it is dealt with. The complaints investigation reports will be generated and submitted to the Human Resources Department; and
- The HR Department is responsible for all grievances related to employment/working conditions/training.

In addition to their employee grievance process, Polymetal have 'suggestion boxes' located on site and in Auezov and Shalabay Akimat buildings for employees and residents to register their suggestions.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**NOISE MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

**DATE ISSUED:** **October 2016**
**JOB NUMBER:** **KZ10061**
**VERSION:** **V2.0**
**REPORT NUMBER:** **MM14**
**STATUS:** **Final**

**POLYMETAL**

**KYZYL PROJECT**

# NOISE MANAGEMENT PLAN

**October 2016**

**PREPARED BY:**
Simon Urquhart

**APPROVED BY:**
Alison Allen Associate Director



Wardell Armstrong is the trading name of Wardell Armstrong International Ltd,
Registered in England No. 3813172.

Registered office: Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom

UK Offices: Stoke-on-Trent, Cardiff, Carlisle, Edinburgh, Greater Manchester, London, Newcastle upon Tyne, Sheffield, Taunton, Truro, West Bromwich. International Offices: Almaty, Moscow

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Blasting ..... 2
1.2 Health and Safety Considerations ..... 2
**2 POTENTIAL RECEPTORS ..... 2**
2.1 Site Workers ..... 2
2.2 Local Residents ..... 3
2.3 Effect of Emissions ..... 3
**3 SOURCES OF NOISE AND VIBRATION EMISSIONS ..... 3**
3.1 Operations Activities Generating Noise and Vibrations ..... 3
3.2 Sources of Noise and Vibration and Appropriate Control / Mitigation Measures ..... 4
**4 COMPLIANCE AND STANDARDS ..... 5**
4.1 National Legislation ..... 5
4.2 IFC Environmental Health and Safety Guidelines; General EHS Guidelines; ..... 5
4.3 Company Standards ..... 8
**5 MONITORING AND PERFORMANCE ..... 8**
5.1 Noise Monitoring ..... 8
5.2 Vibration Monitoring ..... 9
5.3 Site Inspections ..... 9
5.4 Reporting ..... 9
**6 ROLES AND RESPONSIBILITIES ..... 10**
6.1 Noise Inspections ..... 10
6.2 Noise and Vibration Monitoring ..... 10
6.3 Record Keeping and Reporting ..... 10
**7 CORRECTIVE ACTIONS ..... 10**
7.1 Action Levels ..... 10
7.2 Noise and Vibration Surveys ..... 11

**TABLES**

Table 1: Sources of Noise and Vibration and Appropriate Control / Mitigation Measures ..... 4
Table 2: Kazakh Regulatory Limits ..... 5
Table 3: IFC/WHO Noise Level Guidelines (General EHS Guidelines Table 1.7.1) ..... 6
Table 4: Compliance Targets for Noise Working Environments ..... 6
Table 5: Comparison of ACGIH Threshold Limit Values (TLVs) for Exposure of the Hand to Vibration in X, Y or Z Direction and Daily Exposure in EU Directive 2002/44/EC ..... 7
Table 6: European Vibration Directive (2002/44/EC) Exposure Limits ..... 7
Table 7: Noise monitoring location points ..... 8

**APPENDICES**

APPENDIX 1: NOISE AND VIBRATION SURVEY PRO-FORMA

# 1 INTRODUCTION

The current design for the Kyzyl Project was assessed for noise impacts. Noise impacts have been found to be significant under many operating conditions and during many operational stages of the Project. In order to ensure that noise and vibration emissions are controlled as effectively as possible, this noise management plan has been developed and will form part of the comprehensive environmental management plan for the site. It is principally applicable to the operational stage of mine life, but will also be used to inform all construction and closure activities.

Potential noise and vibration emissions for the project are categorised as:

- Operational noise; open pit mining, mobile plant including the transport to the processing and waste areas, and noise from air overpressure resulting from blasting; and
- Ground vibrations; from blasting to extract rock within the open pit and certain other Project specific activities;

Potential impacts and mitigation measures for each of these emission types are addressed in this Noise Management Plan. The purpose of the noise management plan is to prevent the generation of noise and where this cannot be prevented entirely, to minimise noise levels experienced in the environment surrounding a site as possible.

General mitigation measures applicable to all noise sources which will be implemented to address identified impacts for the operational phase of the Project are summarized as follows:

- Workers will be trained in noise abatement best practices, including avoiding unnecessary revving of engines and switching off equipment when it is not required;
- Haul routes will be well maintained and where steep gradients are required operatives will be trained to minimize engine noise through avoiding unnecessary revving etc.;
- Drop height for materials will be minimised;
- Vehicle and plant start-ups will be sequenced to avoid simultaneous noise bursts;
- All vehicles will be fitted with reversing alarms set at the lowest level subject to health and safety considerations;
- Provide an air inlet silencer and exhaust silencers for stationary combustion engines and other units (for example generators);
- Perform regular inspection and maintenance of material handling vehicles and equipment to ensure that they have quality mufflers installed, worn parts are replaced, and lubricants are applied so that the design noise-output specifications continue to be met;
- When plant equipment has to be replaced, the selected plant will have a sound power level equal to or less than the plant that it is replacing;
- Blast design will include face profiling and explosive packing to maintain high level of environmental performance for each blast;
- Employees and contractors involved in mining and blasting operations will be issued and wear appropriate hearing protection in high-noise areas. Such areas will be designated by signage in the appropriate language, and employees and contractors will be trained in hearing protection procedures;
- The static plant located in the crusher and processing areas will be housed within a building, and breakout points in the facade of these buildings (i.e. doors, windows etc.) will be

minimised, as well as minimising the reverberant noise inside the buildings, which will be controlled through sound absorptive material;

- Complaints related to noise related to mining will be monitored through the stakeholder engagement activities and the Project's complaints and grievance process, including the use of drop boxes to encourage comments on performance;
- Noise monitoring will be undertaken in accordance with the Noise Management Plan and following any complaints from within the affected community receptors; and
- All measured data will be logged and maintained as a record for the site EMS, which should be available on request and published annually for the duration of the Project.

The following general measures will be implemented to minimize transportation-related noise impacts associated with the Project:

- Enforce speed limits in relation to road conditions and location of sensitive receptors such as population areas;
- Maintain access road surfaces in good repair to reduce tire noise; and
- Ensure continuous traffic flow to avoid prolonged idling.

### 1.1 Blasting

To minimise the impact of the perception of blasting on nearby residents, community engagement will include informing the surrounding communities when blasts are likely to occur; how long each blasting schedule will last, and how frequently they can expect blasting to occur. A safe blast radius will be maintained around blasting. All blasts will have an exclusion (or evacuation) zone established prior to firing of the shot. The size of the exclusion zone shall be such that all fly and associated debris is contained within the zone, as well as consideration on impacts of blast environmental limits on humans and where required, animals. The size of the exclusion zone is directly related to the blasting activity and the surrounding environment. No blasting will be carried out during night time.

All air overpressure and vibration monitoring will be carried out in accordance with the relevant guidance[1].

### 1.2 Health and Safety Considerations

In addition to the mitigation listed above, employee personal protective equipment will be used wherever necessary and occupational medical monitoring will be employed.

## 2 POTENTIAL RECEPTORS

### 2.1 Site Workers

It is vital to ensure that staff on site have a safe working environment. This includes minimising the noise levels experienced by staff whilst on site.

[1] Blast and Vibration Impact Assessment, Appendix J of AS2187.2-2006

For human health assessment, it is necessary to know the noise and vibration levels that each member of staff is exposed to each day.

### 2.2 Local Residents

Primary receptors for operational-related noise and vibration increases include Polymetal employees, residents and structures in the communities nearest to the activities: Auezov and Solnechnoye. In addition, ecological receptors such as mammals (including livestock) and birds that contribute to the natural habitat have the potential to be disturbed as a consequence of noise and ground vibration. Noise and vibration emissions therefore need to be comprehensively managed.

In case complaints are received relating to nuisance noise and vibration, they will be dealt with via the established company grievance procedure.

### 2.3 Effect of Emissions

Noise and vibration generated by the site has the potential to result in adverse health impacts upon workers and local residents as well as the potential to cause disturbance to local wildlife. The best practice adopted within this noise management plan sets appropriate guideline values to ensure that potential noise and vibration impacts from the site are minimised.

## 3 SOURCES OF NOISE AND VIBRATION EMISSIONS

### 3.1 Operations Activities Generating Noise and Vibrations

During operations, potential impacts that are likely to affect the ambient noise level will result from operations that include: drilling and blasting, product extraction and stockpiling, crushing, hauling, stacking, and loading activities together with ground vibrations and air over pressure associated with rock extraction within the open pit.

Mining and processing will occur 24 hours a day, for 365 days per year, resulting in the potential for increased noise levels during the day and night time periods. Blasting activities which include drilling and blast preparation works will take place continuously; however, blasting will be restricted to daylight hours and will be scheduled to maintain the mining programme. Ground vibrations associated with rock extraction are only expected to be detected by mine operatives working within and adjacent to the open pit.

New haul roads will be constructed between the open pit and both the process and waste areas. Haul trucks with a carrying capacity of 180 tonnes will transport the ore from the open pit to the process and waste areas. A fleet of up to 10 Komatsu HD 785-5 and 19 Belaz 7518 haul trucks at any one time, will be required to maintain annual production. Haulage will be split between the process, waste areas and internal movements within the open pit.

Mobile equipment operations are predicted to increase the ambient noise levels in the area, including input from light vehicle operations noise, haul trucks and heavy equipment operations noise including reversing alarms and vibrations resulting from supply truck traffic on public roads. Supply truck traffic along public roads will be restricted to day time hours for safety reasons. The traffic movements themselves will be of low number and therefore have a negligible impact on receptors.

### 3.2 Sources of Noise and Vibration and Appropriate Control / Mitigation Measures

| Table 1: Sources of Noise and Vibration and Appropriate Control / Mitigation Measures | |
|---|---|
| **Source** | **Noise and Vibration Control & Mitigation Measures** |
| **Noise** | |
| Topsoil / Soil Cover Stripping, Drilling, Blasting, Product Extraction and Stockpiling, Crushing, and Loading Activities | • Perform regular maintenance and inspection of vehicles and mobile equipment, including mufflers.<br>• Enforce speed limits for heavy equipment and general traffic on all roads, and maintain roads.<br>• Install noise attenuation devices on construction equipment.<br>• Position stationary noise sources away from residents.<br>• Schedule high noise-generating activities to daytime and/or normal work hours.<br>• Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.<br>• Monitor noise-related complaints through the Complaints and Grievances Process.<br>• Use personnel protective equipment where required and occupational medical monitoring for employees. |
| Mobile Equipment | • Perform regular maintenance and inspection of vehicles and mobile equipment, including mufflers.<br>• Enforce speed limits for heavy equipment and general traffic on all roads, and maintain roads.<br>• Limit equipment on site - have only the necessary equipment on site.<br>• Use noise barriers, baffles, or enclosures when possible.<br>• Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.<br>• Monitor noise-related complaints through the Complaints and Grievances Process.<br>• Use personnel protective equipment where required and occupational medical monitoring for employees. |
| General Project Operations | • Enclose noise-generating equipment in a sound-insulated building.<br>• Use exhaust silencers.<br>• Perform regular maintenance and inspection of equipment.<br>• Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.<br>• Monitor noise-related complaints through the Complaints and Grievances Process.<br>• Use personnel protective equipment where required and occupational medical monitoring for employees. |
| Insulation – domestic properties | • Should noise monitoring demonstrate exceedance of the noise limits for long term operations and mitigation measures applied at the site are not proven effective, further measure will be agreed with affected |

| Table 1: Sources of Noise and Vibration and Appropriate Control / Mitigation Measures | |
|---|---|
| **Source** | **Noise and Vibration Control & Mitigation Measures** |
| | householders, using insulation techniques such as, acoustic fencing, double glazing and other suitable noise insulation techniques. Corrected internal noise criteria would apply, of specialist advice. |
| **Vibration** | |
| Vehicles, Heavy Equipment | • Enforce speed limits for heavy equipment and general traffic on all roads.<br>• Schedule high vibration-generating activities to daytime hours. |
| General Project Operations | • Schedule high vibration-generating activities to daytime hours.<br>• Perform regular maintenance and inspection of equipment.<br>• Monitor vibration-related complaints through the Complaints and Grievances Process. |

# 4 COMPLIANCE AND STANDARDS

## 4.1 National Legislation

Kazakh regulation 3.01.035-97 "Sanitary rules and norms for Maximum permissible noise levels in residential and public buildings and housing areas" provided by Polymetal sets out details of national regulatory limits as presented within Table 2;

| Table 2: Kazakh Regulatory Limits | | |
|---|---|---|
| **Type of Premises or Area** | **Time** | **Max. $L_A$ dB** |
| Areas immediately adjacent to residential buildings, rest homes for elderly/disabled, kindergartens, schools and other educational institutions, libraries | 7 am – 11pm<br>11pm – 7am | 70<br>60 |
| Recreation areas in the territory of building estates and residential building blocks, rest houses, rest homes for elderly/disabled; playgrounds of kindergartens, schools and other educational institutions | 7 am – 11pm<br>11pm – 7am | 75<br>65 |

It should be noted that the national regulatory limits provided in Table 2 are for maximum instantaneous noise impacts and therefore should only be used to assess the noise impact from instantaneous noise, such as blasting.

The limits do not cover the LAeq average day and night-time noise levels and therefore, it is considered appropriate to assess the day and night-time noise impact to the WHO EHS Guidelines as no guidelines have been stipulated by the EU.

## 4.2 IFC Environmental Health and Safety Guidelines; General EHS Guidelines;

The International Finance Corporation (IFC) has produced General EHS Guidelines for noise, which are summarised below. They make reference to noise from facilities and stationary noise sources, and are commonly applied as design standards for industrial facilities. Whilst they offer general guidance on noise effects, the IFC has indicated that they are not directly applicable to transport or mobile noise sources.

Measurements are to be taken at noise receptors located outside the project property boundary.

| Table 3: IFC/WHO Noise Level Guidelines (General EHS Guidelines Table 1.7.1) | | |
|---|---|---|
| **Receptor** | **Maximum Allowable Ambient Noise Levels, $L_{Aeq,1hr}$, dBA Free field** | |
| | **Daytime 07:00 – 22:00** | **Night-time 22:00 – 07:00** |
| Residential, institutional, educational | 55 | 45 |

Therefore, the absolute noise levels of 55dB(A) and 45dB(A) will be adopted as compliance criteria by the Project for both day and night periods respectively

***Workplace Noise Exposure***

Section 2.3 of the IFC EHS Guidelines (April 2007) provide guidelines for noise impacts on workers, given in Table 4 and these will be used by the Project as the relevant compliance criteria.

| Table 4: Compliance Targets for Noise Working Environments | | |
|---|---|---|
| **Location / Activity** | **Equivalent level $L_{Aeq,8h}$** | **Maximum $L_{Amax, fast}$** |
| Heavy industry (crushing plant, open pit and areas of the Project with mechanical operations, static and mobile) | 85 dB(A) | 110 dB(A) |
| Light industry (Areas within the Project with limited static plant and mobile equipment) | 50-65 dB(A) | 110 dB(A) |
| Details and zones to be based on detailed Work Place occupation noise assessment (see Health and Safety Management Plan) | | |

***Blasting Air Overpressure and Vibration***

*Environmental and Community Criteria*

The US Bureau of Mines (USBM) considers a vibration level at 10Hz of 12mm/s will cause cosmetic damage to buildings, whilst 18mm/s can result in structural damage (to US residential property types). British Standard BS7385 (1993) demonstrates that new cosmetic damage can occur to (UK) residential buildings with vibration levels at 24.1mm/s and existing cracks will grow at 8.7mm/s. However, it has also been demonstrated that blast Peak Particle Velocities (PPVs) of up to 60mm/s can result in no damage.

Standards exist from other parts of the EU which differ slightly from those above, such as the German DIN 4150 part 3 and the Spanish UNE22-381-93. In Germany, the PPV for a frequency <10Hz is 20mm/s for industrial and commercial buildings and only 5mm/s near residential buildings. The limit values for ground vibration applied to European quarries generally ranges from 2 to 50mm/s peak particle velocity (PPV), with an average of around 15-20mm/s, and 90-140dBL (OP) for the air overpressure. In the UK, Acceptable Levels of Overpressure Limits for mining and quarrying

have been set at various levels between 120dB and 133dB. However, it is accepted best practice that compliance criteria take account of external factors such as prevailing weather condition.

A blasting management plan will be developed for the site based on the standards identified to take account of site conditions for the Project, subject to the predicted impacts being within the range identified for ground vibration and air over pressure.

***Workplace Vibration***

The threshold limits as determined by ACGIH for hand arm vibration and the European Vibration Directive Exposure Limits (2002/44/EC) for whole body vibration in the workplace exposure are summarised in Table 5.

| **Table 5: Comparison of ACGIH Threshold Limit Values (TLVs) for Exposure of the Hand to Vibration in X, Y or Z Direction and Daily Exposure in EU Directive 2002/44/EC** | |
|---|---|
| **Total Daily Exposure Duration (hours) (ACGIH)** | **Maximum value of frequency weighted acceleration ($m/s^2$) in any direction** |
| 4 to less than 8 hours | 4 |
| 2 to less than 4 hours | 6 |
| 1 to less than 2 hours | 8 |
| Less than 1 hour | 12 |
| **Daily exposure** (EC Directive - 2002/44/EC) | **Maximum value of frequency weighted acceleration ($m/s^2$) in any direction** |
| Daily Exposure Limit Value 8hr ( DELV) | 5 |
| Daily Exposure Action Value (DEAV) | 2.5 |

There is no direct comparison between the two sets of guidelines, as the ACGIH has values dependent on duration of exposure and is based on any single axis exceeding 4m/s2. The EU DELV identifies 5m/s2 as the vector sum of the three axes and is based on an 8hr exposure time. There is no major difference in standard between the two; therefore, the Project will use the EU Daily exposure limits as it is multi directional compliance criteria.

Whole body vibration identified as ACGIH limits are identified by Z and XY vector graphs; however, ACGIH also refers to the EU Exposure Limit of $0.5m/s^2$ action level. The EU Directive (2002/44/EC) uses limits on any of the three axes and the Project will use the EU exposure limits as compliance criteria (see Table 4.5).

| **Table 6: European Vibration Directive (2002/44/EC) Exposure Limits** | | |
|---|---|---|
| **Type** | **Daily Exposure Action Value ($m/s^2$)** | **Daily Exposure Limit ($m/s^2$)** |
| Whole body vibration | 0.5 | 1.15 |

### 4.3 Company Standards

In accordance with the Polymetal Health and Safety Policy, Polymetal commit to providing a working environment that is safe and without risk to health. This commitment applies to all employees, temporary employees, contractors, sub-contractors and members of the public who are or may be affected by its activities.

Therefore, appropriate national and international standards relating to occupational and community health, environmental noise and nuisance noise, will be adopted by Polymetal. These standards, as described above, will inform the Corrective Actions process described in Section 7 of this management plan.

## 5 MONITORING AND PERFORMANCE

### 5.1 Noise Monitoring

Noise monitoring will be carried out at the following locations representative of residential receptors, determined by current operations and prevailing wind direction. As operations move and develop the location of the monitoring points will be reviewed to ensure adequate coverage is maintained.

**Table 7: Noise monitoring location points**

| Location | Description | Latitude | Longitude |
|---|---|---|---|
| NQ-1 | Northern corner of Auzeov settlement (residential) | 49°42'50.62"N | 81°34'31.03"E |
| NQ-2 | Southern corner of Auzeov settlement (residential) | 49°42'23.07"N | 81°34'50.55"E |
| NQ-3 | Auzeov school | 49°42'21.90"N | 81°34'9.36"E |
| NQ-4 | Eastern corner of Auzeov settlement along access road (residential) | 49°42'52.57"N | 81°35'17.55"E |
| NQ-5 | Solnyechni village along Bakyrchik-Bursak bypass road(residential) | 49°42'4.50"N | 81°35'52.44"E |

Type 1 noise meters with environmental monitoring kits will be used for noise monitoring. These meters will be maintained and calibrated in accordance with the manufacturer's recommendations and the requirements of the relevant noise guidelines.

***Method of Operation***

The noise meters will measure noise levels in decibels (dB). They are protected with an environmental monitoring kit, which will keep the meter dry and can be strapped to a site structure or sited independently. Once removed, the noise results can be downloaded to a computer and

analysed using proprietary software provided by the equipment manufacturer. Calibration certificates for equipment used will be required in accordance with current guidance and a copy kept on file.

***Monitoring***

During the construction and operational phase of the development, the ambient noise level surveys will be undertaken quarterly at locations to be agreed considered representative of nearest identified sensitive receptors to the Project boundary. The monitored noise levels can be analysed and assessed against the relevant noise guideline values.

**Compliance target:** Noise levels generated by site operations below the 55dB (Daytime) and 45dB (Night-time) guideline values.

## 5.2 Vibration Monitoring

Vibration monitoring will be undertaken as required in response to complaints relating to vibration from site operations. Suitably qualified staff will be employed to undertake the vibration monitoring using equipment of a suitable standard in accordance with the relevant guidance. Calibration certificates for equipment used will be required in accordance with current guidance and a copy kept on file.

## 5.3 Site Inspections

This is vital for the day-to-day management of noise and vibration on site. Noise monitoring provides back-dated data to measure the success of the processes implemented through inspections of operations.

Site inspections will be undertaken in response to noise and vibration complaints and where noise monitoring indicates that guideline values have been exceeded. These inspections will be supported by additional noise and vibration monitoring as required to determine the source of noise and/or vibration resulting in the complaint or exceedance of guideline values. Appropriate mitigation measures will be implemented as required to reduce noise and vibration levels from the mining operations.

## 5.4 Reporting

Noise and vibration analysis will be submitted to local, regional and national authorities as required by legislation. Regular assessments of levels of noise and vibration will be made and management on site reviewed as required to ensure that levels of noise and vibration from site are minimised.

At a minimum, annual revisions of the Noise Management Plan (NMP) will be carried out to ensure the plan reflects current practice and vice versa. If the reviews of noise monitoring results cause a change in site processes, the NMP will be revised to reflect that.

The results of the noise and vibration monitoring will also be made available to the various authorities as required by legislation.

# 6 ROLES AND RESPONSIBILITIES

## 6.1 Noise Inspections

Inspections of noise and vibration complaints and/or exceedances will be carried out as required by the environmental manager, site manager or other nominated person. If the specified person is unable to carry out the inspection, then an alternative suitably trained staff member must be directed to undertake the inspection. Noise and vibration monitoring will be undertaken as required.

## 6.2 Noise and Vibration Monitoring

Monitoring of noise and vibration levels and reporting of results will take place according to an appropriate schedule to be decided upon by management.

During the operational phase of the development, the ambient noise level surveys will be undertaken quarterly at locations to be agreed considered representative of nearest identified sensitive receptors to the Project boundary. Additional monitoring of noise and vibration levels, will take place in response to noise and vibration complaints received through the established company complaints and grievance procedure.

## 6.3 Record Keeping and Reporting

A reporting template in Appendix 1 will be used to record all surveys and these will be completed and retained on site as part of the environmental monitoring data records. The environmental manager at the site will be responsible for maintaining these records in an appropriate way and ensuring that all required surveys are undertaken.

# 7 CORRECTIVE ACTIONS

## 7.1 Action Levels

If analysis is received which indicates that there has been a breach of action levels as identified in Section 4 (Table 4.1 to 4.5), then appropriate investigative action and remediation measures will be undertaken.

These actions would include, but will not be limited to:

- Analysing the weather conditions during the period in which the breach occurred;
- Review of site operations during the period in which the breach occurred;
- Identification of site activities causing the breach; and
- Review and amendment of mitigation measured to ensure no further breaches occur (see Table 3.1).

### 7.2 Noise and Vibration Surveys

Noise and vibration surveys and assessment of results will inform changes in the mitigation measures in use on site. The introduction of these processes will be documented in order to demonstrate that on-going reviews are taking place. Once implemented these changes will be monitored to ensure their effectiveness, and further changes made as required until they are proven successful.

## APPENDIX 1: NOISE AND VIBRATION SURVEY PRO-FORMA

## Noise and Vibration Monitoring Record

| | | |
|---|---|---|
| **Survey Date:** | **Survey Time:**<br>*Monitoring Start and End Time* | **Staff name:** |
| **Monitoring Location:** *location within site / distance from site activities and other noise/vibration sources. Reference to plan showing location of monitoring where possible* | | |
| **Weather Conditions** | | |
| Temperature *eg: data from site weather station* | Wind speed & direction *eg: data from site weather station or description from observations.* | Precipitation *eg: current conditions and previous precipitation events (i.e. within 2hrs)* |
| Cloud Cover *eg: full, partial, none – in % if possible* | Snow cover *eg: high altitude only, all levels, partial* | |
| - ***Noise monitoring should not be undertaken during precipitation events or when wind speeds exceed the working range of the microphone windshield*** | | |
| **Noise Monitoring Observations** | | |
| *observations about specific monitoring points eg: dominant noise and vibration sources, disturbance/damage to equipment, missing equipment, any other relevant noise/vibration comments including dominant sources, duration of each activity per day (or as a proportion of the monitoring period) and distance from monitoring location (nearest point and average distance if source is mobile)* | | |
| **Noise Monitoring Equipment:** | | |

| | | |
|---|---|---|
| **Noise and Vibration Levels:** *Report noise levels in dB and vibration levels (PPV / acceleration ($m/s^2$) as appropriate*<br><br>***($L_{Aeq}$ and $L_{Amax, fast}$ dB levels required as a minimum)*** | **dB $L_{Aeq}$** | **dB $L_{Amax, fast}$** |

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**TAILINGS STORAGE FACILITY MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER:** | **MM2** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL ESIA – MANAGEMENT PLAN**

# TAILINGS STORAGE FACILITY MANAGEMENT PLAN

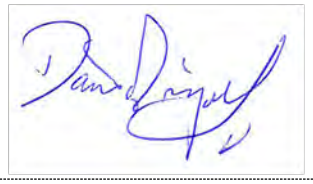
**October 2016**

**PREPARED BY:**

| | |
|---|---|
| Naomi Lea | Principle Geologist |
| Nick Watson | Technical Director |

**APPROVED BY:**

| | |
|---|---|
| Dave Brignall | Technical Director |







ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Objectives of the TSF MP ..... 1
1.2 Associated Plans ..... 1
1.3 Report Structure ..... 2
**2 REGULATORY AND OTHER REQUIREMENTS ..... 3**
2.1 ESIA and EMMP ..... 3
2.2 Corporate Requirements ..... 3
2.3 Kazakhstan Legislation/Regulations/Policies ..... 3
2.4 Other ..... 4
**3 PROJECT CONTEXT ..... 5**
3.1 Project Description ..... 5
3.2 Tailings Storage Facility ..... 6
3.3 Relevant Design Parameters ..... 8
**4 TAILINGS ..... 9**
4.1 Geochemical Composition of Tailings ..... 9
**5 MINE CLOSURE PROGRAMME ..... 10**
5.1 Closure Planning ..... 10
5.2 TSF Closure Concept ..... 10
5.3 Closure Investigations ..... 10
**6 MONITORING AND REPORTING ..... 12**
6.1 Monitoring ..... 12
6.2 Incidents ..... 15
6.3 Auditing and Review ..... 15
**7 TSF MANAGEMENT FRAMEWORK ..... 17**
7.1 Hazard Identification and Risk Assessment ..... 17
7.2 TSF Management Overview ..... 17
7.3 Site Management System and Responsibilities ..... 18
7.4 Interface between Environmental and Mining Requirements ..... 18
**8 MANAGEMENT MEASURES ..... 19**
8.1 Tailing Storage Facility ..... 19
8.2 Detailed Management Measures ..... 19
**9 REFERENCES ..... 24**

**TABLES**

Table 3.1: TSF Design Criteria ..... 8
Table 8.1: TSF Management Procedures ..... 20

# 1 INTRODUCTION

This Tailings Storage Facility Management Plan (TSF MP) is required by Polymetal (hereafter referred to as 'the Company'), for the Kyzyl Gold Project in Eastern Kazakhstan, to describe requirements for the effective management of the tailings storage facility. The tailings will be generated from an open pit and a conventional gold plant involving carbon flotation and sulphide flotation and placement of tailings into a tailing storage facility (TSF).

The preparation of this TSF MP is primarily to meet requirements contained in the ESIA and associated Environmental Management Plans and for compliance with Kazakhstan mining regulations. The purpose of the TSF MP is to provide a management framework for the safe, stable and non-contaminating operation of the TSF while assisting to minimise the need for ongoing maintenance and monitoring post closure.

## 1.1 Objectives of the TSF MP

The TSF MP is a technical document that describes the proposed management of the tailing storage facility with a particular emphasis on 'high risk' areas, i.e., dam stability and environmental contamination for seepages. The scope of the TSF MP is to address the tailings storage facility from the point of deposition of the tailings to the return extraction point of the process water.

From a broad perspective, the overall objective of the TSF MP is to achieve effective management of these materials to minimise adverse environmental effects during operation, decommissioning, closure and post-closure. In particular, implementation of the TSF MP shall provide a sound basis for ongoing rehabilitation and mine closure, reduce post-closure liabilities (such as monitoring and maintenance of reclaimed areas), and play an important role in ensuring that the mine's legal compliance and social licence are met.

Given the early stage of the project, this document represents a framework management plan on which Polymetal and their Kyzyl Gold Project management team can build a practical operational plan, informed by appropriate engineering design and analysis. This TSF framework management plan will therefore need revision based on the operations of the mine and be regularly updated in light of the operational experience and monitoring data from the TSF.

## 1.2 Associated Plans

The TSF MP is to be used in conjunction with the following documents:

- ESIA (Wardell Armstrong, 2015), which lists the commitments made that relate to the management of the tailings storage facility;
- Water and Wastewater Management Plan (Appendix 1); and
- Mine Closure and Reclamation Plan (Appendix 5).

The TSF MP is also intended to be used in conjunction with the various standard operating procedures (SOPs) in place that detail procedures to handle tailings material.

### 1.3 Report Structure

The TSF MP comprises 8 sections:

1. Introduction.
2. Regulatory and other requirements, including the Environmental Management Plan (EMP); lease conditions; Company policies; Kazakhstan legislation, regulations and policies.
3. Project context, including a brief summary of the tailings storage facility design and a project description and relevant site features.
4. Tailings geochemical and geotechnical properties and water quality.
5. Mine closure programme.
6. Monitoring and reporting regime.
7. TSF management framework, including hazard identification and risk assessment, management systems and responsibilities.
8. Management measures including design principles and detailed management measures.

A list of references is given at the end of the report.

# 2 REGULATORY AND OTHER REQUIREMENTS

As a minimum, the project is legally required to comply with Kazakhstan regulations and the commitments contained within the Environmental Social Impact Assessment (ESIA) and Environmental Monitoring and Management Plan (EMMP). The project is also required to comply with corporate requirements and those international standards that Polymetal has adopted. These commitments and requirements are summarised below.

## 2.1 ESIA and EMMP

An environmental and social impact assessment (ESIA) has been prepared for the Kyzyl Gold Project. The Environmental Management and Monitoring Plan (EMMP) will be prepared and based upon the impact investigations undertaken for the ESIA as a basis for management commitments. The EMMP will be reviewed annually and amended as required.

## 2.2 Corporate Requirements

Polymetal has established corporate guidelines that represent the company's view concerning the priorities to be addressed and generally accepted best practice. The company policies that are relevant to the mine will be listed in the EMMP; including those that are relevant to TSF management:

- Corporation Vision and Values;
- Corporation Environmental Policy Statement; and
- Corporation Materials and Waste Management Guideline.

## 2.3 Kazakhstan Legislation/Regulations/Policies

The Kazakhstan policies, regulations, legislation and standards that are relevant to the mine are listed in the ESIA/EMMP. Those that are relevant to TSF management include:

- Principal Legislation and Regulations:
  - Environmental Code (2007) and amended in 2011
  - Law on Subsoil and Subsoil Use (2010) Land Code (2003)
  - Water Code (2003)
  - Kazakhstan State Ecological (SEE) approval of "normative projects" for Maximum Permissible Emissions (MPE) of potential pollutants released to the environment on an annual basis
  - Kazakhstan State Ecological (SEE) approval of "normative projects" for Maximum Permissible Discharge (MPD) of potentially polluting matter to land and water on an annual basis
- Guidelines and Standards (Kazakhstan standards):
  - Environmental Monitoring
  - Typical Rules of Organisation and Introduction of Production Monitoring

- Methodical Instruction for Determination of Level of Environment Component Pollution by Toxic Substances of Production and Consumption Wastes
- Methodical Instruction for Estimation of Impact on Environment of Located Collectors of Production Wastes

## 2.4 Other

In addition to meeting the requirements discussed above, the TSF MP also reflects generally accepted international best practices in relation to TSF management as described in the European Commission Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities, (January 2009) which summarises the best technical and management practices and is intended to assist the mining industry in providing high levels of environmental protection.

# 3 PROJECT CONTEXT

## 3.1 Project Description

Located in East Kazakhstan Region (Oblast) of Kazakhstan, the Kyzyl Project is a gold deposit, 1,100km north of former capital Almaty, in the northwestern part of the Kalbinsky Range. The Project is located in Auezov municipality within Zharminsky District within the context of a historical mining area.

Mining began at the site in 1956, and has continued intermittently to the present day. A populated settlement, Auezov, exists on the mine boundary, and disused processing plant and mining infrastructure is already in place.

The preferred option for the Project is an open pit and underground gold mine that will be developed in two stages. Stage 1 will include development of the open pit, waste dumps and ore stockpile from 2016 – 2026. Stage 2 is scheduled from 2026 to 2039 and includes development of underground facilities from the base of the open pit, starting in the central and western areas, and followed by development of the eastern area.

Open pit mining will be carried out using conventional drill, blast, load, and haul methods. Underground mining will be carried out using the underhand cut and fill method, and will incorporate cement paste backfill. The backfill material will be sourced from the processing plant's tailings storage facility (TSF).

The design production rate for open pit mining is 1.8Mtpa of ore, with average feed gold grade of 6.90g/t. Underground mining will take place at 1.2Mtpa of ore, with an average feed grade of 8.5g/t Au. The processing plant will involve crushing, milling, and a complex flotation circuit that include a ball-mill regrind, carbon flotation, flash flotation, and more conventional sulphide flotation. The product from the processing plant will be a sulphide flotation concentration at a gold grade of about 99.2g/t. The concentrate will be dried and packed into 1.5t bags. The bags will be transported to Shalabay railway station via road, before loading on a freight railway car destined for further processing in Amursk.

Waste product from the processing plant is tailings, which will be pumped into the TSF. Water will be recovered from the TSF for reuse in the process and mine.

The Kyzyl Gold Project general arrangement plan is shown in the Drawing 1.3. A full description of the Project can be found in Chapter 3 of this ESIA.

As the project develops the underground mine will come on line. At this time approximately half of the tailings material will be prepared as a backfill mix for backfilling of the exhausted stopes.

### 3.2 Tailings Storage Facility

The Kyzyl Gold Project will produce tailings during the processing of gold ore from the Bakyrchik deposit. The tailings will be produced from the thickening of sulphide flotation tailings. The tailings will be pumped as a slurry via a pipeline to the proposed TSF and deposited from the crest of the main containment dam. Return process water will be pumped from a floating decant platform and returned to the process plant via a dedicated pipeline. The original tailings dam is located to the northwest of the proposed main TSF adjacent to the process plant. The original tailings dam has not been closed but is no longer operational. The general site layout is shown on Drawing No 34 01 06 001 00- RT included as Appendix 1 to this document.

The proposed tailings impoundment will be formed by four dam structures across an un-named creek valley to the east of the mine site and process plant: Containment Dams No 1 and 2 and Upstream Dams 1 and 2. The un-named creek valley is orientated broadly speaking north south with the creek flowing north to south. Two tributaries of the un-named creek merge just to the north of the proposed TSF area. The un-named creek will diverted around the eastern side of the impoundment area via a drainage ditch and cut off trench. A small dam structure is already in place at the northern most edge of the proposed TSF impoundment area to divert the flow of the western branch of the un-named creek towards the east.

The dams will be constructed from topsoil borrow pit material from the stripping of the tailings impoundment area and the open pit overburden. The impoundment area will be lined with 1.0mm thick polyethylene liner which will be protected with a soil layer to restrict puncturing. The polyethylene liner will be extended up the raises of the containment dams and will be tied into the existing impoundment liner to create a continuous seal across the impoundment area and raised dam structures.

Containment Dam No 1 is the main dam and is located at the southern end of the proposed TSF impoundment area. The dam will be raised in four stages. The starter dam will be 20m high, the second, third and fourth lifts raised in 5m downstream lifts resulting in a final dam height of 35m. The upstream slope of the dam will be lined in 1.5mm thick polyethylene liner tied into the impoundment liner to create a seal for the full height of the upstream face. Containment Dam No 1 is classified as a hazardous hydraulic engineering structure (second category of reliability and durability).

Containment Dam No 2 is a downstream raise of the existing tailings dam at the western edge of the proposed TSF impoundment area. The raise will have an upstream and downstream slope of 1 in 3. The overall height of the raised dam will be 12m. The upstream face will be lined with a 1.5mm polyethylene liner tied into the impoundment liner.

Upstream Dam No 1 is the smallest and shortest of the 4 dam structures and is located in the northern area of the proposed TSF impoundment. It is a downstream expansion of the existing un-named creek

dam. The final dam height will be 5m with 1 in 3 slopes. The upstream slope will be lined with 1.5mm polyethylene liner tied into the impoundment liner.

Upstream Dam No 2 is located in the north-eastern area of the proposed TSF and will act as a cut-off to the main tributary of the un-named creek. The dam will divert the creek flow towards the stream diversion channel to the east of the TSF. The dam itself will be 5m high with 1 in 3 slopes. The downstream face will be lined with 1.5mm polyethylene liner tied into the impoundment liner. Rip rap will been placed on the upstream face as an erosion protection measure.

A cut-off drain will be constructed along the eastern side of the proposed TSF to collect and divert surface and groundwater flow away from the TSF. The cut-off trench will be cut and filled and lined with polyethylene liner to restrict groundwater flow from the stream diversion channel.

The stream diversion channel will be formed on the eastern site of the proposed TSF area with a length of 2,750m (including an 1800m long section across the front of Upstream Dam No 2 and 950m long diversion section). The channel will be trapezoid in cross section with 1 in 3 side slopes and 3.5m wide base. The channel will be lined with 1.5mm polyethylene liner

The tailings pipeline system will comprise a series of pumps, and two polyethylene pipe lines. The primary pipeline will deposits the tailings from the crest of Containment Dan No 1 via hydraulic filing on the upstream slope. The secondary pipeline will be used as a backup system to the main pipeline. The pipeline will be on the surface, heat insulated and bedded on a gravel and pebble bed with anchor points every 100m with intermediate anchor points every 3.5m to restrict lateral movement. Some lateral movement is accommodated within the pipeline to account for temperature variations creating thermal expansions. Spiggot points fitted with valves and flexible rubberised fabric hoses are located at 20m intervals along the crest of Containment Dam No 1 to allow the even distribution of tailings down the face of the dam.

## 3.3 Relevant Design Parameters

The proposed TSF has been designed on the following criteria summarised in Table 3.1:

**Table 3.1: TSF Design Criteria**

| Item | Unit | Value |
|---|---|---|
| Plant ore fee rate | ktpa | 1,800 |
| Total tailings to be deposed into TSF over life of mine | kt | 19,600 |
| | k $m^3$ | 1,400 |
| TSF capacity | M $m^3$ | 14.5 |
| Availability | - | 0.81 |
| Slurry solids to liquid ratio (S:L) (w/w) | - | 1:1.015 |
| Slurry discharge rate to TSF | $m^3/h$ | 315.6 |
| Solids (from slurry) discharge rate | t/h | 232.1 |
| Water (from slurry) discharge rate | $m^3/h$ | 235.7 |
| Tailings solids particle density | $t/m^3$ | 2.78 |
| Discharged tailings bulk density | $t/m^3$ | 1.4 |
| Fraction of tailings passing -0.071mm | % | 80 |
| Recycle water flowrate | $m^3/h$ | 220.6 |

# 4 TAILINGS

## 4.1 Geochemical Composition of Tailings

The Bakyrchik ores can be classified as low-grade and low-sulphide by their composition and as disseminated by their textural features. They are not uniform in oxidation. The oxide, transitional and primary ores were identified based on the ore oxidation degree. The oxide ores mainly occur to a depth of 30-40 m below ground level and have been virtually mined out in explored areas by now. The mixed ores lie beneath them, and the primary sulphide ores occur at deeper levels.

The only commercially valuable product is gold (average grade of 7.0–9.5g/t), which is mainly associated with arsenopyrite, pyrite and quartz, more occasionally with carbonaceous matter, polymetallic sulphides and antimonite. The bulk of gold (95–97%) is concentrated in pyrite and arsenopyrite. In some cases gold is confined to the areas of sulphide intergrowth with quartz or carbonaceous matter. A correlation between gold and arsenic concentrations is observed.

Silver is present in insignificant amounts and refers to associated components.

The gold distribution in ores is non-uniform. Coefficients of variations range from 56.5% to 86.0 % within ore bodies. Gold grades range from 50g/t to 800g/t in pyrite and from 50g/t to 1000g/t in arsenopyrite.

The bulk of gold forms ultrafine dissemination in sulphide minerals, primarily in arsenopyrite and pyrite.

The main detrimental ore components are organic carbon and arsenic. The content of organic carbon, which causes major problems during hydrometallurgical processing, ranges from 1.2% to 1.6% on average (at a total carbon content of 2.0–3.5%). The arsenic content varies from 0.3% to 1.5%.

The Bakyrchik ores are referred to as “double refractory” metallurgical raw material, characterized by ultrafine gold dissemination in sulphide minerals in the presence of a significant amount of carbonaceous inclusions with extremely high preg-robbing capacity. The Bakyrchik ore processing flowsheet via flotation achieves a 93.44% gold recovery rate into saleable concentrates at a concentrate yield of 6.5%.

# 5 MINE CLOSURE PROGRAMME

## 5.1 Closure Planning

The Mine Closure and Reclamation Plan (MCRP – see Appendix 5), which is intended to support the Polymetal planning and regulatory requirements and ensure that closure measures are consistent with the EMP, has been prepared. The MCRP aims to satisfy applicable Kazakhstan regulations, including Mining Reclamation Requirements, and World Bank Environment, Health and Safety Guideline (IFC, 2007).

From a TSF management perspective, closure measures are designed to prevent, control and, as a final resort, treat tailings, with the aim of long-term preservation of the environment within and downstream of the decommissioned operations. The TSF closure plan should include groundwater and surface water protection measures that are supported by geochemical studies.

## 5.2 TSF Closure Concept

Current relevant aspects of closure planning for the TSF include the following:

- Removal of the settling pond from the TSF area. Water will be discharged via a purpose built drainage ditch into the flood storage pond. The water will be mixed and diluted with clean creek water prior to discharge to the environment;
- Slurry pipelines, water lines and pump equipment will be dismantled and removed;
- Once the water level within the tailings mass is sufficiently low the tailings area will be filled with clean borrow pit soils to a thickness of 0.6m graded to fall towards the periphery of the TSF area. A 0.2m thick top soil layer will placed over the backfill to create a good growing medium. It is anticipated that the area will revegetate naturally with the local flora;
- The area will be graded to fall towards the peripheral water diversion ditch. The perimeter surface water collection ditch will feed any surface run off into the Alaigyy creek; and
- The stream diversion channel, water diversion ditch and cut off drains will continue functioning but will not be subject to ongoing maintenance or repair.

Where necessary, raw materials shall be sourced from outside of the mined areas.

## 5.3 Closure Investigations

Notwithstanding the approaches described above for the TSF, the available information is not sufficient to allow detailed closure planning and hence expert advice is required to further advance this issue. In particular the following tasks need to be further developed and addressed:

- Develop agreed site closure objectives and rehabilitation criteria via consultation with stakeholders, with a specific focus on the TSF;

- Conduct a detailed and integrated hydrogeochemical analysis of the site, including seepage from the TSF;
- Assess and determine water treatment measure to meet discharge qualities;
- Assess and characterise potential cover material sources;
- Undertake a receiving environment impacts analysis;
- Refine the existing TSF cover design criteria and measures;
- Develop a site-appropriate cover system field trial programme; and
- Monitor each cover system field trial for development of a detailed closure approach.

The schedule for these tasks shall take into account overall mine closure planning, with a focus on ensuring that sufficient time is allowed for the field trial programme for the measures to be designed and implemented.

# 6 MONITORING AND REPORTING

## 6.1 Monitoring

Monitoring is a key aspect of continued stability, safety and the correct operation of the TSF. The monitoring and auditing requirements have been based on the design and operating principles of the TSF and consider seepages and spillages to the environment as well as the long term safety and stability of the TSF and the delivery pipeline system.

Monitoring features have been built into the TSF during construction and include:

- Two piezometers per lift in Containment Dam No 1: to measure the drawdown curve and filtration within the embankment;
- Benchmarks and markers to monitor precipitation and dam displacements; and
- A water gauge rod in the vicinity of the return water pump.

***Approach***

The primary objectives of the TSF and delivery pipeline system monitoring programmes are to:

- Provide information that will determine the adequacy of TSF management practices and allow improved practices and procedures to be developed;
- Provide information on the continued stability and safety of the TSF structure;
- Detect and measure trends or environmental changes, and enable analysis of their causes; and
- Confirm impacts of particular activities and identify unforeseen effects and the need for additional remedial measures.

The monitoring programme shall be based on a conventional three-phase surveillance system, incorporating operations, discharge and ambient monitoring.

The monitoring plan shall be compliant with applicable regulations, understandable and simple to implement, and auditable. It shall be the responsibility of Polymetal's environmental and legal officers to prepare, steward and act as the custodians of all compliance documentation.

***Monitoring Programme***

The monitoring programme to be implemented to ensure proper management of the TSF includes:

- Routine examination and inspection of the containment and upstream dams to check for dam geometry, settlement, cracks, seepages or erosion;
- Regular monitoring of operating procedures (i.e. water levels, free board, spigots and decant pontoon and return water pump);

- Regular monitoring of piesometirc levels and filtration regime in the main containment dam;
- Monitoring of surface runoff and seepage (if they occur) quality from the TSF on a weekly basis until management measures are seen to be effective;
- Monitoring of the TSF suerpantant water and slurry water quality;
- Regular, i.e., once per shift, inspection of the tailing and leachate return water pipelines;
- Continuous monitoring of pump pressure (automatic system) to detect tailing pipeline failure; and
- Continuous monitoring of wildlife activity in the TSF ponds.

General monitoring of the operation, which will take place on a routine and frequent basis, shall also include the following:

- Tailing production rates; and
- Clear Stream diversion channel prior to the flood period.

The above measures shall be supplemented by regular inspection of surface- and groundwater at monitoring bores or designated surface water sampling locations, including periodic analyses to determine pH, metal-, cyanide- and hydrocarbon content. In particular, the TSF MP's environmental performance shall be determined primarily by evaluation of water quality in and around the TSF, with a focus on the identification of environmental impacts associated with seepages from tailings dams and compliance with applicable regulations. The monitoring data collected shall be reviewed on an ongoing basis and compared to expected conditions and compliance requirements.

In line with international best practice, the mine shall develop site-specific trigger values within the EMMP/TSF MP. Contingency measures that are initiated when these values are exceeded can include increased levels of monitoring and response actions that address the specific causes.

The monitoring programme shall be reviewed annually during the operational life of the mine, with a particular focus on the following questions:

- Do the impacts resulting from TSF management vary from initial predictions?
- Has the configuration or operation of the project changed significantly from a TSF management perspective?
- Have additional external factors such as legislative requirements or stakeholder concerns become apparent that might influence TSF management?

***Databases and Records System***

The mine shall develop a computerised and auditable database system for monitoring data. The primary functions of the system shall include:

- Recording seepage locations and rates of seepages (if occurring);

- Settlement surveys;
- Piezometric data from within the containment dams;
- Recording geochemical, water quality data and similar data;
- Internal and external reporting of data;
- Recording relevant regulatory requirements;
- Recording the results of inspections; and
- Recording additional information such as the results of TSF management audits and reviews.

The system shall also include the following (in relation to the TSF):

- compliance inspection and audit reports;
- non-compliance reports (NCRs);
- corrective action requests (CARs); and
- incidents register.

The above documentation shall be:

- easily located and logically filed in hard copy and electronic copy form, including date of issue;
- available for all relevant site personnel, contractors and consultants;
- periodically reviewed and revised as necessary (and clearly dated) by authorised personnel; and
- removed from all points of issue when obsolete.

The Process Plant Manager shall be responsible for ensuring that feedback is assessed and implications are acted upon with respect to the TSF and delivery pipeline.

***Quality Control***

Where relevant, monitoring shall be carried out to a high level of scientific rigour to allow future comparison of the data. Standard quality assurance checks shall be done.

The design of the monitoring programme shall incorporate statistical considerations related to the end use of the data. Sampling methods shall be objective, repeatable and standardised to minimise differences attributable to different or successive operators.

The instrumentation, sampling methods, analytical procedures and data analyses used in the TSF and delivery pipeline monitoring programme shall be consistent with accepted international practice. As described, the recording system ensures appropriate quality assurance and quality control while monitoring programs are undertaken, where this system includes:

- A clear statement of the objectives of the different aspects of the monitoring programme;

- Clearly defined employee responsibilities for managing and conducting monitoring;
- Procedures for monitoring and sample collection;
- Training of responsible personnel;
- Regular maintenance and calibration of on-site monitoring equipment;
- Use of appropriately qualified and regulated external laboratories to verify onsite monitoring results and to check for precision;
- Use of duplicate samples, field blanks, laboratory blanks and similar; and
- Chain-of-custody procedures for sample handling and transportation for both internal and external samples.

***Reporting***

Reporting of the results from the above monitoring programme shall be performed as per reporting procedures and involves:

- Annual reports to the government (further details are provided in the EMMP); and
- Quarterly reports dealing specifically with TSF management issues to mine senior management and relevant Governmental authorities.

## 6.2 Incidents

***Incident Reporting***

Incidents related to TSF management and which occur either as a result of an emergency, accident or malfunction, or which cause or threaten serious or material environmental harm, shall be reported.

***Emergency Preparedness and Response***

Responses to emergencies shall be detailed in the Spill Prevention and Emergency Response Plan (SPERP) (Appendix 4).

## 6.3 Auditing and Review

A compliance audit programme shall be implemented to:

- monitor/inspect and audit TSF management activities, to ensure compliance with the procedures described;
- report the results of inspections and audit to mine management and Polyemetal; and
- register and report incidents to the relevant authorities.

***Daily Supervision and Inspections***

The Process Plant Manager, Environment Manager, or appointed delegates, shall undertake informal inspections to ensure that TSF management procedures are being implemented satisfactorily in

relation the TSF and delivery pipeline. The frequency of inspection depends on the magnitude of risk associated with the environmental issue that is subject to the particular management procedures, but may range from per shift up to weekly or monthly. Issues of significance arising from supervision and inspection shall be reported to senior management. It shall be the responsibility of the department managers to ensure that inspection schedules are developed and that inspection reports and actions are placed on record.

***Compliance Audits***

The following auditing programme shall be implemented:

- an audit programme shall be developed comprising an audit protocol and schedule;
- a regulator-registered auditor shall undertake formal performance review to ensure compliance with this TSF MP, based on the protocol and schedule referred to above; and
- a compliance register shall be maintained to track and report on compliance with statutory and other requirements, as they relate to TSF management.

***TSF MP Review***

The results of formal audits shall be used to review and revise, as appropriate, the TSF MP and associated SOPs, as well as information obtained from the ongoing monitoring programme and other 'lessons learned' during day-to-day operations.

A comprehensive review of the TSF MP shall be undertaken at least every three years. In the years where a comprehensive review is not undertaken, a detailed TSF MP Compliance and Progress Report shall be prepared.

# 7 TSF MANAGEMENT FRAMEWORK

## 7.1 Hazard Identification and Risk Assessment

Risk assessment should specifically focus on identifying hazards associated with the TSF and a conceptual environmental risk model highlights the possible source of risk, the relevant receptor and the pathways linking the hazards to the receptors. The following summarises the risks identified in terms of the TSF MP per component of the proposed TSF:

Pipeline

- fault or leak in the tailings slurry pipeline leading to seepages and spills;
- break down in pumps or pipeline resulting shut down of the pipeline delivery system; and
- insufficient return water to the process plant.

TSF

- containment dam instability;
- overtopping of dams;
- internal erosion;
- seepages;
- dust; and
- long-term erosion.

Stream diversion channel and cut off ditch

- blockage leading to overtopping;
- scouring and erosion; and
- seepages.

## 7.2 TSF Management Overview

Design and planned operations for the TSF should incorporate preventative and mitigation measures for the safe storage of tailings material. Proposed monitoring programmes should include frequent site inspections and recording of containment dam conditions, geometry and settlement, seepages and water levels both within the impoundment and within the containment structures and meterological data. On-site field pH measurement and regular water sampling and analysis should be undertaken on the groundwater and impoundment water.

## 7.3 Site Management System and Responsibilities

***Process Plant Department***

The Process Plant Manager is responsible for the construction, performance, operation, monitoring, maintenance and reporting of the TSF as per the TSF MP Reporting Procedure, and implementation and upkeep of related management plans and SOPs. Any waste rock used for the TSF construction is the responsibility of the Process Plant Manager.

***Environment Department***

The Environment Manager is responsible for monitoring of surface- and groundwater quality downstream of the facilities as per the EMP, and for reporting as per the Reporting Procedure, as well as serious environmental incident reporting and investigation.

## 7.4 Interface between Environmental and Mining Requirements

The Environment Department works with all other departments to accomplish legal compliance and to ensure due diligence and integration through the implementation of the Kyzyl Gold Mine EMP and TSF MP. The Process Department ensures compliance with the TSF MP and the Environment Department monitors compliances throughout the site.

Specific responsibilities for the various TSF management measures are detailed in the management procedures Table 8.1 below.

# 8 MANAGEMENT MEASURES

## 8.1 Tailing Storage Facility

The operational objective of the tailing deposition is to provide sufficient safe storage of tailings in a sub aqueous environment. This objective also helps to reduce acid generation. The TSF design is reported to be in accordance with the "RK SNiP 1.04-14-2003 'Landfills for detoxification and disposal of toxic industrial wastes'" regulation and has taken account of environment, health & safety, climatic conditions, and seismicity. The dam design has provisions for a drainage system and geomembrane, to channel any waste or underground water. Piezometer and observation wells are also included in the design. Seepage that occurs through the TSF embankment shall be collected and directed to lined sediment traps before being pumped back into the TSF.

The dam will be constructed with full Construction Quality Assurance (CQA) and Quality Assurance and Quality Control (QA/QC systems and procedures.) Any constraints identified by the CQA report will be incorporated into the TSF MP.

## 8.2 Detailed Management Measures

Detailed tailing management measures are described in the Table 8.1 below. All of these precautionary measures shall be re-evaluated and updated as the operational experience of the TSF increases.

**Table 8.1: TSF Management Procedures**

| Category | Implementation | | | Monitoring |
|---|---|---|---|---|
| | Ref. No | Management measure | Responsibility | Performance indicator/output |
| Operations | 1 | All personnel involved in TSF management shall be appropriately qualified and trained, and inducted to ensure knowledge of relevant site-specific aspects. | Process Plant Manager/ Mining Manager/ Environment Manager | Qualification and training records |
| | 2 | Refresher courses/training updates shall be provided when TSF management or related procedures are revised, or additional relevant information becomes available. | Process Plant Manager/ Mining Manager/ Environment Manager | Qualification and training records |
| | 3 | Representative samples of tailing and impoundment water shall be routinely tested during operations to validate predicted geochemistry and water quality. | Process Plant Manager/ Environment Manager | Tailings and process water routinely tested; SOP revised as required. Inspection record sheets |
| | 4 | Representative samples of ground water from the vicinity of the TSF shall be routinely tested during operations to validate predicted water quality. | Process Plant Manager/ Environment Manager | Groundwater routinely tested; SOP revised as required. Inspection record sheets |
| | 5 | Inspections and monitoring of the TSF shall be undertaken daily. Inspections to include for visual signs of deformation, erosion, settlement, seepage and piezometric levels. | Process Plant Manager | Monitoring programme. SOP and TSF MP updated as required. Inspection and monitoring record sheets |
| | 6 | Inspection of the tailings delivery pipeline, discharge points and return water pump per shift. | Process Plant Manager | Operational performance. SOP updated as required. Inspection record sheets |
| | 7 | Routine inspection of tailings beach formation and rotation of discharge points to confirm beach profile formation and tailings distribution plan. | Process Plant Manager | Operational performance. SOP updated as required. Inspection record sheet |
| | 8 | Record and monitor the quantity and rate of tailings material deposited to confirm storage capacities and schedule of raises. Any periods of breakdown or no deposition shall also be recorded | Process Plant Manager | Operational performance. SOP updated as required. Quantity record sheets and schedule of TSF raises to provide sufficient storage capacity. |

| Table 8.1: TSF Management Procedures | | | | |
|---|---|---|---|---|
| **Category** | **Implementation** | | | **Monitoring** |
| | **Ref. No** | **Management measure** | **Responsibility** | **Performance indicator/output** |
| | 9 | A groundwater monitoring network around the TSF shall be installed and maintained as per the groundwater monitoring programme in the EMP. The resulting information shall be used to inform a groundwater plume model. | Process Plant Manager/ Environment Manager | Monitoring programme and monitoring records |
| | 10 | Inspect and monitor water levels in the TSF to confirm compliance and understanding of the TSF water balance. | Process Plant Manager/ Environment Manager | Monitoring Data and updated water balance. Inspection record sheets |
| | 11 | Emergency response procedures that shall specifically address TSF failures shall be developed. | Mining-/Process Plant-/Environment Manager | Revised emergency response procedures |
| | 12 | Yearly topographical survey of the TSF to confirm no deformation and subsidence and storage capacity. | Process Plant Manager/ Mining Manager | 3D survey and volume log |
| | 13 | Should seepage from the TSF be detected, the following remedial actions shall be undertaken | Process Plant Manager | |
| | | • Additional monitoring boreholes shall be installed down-gradient of the original bores to determine the extent of the seepage. | | Monitoring Data |
| | | • The risk posed by the seepage to downstream water use and environment values shall be assessed. | | Monitoring Data |
| | | • If required, a seepage interception drain shall be excavated to bedrock if seepage collection is necessary. | | Monitoring Data |
| | | • Additional monitoring settlement points will be installed at the crest of the TSF in the vicinity of the seepage. | | Monitoring Data |
| | 14 | Construction of the TSF lifts shall be as per TSF design and scheduling: | Process Plant Manager / Mine Manager | Construction Audit |
| | | • Only identified suitable construction material will be used. Clay and general fill material to be sourced from the open pit. | | Construction Audit |
| | | • Fill placed as per engineering design. | | Construction Audit |
| | | • Liner installation as per engineering design with full QA/QC procedures | | Construction Audit |
| | | • Topographical survey during and after construction phases to confirm compliance with design. | | Construction Audit |
| | 15 | Conduct and annual review of the TSF to: | Process Plant Manager | |

**Table 8.1: TSF Management Procedures**

| Category | Implementation | | | Monitoring |
|---|---|---|---|---|
| | Ref. No | Management measure | Responsibility | Performance indicator/output |
| | | • evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, monitoring results, spills and other incidents, recommendations and the commitment to continual improvement | | Audit and Revised TSF MP, SOP and closure plan |
| | | • evaluate the continuing adequacy of, and need for changes to, policies and objectives and performance of the tailings management system | | Audit and Revised TSF MP, SOP and closure plan |
| | | • address the need for changes to commitments to Communities of Interest | | Audit and Revised TSF MP, SOP and closure plan |
| | | Report the observations and conclusions of this annual review of tailings management to the accountable executive officer | | Audit and Revised TSF MP, SOP and closure plan |
| Closure | 1 | Remedial actions for tailings discharge shall be developed and agreed with The Kazakhstan regulators prior to implementation. | Mining Manager | Revised TSF MP |
| | | • Capacity building with local stakeholders about TSF issues shall be undertaken, as shall soliciting regular feedback and reporting on the status of TSF management. | Community Relations-/Environment-/Process Plant-/Mining Manager | Consultation records |
| | | • Closure investigations (see Section 7.3) shall be implemented. In particular: | Mining-/Geology-/Environment Manager | Detailed closure plan |
| | | • The viability of constructing a store and release cover system shall be investigated by determining the on-site availability of suitable cover construction materials and assessing the climatic suitability of the site. | Mining Manager | Detailed closure plan |
| | | • The potential to combine the store and release cover with an alkaline cover to enhance its performance shall be investigated. | Mining-/Geology-/Environment Manager | Detailed closure plan |
| | | • The integrity of the proposed cover system over the potentially long time period required (i.e., post closure) shall be taken into account in cover design. | Mining Manager | Detailed closure plan |
| | | • Final restoration profiles faces shall be engineered to reduce erosion as per the closure plan. | Mining Manager | Detailed closure plan |

| Table 8.1: TSF Management Procedures | | | | |
|---|---|---|---|---|
| **Category** | **Implementation** | | | **Monitoring** |
| | **Ref. No** | **Management measure** | **Responsibility** | **Performance indicator/output** |
| | | • A layer of clean backfill material and suitable growth medium (topsoil where available) shall be placed over minimum 1m sealing material and allowed to re-vegetated. | Mining Manager/ Environment Manager | Detailed closure plan |
| | 2 | A detailed rehabilitation programme shall be developed for the TSF as an integral part of project design and implementation, and all areas shall be rehabilitated as soon it is no longer required for project purposes. | Mining Manager/ Environment Manager | Detailed closure plan |
| | 3 | The monitoring programme shall be reviewed and updated annually as described in section 8 | Process Plant/ Environmental Manager | Audit |
| | 4 | Record-keeping and reporting shall be as described in section 8. | Process Plant-/ Mining/ Environmental Manager | Audit |
| | 5 | Inspections and supervision shall be undertaken as described in section 8 to ensure that the TSF management procedures are being implemented satisfactorily. | Process Plant-/ Mining-/Geology-/ Environmental Manager | Audit |
| | 6 | TSF management practices shall be audited annually against the TSF MP (see Section 8). | Mining Manager | Audit |
| | 7 | The TSF MP shall be reviewed as per the requirements in Section 8. | Mining Manager | Revised TSF MP |

# 9 REFERENCES


- European Commission: Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities, January 2009.

- The Mining Association of Canada: A guide to the management of tailings facilities, Second Edition, 2011.

- Australian Government Department of Industry Tourism and Resources: Tailings Management, Leading Practice sustainable development program for the mining industry, February 2007.

- Government of Western Australia, Department of Minerals and Energy: Guidelines on the Development of an Operating Manual for Tailings Storage, October 1998.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**WASTE MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **OCTOBER 2016** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER:** | **MM3** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL PROJECT**

# WASTE MANAGEMENT PLAN

**OCTOBER 2016**

**PREPARED BY:**
Adrian Lea Technical Director

**APPROVED BY:**
David Brignall Technical Director





ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Purpose and Objectives ..... 1
1.2 Scope of the Waste Management Plan ..... 1
1.3 Roles and Responsibilities ..... 2
1.4 Permitting ..... 2
**2 INTEGRATED WASTE MANAGEMENT SYSTEM (IWMS) ..... 3**
2.1 Integrated Waste Tracking System ..... 3
2.2 Classification of Waste ..... 3
2.3 Waste Management Strategy (WMS) ..... 5
2.4 Waste Estimates ..... 6
2.5 Waste Minimisation ..... 7
2.6 Material Re-Use ..... 7
2.7 Recycling ..... 7
2.8 Employee Awareness ..... 7
2.9 Waste Storage ..... 8
2.10 Non-Hazardous Waste ..... 8
2.11 Labelling ..... 8
2.12 Design and Location Specification ..... 9
2.13 Maintenance ..... 9
2.14 Inspections ..... 10
2.15 Hazardous Waste ..... 10
2.16 Containerisation ..... 10
2.17 Labelling ..... 11
2.18 Storage Facilities ..... 11
2.19 Facility Design Specifications ..... 12
2.20 Siting and Location ..... 12
2.21 Operational Procedures ..... 12
2.22 The Transportation of Waste ..... 13

# 1 INTRODUCTION

Polymetal has an adopted Environmental Management System (EMS). In 2013 this EMS was independently certified by Bureau Veritas Certification in line with international standard ISO 14001-2004.

## 1.1 Purpose and Objectives

This fWMP has been prepared in order to ensure that the management of solid waste generated as a result of the operation of the Bakyrchick Gold Project is consistent and compliant with Republic of Kazakhstan and international laws, regulations and best practice. The key objective of this WMP is to:

- ensure that all waste management operations and facilities comply with Republic of Kazakhstan laws and regulations related to the management of waste and the protection of the environment, or to relevant industry standards of practice where such laws and regulations do not currently exist.

## 1.2 Scope of the Waste Management Plan

The development and operation of all solid waste management activities and facilities at the Bakyrchick Gold Project are addressed within this fWMP. These facilities include construction camps, vehicle maintenance areas, temporary waste and recycling storage facilities and other sites directly under the control and/or influence of Polymetal. Relevant activities include the management and transport of waste and recycling from facility areas to approved waste recycling, treatment or disposal facilities.

The waste types dealt with by this fWMP include all solid waste produced directly by Polymetal, or its subcontractors, in the course of constructing and operating the Bakyrchick Gold Project.

This fWMP excludes:

- waste water treatment works and any associated discharges;
- emissions to atmosphere;
- clean soil and natural overburden excavated and utilised in construction operations;
- drilling wastes;
- clean water discharges; and
- mining wastes, including tailings and processing waste.

All such materials, liquids or emissions are covered in separate plans or procedures and are subject to separate Republic of Kazakhstan regulatory and permitting approval as appropriate.

## 1.3 Roles and Responsibilities

Polymetal, through their management and sub-contractor roles, are responsible for the management of waste and recyclables in respect of the Bakyrchick Gold Project.

The Project Environmental Manager, and the Project HSE Manager, is responsible for the administration of the fWMP, including the dissemination and training of sub-contractors and staff on each element of the Project and the conducting of audits to ensure compliance with the procedures contained within this fWMP.

Any incident of non-compliance will be reported directly to the sub-contractor and staff and their supervisory staff for immediate attention. Any issues not resolved in a satisfactory manner shall subsequently be referred to the Project Environmental Manager for resolution.

## 1.4 Permitting

Polymetal is responsible for all permits and licences for the fWMP. The responsibility for preparing and submitting any application, and associated costs and records associated with any permit application, are the responsibility of Polymetal.

All necessary permits should be obtained prior to undertaking any activities outlined in this WMP.

Polymetal is also responsible for ensuring that any sub-contractor or agent involved in the administration of this fWMP are adequately licensed, permitted and trained in accordance with this fWMP.

# 2 INTEGRATED WASTE MANAGEMENT SYSTEM (IWMS)

The purpose of the Integrated Waste Management System (IWMS) is to assist the responsible and effective management of waste in a structured manner, to minimise the risk of health and safety incidents and liabilities and minimise the potential for harm to the environment. The system promotes the waste hierarchy which seeks to minimise the amount and toxicity of waste generated, the re-use and recycling of waste, its treatment and effective disposal.

## 2.1 Integrated Waste Tracking System

An integrated waste tracking system shall be implemented as part of the IWMS. There are three primary aims of the tracking system;

- The system will act as a management tool, providing information on the characteristics and volume (weight) of waste being generated at the Kyzyl Gold Project;
- The system will act as a control mechanism for the safe handling, transport, treatment and disposal of waste and a mechanism by which environmental health and safety compliance can be demonstrated; and
- The system will ensure that waste streams are monitored in a consistent manner.

The tracking system will be based on a series of documents that provide;

- an inventory of waste produced, by volume (weight) and type;
- records of waste movements from source to temporary storage;
- treatment or other interim solution;
- records of transport to final disposal point; and
- a record of final waste location.

The system will be maintained in both paper and electronic formats. Polymetal will provide a copy of these records to the relevant government department if requested to do so. Importantly, particularly for hazardous waste, the system will provide a complete record of waste from 'cradle to grave'. The system will provide an effective management tool and will demonstrate compliance with Republic of Kazakhstan and internal law and best practice and compliance with Polymetal environmental and health and safety policy.

## 2.2 Classification of Waste

The categorisation of waste is necessary in order to establish the correct storage, handling, transportation, treatment and disposal of waste and the creation of an appropriate tracking and reporting system. In accordance with the Environmental Code of Kazakhstan (Chapter 42 Article 287) hazardous waste is waste that contains one or several of the following substances:

1. explosives;
2. highly inflammable liquids;
3. highly inflammable solid substances;
4. self-inflammable substances and waste;
5. acidifying substances;
6. organic peroxides;
7. poisonous substances;
8. toxic substances causing long-lasting and chronic disease;
9. infectious substances;
10. corrosive substances;
11. ecotoxic substances;
12. substances or waste giving off flammable gases when put in contact with water;
13. substances or waste which may give off toxic gases when put in contact with the air or water; and
14. substances and materials that may form other materials with one of the above mentioned properties.

In accordance with the Environmental Code of Kazakhstan (Article 287) for the purposes of transportation, recycling, storage and burial of waste three levels of hazard posed by waste have been determined based on the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal:

1. Green—index G;
2. Amber—index A;
3. Red—index R.

The coding of waste shall take into account the area of formation, method of storage (burial), method of recycling or regeneration, potentially hazardous constituents, type of hazard, and the economy sector where the waste is formed. The level of hazard and the coding of waste shall be determined based on a waste classification index, which is approved by the environment protection authority. If a certain type of waste is not present in the index, the level of hazard and the coding shall be determined on a case-by-case basis and shall be agreed with the environment protection authority. The level of hazard and the coding of waste shall be determined when there is a change in technology, or move to alternative raw materials, or in other cases when the hazardous properties of the waste may have changed. The nature users shall determine the coding of the waste independently or by employing the services of individuals and/or legal entities who are licensed to perform environmental works, or provide environmental services.

Consistent with the IWMS, and in accordance with the Environmental Code of Kazakhstan (Chapter 42 Article 286), this does not apply to wastes generated in the course of the exploration, production and processing of mineral resources. These wastes are regulated by the Republic of Kazakhstan's legislation relating to subsoil and use of subsoil

## 2.3 Waste Management Strategy (WMS)

Polymetal will apply the principle of continuous improvement to the management of waste, particularly in respect of waste minimisation, re-use and recycling. The overall waste management strategy (WMS) is based on the principle that waste generation should be minimised and to ensure that waste material is managed as effectively as possible and as close to the place of origin, or source, as possible. This principle is combined with a hierarchical approach to selecting an appropriate waste management solution. This approach places priority on waste minimisation methods, while also seeking to minimise the hazardous nature of any waste generated, in a manner consistent with best Kazakh and international practice. This hierarchy consists of the following generic options, from most desirable to least desirable:

1. Minimisation
2. Re-use
3. Recycling
4. Recovery
5. Disposal

## 2.4 Waste Estimates

The amount and type of waste generated at the Bakyrchick Gold Project annually is detailed in the Table below.

| Waste Type | Amount (tonnes/year) | Treatment | Maximum amount to be stored at the Bakyrchick Gold Project facility (tonnes) | Responsible |
|---|---|---|---|---|
| Road construction waste | 2132 | Temporary storage at site and transfer to project on demand | 100 | Site - The Chief Yevgeny Kiselyov |
| Timber/wood | 0.9 | Third party organisations | 0.9 | The Chief Anti-Terrorist Centre |
| Scrap Metal | 94.0 | Third party organisations | 5.0 | Site – Chief Engineer Republic – General Director of KAP Construction |
| Oil Mineral Waste | 0.54 | Third party organisations/some site use | 0.54 | Site – Chief Engineer Republic – Chief Anti-Terrorist Centre |
| Spent Electrodes | 0.201 | Third party organisations | 0.201 | Site – Chief Engineer Republic – Chief Anti-Terrorist Centre |
| Solid Waste (MSW) | 205.0 | On the treaty at a polygon MSW | 2.0 | Site – Chief Engineer Republic – Director General of General Affairs |
| Construction Waste | 3,806$m^3$ | On the treaty at a polygon MSW | 951.5$m^3$ | Republic – Director General of KAP Construction |
| Spent Mercury Lights | 1025 | Specialised organisation to receive mercury containing light bulbs | 1025 | Site – Chief Engineer |
| Oily Rags | 0.227 | Combustion in boiler room | 0.227 | Site - The Chief Yevgeny Kiselyov<br>Republic - Chief Anti-Terrorist Centre |
| Spent Rechargeable Batteries | 1.0 | Specialised organisation to receive spent rechargeable batteries | 1.0 | Republic - Chief Anti-Terrorist Centre |
| Waste wood | 0.2 | Combustion in boiler room | 0.2 | The Chief CSFS |
| Computer Scrap | Not regulated | Specialised organisation to receive computer scrap | Not regulated | The Chief IT Services |

## 2.5 Waste Minimisation

Polymetal will minimise the generation of waste by implementing a number of measures, including;

- to design and build in a sustainable manner;
- to reduce the amount of waste generated from development;
- to conserve natural resources through re-using waste arising from construction;
- to re-use materials on site where possible to reduce transportation;
- to use recycled materials where possible; and
- to reduce waste generation during the operational life of the project, and facilitate recycling where waste does arise.

## 2.6 Material Re-Use

Polymetal will seek to re-use products and materials wherever practicable in order to avoid these materials becoming waste. This will reduce the volume of waste being generated and avoid the unnecessary transportation and consumption of new materials. Material re-use will be promoted and encouraged by purchasing, using, dismantling and storing materials in a manner which encourages their potential re-use.

## 2.7 Recycling

Polymetal will seek to conserve raw materials, including transport impacts, by recycling waste where appropriate.

## 2.8 Employee Awareness

Employees will be appropriately trained regarding the various aspects of Polymetal's waste management program, including;

- the importance and goals of the waste management programme;
- waste elimination and minimisation;
- types of waste that may be encountered;
- specific information about hazardous waste;
- waste sorting, segregation and storage requirements;
- waste re-use and recycling;
- waste handling procedures;
- health and safety training requirements relating to waste management;
- types and labelling of waste-specific containers;
- nature and limitation of on-site waste management facilities;
- waste management facilities available at the site;
- required waste management documentation; and
- maintenance and inspection of waste storage and other waste management facilities.

## 2.9 Waste Storage

Proper waste storage facilities will be established at the Kyzyl Gold Project in order to;

- Promote the beneficial re-use or recycling of waste materials whenever/wherever possible;
- Ensure than non-hazardous wastes are separated from hazardous wastes; and
- Minimise the risk of personnel exposures, adverse environmental impacts and/or safety incidents.

The Site Manager will be responsible for identifying the locations of the various waste storage areas, their design, construction, operation and maintenance.

## 2.10 Non-Hazardous Waste

Appropriate containers for the collection of non-hazardous waste shall be provided at the KyzylGold Project. These containers shall:

- Be manufactured of a suitable type and thickness of material appropriate to the type and volume of waste that will be placed/stored in them;
- Be maintained in a good condition;
- Be provided with a lid where necessary and appropriate in order to control odours and/or restrict access by vermin;
- Discourage the mixing of different waste types where such mixing may involve incompatible materials and/or has the potential to make it more difficult to properly recycle/dispose of the resulting waste mixture; and
- Be protected from the weather where appropriate in order to maintain the integrity of the waste container and/or reduce the potential for any waste leakage or discharge. Such protection may include storage buildings, shipping containers, roofed areas, tarpaulins or plastic drum covers as appropriate.

Smoking and open flame operations shall be restricted to specially designated locations while ignitable or reactive non-hazardous waste is being handled. 'No Smoking' signs will be clearly displayed wherever there is a potential hazard involving an ignitable or reactive waste.

## 2.11 Labelling

Containers for non-hazardous waste will be labelled in a manner that encourages and facilitates the safe and proper handling, storage, transportation and re-use/recycling/treatment or disposal of the contained waste. The information appearing on a non-hazardous waste container label may include the following:

- Nature of the waste (ie non-hazardous waste);
- Name of the waste;

- Composition and physical state (eg solid, liquid, sludge);
- Name of the activity, process and/or location that generated the waste;
- Proposed or likely treatment mechanism;
- Date when the container was placed into storage;
- Name of the individual who placed the container into storage; and
- Inventory control number.

Non-hazardous waste container labels will be trilingual (ie Russian, Kazakhstan and English).

## 2.12 Design and Location Specification

The size and specifications of the main non-hazardous waste storage area/facility at each location will be designed to reflect;

- The types and quantities of waste likely to be generated/stored;
- The frequency of waste generation and collection from the storage facility;
- Anticipated waste storage time(s); and
- Waste segregation and material handling requirements.

The storage areas will be designed in a manner which is;

- Capable of completely containing the anticipated types and quantities of non-hazardous waste;
- Securely fenced and gated to prevent unauthorised access; and
- Main storage areas will display a trilingual sign (ie Russian, Kazakhstan and English) stating 'non-hazardous waste storage area/facility', 'no smoking' and 'authorised personnel only'; and
- The appropriate type and number of fire extinguishers will be provided and maintained at each main storage area.

The above criteria apply to containerised storage areas for non-hazardous waste only. Large quantities of non-hazardous waste, such as construction or vegetation debris are unlikely to be relocated to the main non-hazardous waste storage area.

## 2.13 Maintenance

Non-hazardous waste storage areas shall be managed and maintained in a manner which provides safe and secure storage. The maintenance regime shall include as/when necessary the;

- repair of security fences and gates;
- replacement of signage;
- collection of waste that has escaped/leaked from containers, including appropriate clean-up when required;
- replacement of worn or faded labels on waste containers
- replacement of damaged or broken waste containers; and

- movement or relocation of any incorrectly placed waste containers to the correct location.

## 2.14 Inspections

The Site Manager shall be responsible for ensuring that;

- the non-hazardous waste storage areas/facilities are inspected on daily basis;
- during a site inspection the following matters shall be checked;
  - security of area/facility and signage;
  - waste segregation;
  - types and quantities of waste stored;
  - condition of waste bearing containers and labels;
  - overall condition of the storage area/facility;
- a monthly audit of each non-hazardous waste storage area/facility is undertaken each month and a record is maintained of the types and quantities of waste being stored at each location.

## 2.15 Hazardous Waste

Hazardous waste will be stored in a manner that provides secondary containment of sealed waste containers. The following sections of this fWMP provide storage specifications for hazardous waste generated at the Kyzyl Gold Project.

## 2.16 Containerisation

Polymetal will provide sufficient numbers of the appropriate type and size of containers at its camp/job sites in order to ensure the adequate collection, segregation and storage of hazardous waste.

The following management practices for containers bearing hazardous waste will be followed:

- Hazardous waste will be appropriately segregated from non-hazardous waste and other types of materials;
- Hazardous waste will be protected from sources of ignition or reaction, including open flames, smoking, cutting and welding torches/equipment, hot surfaces, sparks, spontaneous ignition and radiant heat;
- Containers for hazardous waste collection and storage will be manufactured of a suitable type of material and thickness in relation to the capacity of the container and the type of hazardous waste to be contained;
- Containers for hazardous waste collection and storage will be maintained in a good condition to provide complete waste containment (e.g. no severe rusting, holes, dents, cracks or other structural defects);
- Containers must be compatible with the hazardous waste, the waste must not be capable of reacting with the container and/or impair its ability to provide complete,

long term containment. Corrosive hazardous waste will be stored in suitable plastic containers;
- Containers will be kept closed or covered at all times unless waste is being added to, or removed from, a container;
- While ignitable or reactive hazardous waste is being handled Polymetal will confine smoking and open-flame operations to specially designated locations. “No Smoking” signs will be clearly displayed wherever there is a potential hazard involving an ignitable or reactive waste;
- Containers of hazardous waste will be stored in single layers and will not be stacked;
- Containers of hazardous waste will be stored on pallets or other suitable devices designed to elevate the storage container from the storage unit/area base/floor and protect it from coming into contact with any spilled liquid should a spillage occur;
- The mixing of different types of hazardous waste in the same container will be avoided if such mixing involves incompatible materials and/or has the potential to make it more difficult to properly recycle/dispose/treat the resulting waste mixture; and
- The void spaces in containers holding smaller liquid-containing items will be filled with an absorbent material that will not react with any liquids stored within the container if released from their primary container.

## 2.17 Labelling

Hazardous waste containers will be labelled in a manner which facilitates the safe and proper handling, storage, transportation and treatment/disposal of the contained waste. The information appearing on a hazardous waste container label will include the following:

- Nature of the waste (ie hazardous waste);
- Name of the waste (Including appropriate waste code);
- Composition and physical state (eg solid, liquid, sludge) of the waste;
- Identification of the waste source;
- Specific management requirements of the contained waste (eg landfilling or incineration; treatment/recycling); and
- Date when the container was placed into storage.

Standard hazardous waste container labels will be bilingual (i.e. Russian, Kazakh).

In order to minimise the potential for the accidental mixing of incompatible or reactive materials labels will be placed on containers prior to the first accumulation of any waste.

Labels shall clearly show the correct storage and handling orientation of the waste container (i.e. ‘this end up’).

## 2.18 Storage Facilities

The following outlines the general specifications to be considered during the design and operation of hazardous waste storage.

## 2.19 Facility Design Specifications

- Hazardous waste storage areas will be designed to:
  - Contain the anticipated types and quantities of waste;
  - Accommodate the anticipated types and quantities of waste containers; and
  - Permit the proper segregation of incompatible and/or reactive wastes.
- The base of a hazardous waste storage area shall consist of a concrete slab and a secondary containment device. The base or floor of a hazardous waste storage area must:
  - be designed to support, and not be damaged by, the weight of a full inventory of waste containers and any equipment or vehicles that may be operated within the storage area;
  - be of a sufficient height above adjoining land in order to prevent storm water run-off from entering the storage area; and
  - be sloped to a drainage trench or sump.
- Hazardous waste storage areas must possess;
  - An appropriately sized cover or roof manufactured or constructed of suitable material sufficient to prevent the entry of snow or rainfall,
  - A perimeter security fence equipped with a lockable gate or some other suitable security device,
  - Appropriate fire-fighting devices (e.g. appropriate types and numbers of fire extinguishers) which should be clearly labelled, and
  - A suitable spill response capability (i.e. appropriate types and quantities of spill response clean-up equipment).

## 2.20 Siting and Location

Hazardous waste storage facilities shall:

- be located, designed, constructed, maintained and operated in a manner which minimises the possibility of a fire, explosion or any release of hazardous waste, or hazardous waste constituents, to the air, soil, groundwater or surface water that could threaten human health and/or the environment;
- not be located within a 100 year floodplain or within 150 metres of a 'sensitive receptor' (inhabited property, school, hospital or retirement home); and
- be correctly signed and securely fenced at all times.

## 2.21 Operational Procedures

The Kyzyl Gold Project shall be managed to ensure that;

- wherever practicable appropriate and correctly labelled container(s) shall be made available prior to the generation or accumulation of hazardous waste;
- The Responsible Manager shall be responsible for the following tasks associated with hazardous waste management;
  - Inspecting and accepting incoming waste-bearing containers with the hazardous waste storage areas;

- Storing waste bearing containers within the hazardous waste storage area;
- Updating the relevant records to ensure that an accurate inventory of hazardous waste is maintained;
- Ensuring that personnel involved in the handling and management of hazardous waste are correctly trained and recognise and understand the potential hazards associated with their duties and have been provided with appropriate protective clothing and equipment commensurate with the particular waste types and quantities; and
- Arranging the transportation of accumulated hazardous waste for subsequent treatment or disposal at an appropriate waste management facility and for maintaining accurate records of such movement and treatment.

- The hazardous waste storage facility shall be inspected on a daily basis to ensure that such waste is being safely and securely stored.

## 2.22 The Transportation of Waste

The movement of waste on the public highway and through areas not under the direct responsibility of Polymetal shall be in accordance with the appropriate and relevant Republic of Kazakhstan regulations and laws and, where appropriate, the best international practice.

Hazardous waste shall not be moved or transported across international boundaries. This policy shall be clearly communicated to all employees and, more specifically, to drivers that might be involved in the transportation of such waste materials.

Waste shall be transported in a manner which ensures that the waste is efficiently delivered to its intended destination without safety or environmental incidents. All vehicles used for transporting waste shall:

- be of an appropriate size and type and shall be maintained in good mechanical condition;
- contain a communication systems to communicate with Polymetal in the event of any incident;
- be equipped with an appropriate spillage kit;
- display appropriate signage at all times clearly indicating the type(s) and quantity of waste being transported; and
- be accompanied by the correct waste manifest form which shall clearly detail the type(s) and quantity of waste being transported.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

Appendix 9

to Order No 217/02-207

dated December 25, 2014

**APPROVED BY**


Deputy General Director -
Polymetal Management Company

_____V.V. Savchenko

"__25__" __December___ 2014

# DOCUMENTED PROCEDURE
# ENVIRONMENTAL MANAGEMENT SYSTEM

## EMERGENCY PREPAREDNESS AND RESPONSE

**DP 01-008**

Ref. No_____
Reg. copy No_____

JSC Polymetal Management Company
Saint-Petersburg

## Introductory Note

**This document was**

1 **DEVELOPED** by Joint Stock Company Polymetal Managing Company

2 **PREPARED** by E.V.Yatsevich, Head - Environmental Department, on November 25, 2014

3 **APPROVED AND PUT INTO EFFECT** by Order No 217/02-207, dated 25.12.2014

4 **SUPERCEDES** DP 01-0081 – Emergency Preparedness and Response (Revision 1 dated 06.06.2012).

5 **THE FIRST REVIEW DATE** is 2019

**FREQUENCY OF REVIEWS** is every 5 years

6 **DOCUMENT EXTENSION** ___-_____

7 **REVISION No2** dated December 25, 2014

## Table of Contents

1. Purpose and Scope ....4
2. Regulatory References....4
3. Terms, Definitions, Symbols and Abbreviations ....5
3.1. Terms and Definitions....5
3.2. Symbols and Abbreviations ....6
4. General ....7
5. Requirements ....8
5.1. Identification of Potentially Hazardous Accidents (Emergencies) with a Negative Impact on the Environment....8
5.2. Potential Accidents (Emergencies) with a Negative Impact on the Environment ....9
5.3 Preparedness for Accidents (Emergencies) with a Negative Impact on the Environment ....10
5.4. Response to Accidents (Emergencies) with a Negative Impact on the Environment ....12
5.5. Investigation of Accidents (Emergencies) with a Negative Impact on the Environment ....12
5.6. Compensation of Environmental Damage Caused by an Accident (Emergency) ....12
5.7. Availability of Financial and Material Resources for Prevention of Potential Accidents (Emergencies) ....13
5.8. Providing Briefings, Emergency Training Exercises and Lessons....13
5.9. Responsibility and Follow-up....13
5.10. Elaboration of Measures on Accidents (Emergencies) Prevention ....14
6. Updates....14
7. Storage ....14
Appendix 1 Form of the List of Potential Accidents (Emergencies) with a Negative Impact on the Environment....16
Appendix 2 Criteria of Evaluation of Environmental Contamination Hazard as a Result of a Potential Accident (Emergency) with a Negative Impact on the Environment ....17
Appendix 3 Criteria of Evaluation of Consequences of a Potential Accident (Emergency) with a Negative Impact on the Environment ....19
Appendix 4 Criteria of Evaluation of Probability of an Accident (Emergency) with a Negative Impact on the Environment....20
APPROVED BY ....21
Read and Understood List....22

## 1. Purpose and Scope

1.1. The present documented procedure (hereinafter referred to as DP) of the Company is designated for identification of potential accidents (emergencies) with a negative impact on the environment, preparation for them and response to them.

1.2. The procedure includes the requirements of:

- documenting of identification of potential emergencies and potential accidents;
- documenting of the procedure of prevention of potential emergencies and potential accidents;
- documenting of the procedure of response to real emergencies, accidents;
- storage of relevant records.

1.3 The present DP is a part of the IRD EMS and is mandatory for use by all Company's Managed Enterprises, which are obliged to identify potential hazards, prepare for emergencies with a negative impact on the environment, and respond to them.

## 2. Regulatory References

The present procedure uses references to the following regulatory documents:

ISO 14001:2004 Environmental Management Systems. Specification with Guidance for Use.

ISO 14004:2004 Environmental Management Systems. General Guidelines on Principles, Systems and Support Techniques.

Environmental Code of the Republic of Kazakhstan No. 212-III of the LRK dated January 9, 2007.

Federal Law of the Russian Federation "On Protection of the Environment" No. 7-FZ dated January 10, 2001.

Federal Law of the Russian Federation "On Protection of Population and Territory from Emergencies of Natural and Technogenic Nature" dated December 21, 1994.

Federal Law of the Russian Federation "Technical Regulations for Fire Safety Requirements" No. 123-FZ dated July 22, 2008.

Federal Law of the Russian Federation "On Fire Safety" No. 69-FZ dated December 21, 1994.

GOST R ISO 14001-2007 Environmental Management Systems. Specification with Guidance for Use.

GOST R ISO 14004-2004 Environmental Management Systems. General Guidelines on Principles, Systems and Support Techniques.

GOST R 14.03-2005 Environmental Management. Influencing Factors. Classification.

Rules of the Fire Prevention Regime of the Russian Federation No. 390 dated April 25, 2012.

RD 06-376-00 Methodological Recommendations on Classification of Accidents and Incidents at Hazardous Industrial Facilities of Ore Mining and Underground Excavations dated August 11, 2000.

SP 9.13130.2009 Code of Practice. Fire protection systems. Fire extinguishers. Operating requirements

DP 01-001 Procedure of Identification of Environmental Aspects and Definition of Significant Aspects

DP 01-002 Identification of Relevant Legal and Other Environmental Information and Access to it.

DP 01-006 Documents and Records Management.

DP 01-007 Operations Management.

DP 01-013 Management Review of the Environmental Management System.

DP 01-014 Management of Environmental Activity of Contractors and Suppliers.

RD 01-001 Environmental Management System Guidance.

Enterprise Standard on HSE MS and Industrial Safety 001 Hazard Identification and Risk Assessment.

Enterprise Standard on HSE MS and Industrial Safety 010 Control of the Status of Occupational and Industrial Safety

Enterprise Standard on HSE MS and Industrial Safety 011 Emergencies Preparedness and Accident Prevention at Hazardous Industrial Facilities.

## 3. Terms, Definitions, Symbols and Abbreviations

### 3.1. Terms and Definitions

The present DP uses the following terms defined as follows:

**accident** is destruction of buildings and (or) technical devices applied at a hazardous industrial facility, uncontrolled explosion and (or) release of hazardous substances, fires, rockfalls and other disruptions of the life cycle of production processes, which has caused suspension of operation of a hazardous industrial facility (broad interpretation of the term "accident" is given with a view to the specific character of operation of hazardous industrial facilities at mining enterprises). The notions which the term "accident" comprises of are:

**incident** is a failure or damage of technical devices applied at a hazardous industrial facility, deviation from the operational conditions, breaking of provisions of federal laws, as well as rules and procedures to regulate hazardous industrial facilities operations;

**explosion** is a prompt conversion of substance or oxygenation of gases in closed space (explosive burning) accompanied by release of energy and formation of compressed gases, which are able to destroy technical devices;

**destruction** is a complete or close to complete loss of operational status of a technical device, which requires repair for its (restoring) bringing to correspondence with regulatory ant technical documentation;

**negative impact on the environment** is an impact of business and other activity, the consequences of which lead to negative changes of environmental quality;

**adverse effect on humans** is an impact of habitat factors creating danger to human's life and heath or danger to life and health of future generations;

**environment** is a set of components of the natural habitat, natural objects and man-modified natural objects, as well as man-made objects;

**hazardous industrial facility** is a facility where mining, mineral processing activities as well as underground operations are performed;

**failure of a technical device** is a temporary loss of ability of a technical device used at a hazardous industrial facility to operate as intended in the operating mode;

**fire alarm** is a set of technical means designated for fire detection, processing and transfer (in the given form) of fire notifications, special information, and (or) issuing of commands for switching on automatic fire fighting equipment and switching on actuating units of the smoke control system, technical and engineering equipment, as well as other fire fighting devices;

**fire fighting primary means** are fire fighting means, which are used for fire extinguishing at the initial stage of its development;

**damage of a technical device** is a loss of ability of a certain part of the technical device, used at a hazardous facility, to function as intended;

**fire alarm** is a set of technical means designated for fire detection, processing and transfer (in the given form) of fire notifications, special information, and (or) issuing of commands for switching on automatic fire fighting equipment and switching on actuating units of the smoke control system, technical and engineering equipment, as well as other fire fighting devices;

**environmental and health damage (harm)** is pollution of the environment or withdrawal of natural resources beyond specified standards, which has caused or causes diseases, degradation or death of living organisms and humans, depletion of natural resources;

**emergency** is the situation on a certain territory caused by an accident, which may lead or has lead to human losses, damage of human health or environmental damage, significant financial losses and disturbance of living conditions of people;

**environmental aspect** is an element of the Company's activity, products or services, which can interact with the environment.

**environmental hazard** is a state, which is characterized by occurrence or possibility of destruction, change of status of the environment under the influence of man-made and natural impacts, including ones, which are caused by calamities and disasters and which threaten vital interests of an individual and society;

**environmental risk** is a probability of occurrence of an event, which has negative consequences for the environment and is caused by negative influence of business and other activity, emergencies of natural and technogenic nature, as well as accidents.

### 3.2. Symbols and Abbreviations

The following abbreviations are used in this DP:

**IRD** – internal regulatory documents.
**SM** – senior management.
**HSED** – Health, Safety and Environment Department.
**DP** – documented procedure.
**CA** – contaminating agent
**EI** – Enterprise instruction
**ETP** – engineering and technical personnel.
**Company** – Polymetal Group of Companies.
**EP** – Environmental Protection.
**HIF** – hazardous industrial facility
**AE** – ambient environment

**SMR** – senior management representative.
**ARP** – accident response plan
**OSRP** – oil spill response plan
**ERP** – emergency response plan
**APLRCA** - action plan on localization and rectification of the consequences of accidents at hazardous industrial facilities
**PO-15** – Report on evaluation of environmental efficiency of the EMS
**IEC** – industrial environmental control
**EMP** – environmental management program
**MEE** - managers, experts and employees.
**RF** – Russian Federation.
**RK** – Republic of Kazakhstan.
**HTS** – highly toxic substances
**PPE** - personal protective equipment
**EMS** - Environmental Management System
**MC** – managing company.
**ME** – managed enterprise.
**EMSO** – Environmental Management System Officer.

## 4. General

4.1. The given procedure comprises the procedure of organization and consideration of the following key aspects of the Company's activity:
- identification of potential emergencies;
- preparedness for potential emergencies;
- response to potential emergencies;
- investigation of accidents and emergencies.

4.2. Identification of potential emergencies with an adverse impact on the environment, preparation for them and response to them include:
- identification of potential accidents (emergencies) with a negative impact;
- preparation of the summary list of potential accidents (emergencies) with a possible negative impact on the environment;
- registration of hazardous industrial facilities in accordance with the legislative requirements;
- insurance of hazardous industrial facilities;
- availability of accident (emergency) response plans;
- general preparation for emergencies, including possible scenarios of occurrence and development of accidents at the facility;
- investigation of accidents, incidents and emergencies;
- elimination of the negative impact on the environment, which was caused by an accident;
- training and certification of the personnel of enterprises;
- allocation of responsibility during emergency response activities of the personnel;
- industrial environmental monitoring during operation of an industrial facility.

## 5. Requirements

### 5.1. Identification of Potentially Hazardous Accidents (Emergencies) with a Negative Impact on the Environment

5.1.1. Identification of potentially hazardous emergencies with a possible negative impact on the environment at the ME is performed in accordance with the requirements of the present DP.

5.1.2. Identification of potential accidents (emergencies) with a negative impact on the environment is performed at industrial facilities during identification of environmental aspects. Herewith, all areas are defined, which are connected with:

- operating (normal) mode of equipment;
- emergency mode of equipment and possible emergencies, including processes of equipment startup and shutdown.

5.1.3. Identification of a negative environmental impact of managed enterprises during potential accidents (emergencies) is performed in accordance with the requirements of the documented procedure DP 01-001 “Procedure of Identification of Environmental Aspects and Definition of significant aspects“.

5.1.4. During identification of potentially hazardous situations, the following characteristics are taken into account:

- raw materials, semi-products (reprocessed products), final products and their chemical reactivity;
- mechanical equipment and utilities of the enterprise;
- layout of production areas;
- premises of the enterprise;
- production activity (testing, operation, etc.);
- interaction with adjacent subdivisions of the enterprise;
- Contractors’ activity.

5.1.5. Identification of potentially hazardous emergencies with a possible negative impact on the environment is performed using the initial information by means of analysis of the following:

- data on the previous accidents with a negative impact on the environment;
- results of audits and checks, environmental impact assessments and industrial safety expert reviews of projects, declarations and hazardous facilities;
- results of checks by the government regulatory bodies;
- data of industrial environmental monitoring.

5.1.6. The results of identification of potential accidents (emergencies) with a negative impact on the environment are:

- a list of potential accidents (emergencies) with a negative impact on the environment;
- evaluation of environmental hazard of potential accidents (emergencies) with a negative impact on the environment.

5.1.7. The mechanism of identification of potential accidents (emergencies) with a negative impact on the environment is based on the use of three evaluation criteria:

- level of environmental risk;
- level of environmental hazard;

- seriousness of the accident consequences for the environment.

5.1.8. To define the probability of a potential accident (emergency) with a negative impact on the environment, evaluation of occurrence of a potential accident (emergency) is stipulated according to four levels:

- level 1 ("almost improbable");
- level 2 ("scarcely probable");
- level 3 ("probable");
- level 4 ("quite probable");
- level 5 ("almost certain").

5.1.9. To define the extent of environmental hazard of a negative impact on the environment as a result of potential accidents (emergencies), evaluation of a potential accident is stipulated according to four levels of environmental hazard:

- level 1 ("extremely hazardous");
- level 2 ("highly hazardous");
- level 3 ("moderately hazardous");
- level 4 ("low hazardous").

5.1.10. To define the seriousness of consequences of accidents (emergencies) for the environment, evaluation is stipulated according to four levels:

- level 1 ("irretrievable");
- level 2 ("significant");
- level 3 ("insignificant");
- level 4 ("negligible").

5.1.11. Criteria of evaluation of the level of environmental hazard of a potential accident (emergency) with a negative impact on the environment are given in Appendix 2 to the given DP.

5.1.12. Criteria of evaluation of seriousness of consequences of potential accidents (emergencies) for the environment are given in Appendix 3 to the given DP.

5.1.13. Criteria of evaluation of the level of probability of an accident (emergency) with a negative impact on the environment are given in Appendix 4 to the given DP.

5.1.14. The form of the list of potential accidents (emergencies) with a negative impact on the environment is given in Appendix 1 to the given DP.

## 5.2. Potential Accidents (Emergencies) with a Negative Impact on the Environment

5.2.1 Possible emergencies with a negative impact on the environment include the following:

During operation of the main and auxiliary equipment:

- fires and combustions of materials;
- fires and combustions of the processing equipment;
- collision of main transport vehicles within the industrial site.

During manufacturing activity of enterprises:

- fires and combustions of materials;
- fires and combustions of the processing equipment;
- explosions and fires at the stock of reagents, highly toxic substances;

- destruction of units and parts of the main and auxiliary processing equipment, as well as environmental protection equipment, which has led to emergency contaminants discharge to surface water bodies;
- failure of main, auxiliary and environmental protection equipment;
- combustion and (or) discharges of dangerous substances;
- emergencies at hydro-technical utilities of ponds of industrial liquid wastes;
- destruction and damage (ruptures) of kettles, pressure vessels, steam and hot water pipes (its elements);
- contamination of any gutter, river, lake, water storage or any water body above the limits set by the water quality standards, which has caused a change of water surface or banks colour or which has lead to formation of emulsion below the water level or deposition on the bottom or the banks;
- other types of accidents at industrial facilities, which have caused destruction of buildings and (or) technical devices used at these facilities, uncontrolled explosion and (or) discharge (dumping) of hazardous substances.

5.2.2. An approximate list of accidents and incidents at a hazardous commercial ore mining facility is given in RD 06-376-00 “Methodological Recommendations on Classification of Accidents and Incidents at Hazardous Ore Mining Facilities and Underground Excavations”

### 5.3 Preparedness for Accidents (Emergencies) with a Negative Impact on the Environment

5.3.1 Preparedness for potential emergencies with a negative impact on the environment and response to them at the ME at the stages of design, construction and operation is provided by:
- compliance with design requirements and standards;
- analysis of construction projects;
- compliance with design specifications during operation of enterprises;
- registration of hazardous industrial facilities in the goverment register;
- corresponding training and certification of enterprises’ personnel;
- carrying out operational (production) control, compliance with the requirements of documented procedure DP 01-007 “Operations Management”;
- carrying out industrial environmental control;
- compliance with the rules of environmental safety of Contractors and Suppliers according to the requirements of documented procedure DP 01-014 “Management of Environmental Activity of Contractors and Suppliers”;
- carrying out integrated checks under the guidance of the Chief Engineer of the ME;
- carrying out trainings on emergency response plans;
- availability of a certain financial, material basis for prevention of emergencies.

5.3.2. Main conditions of accident-free use (operation) of technical devices at the ME are the following:
- technical devices shall correspond to the requirements of industrial safety;
- different types of technical devices shall pass acceptance tests before their use at industrial facilities;

- measuring means, which are included in the package of a technical device, designated for use at the industrial facility, shall have Pattern Approval Certificates of Measuring Instruments;

- arrangement and control of maintenance of the indicated devices is performed by the company, which operates the industrial facility;

- technical documentation on a technical device (of foreign make, among other things) includes conditions and requirements of safe operation, the method of carrying out control tests (checks) of this device and its main units, life span and operating life, the procedure of maintenance, repair and diagnostics;

- only persons, who have passed corresponding training and have documents of the established type, have access to operation and maintenance of technical devices designated for use at hazardous industrial facilities.

5.3.3. To prevent emergencies, decrease the seriousness of consequences of potential accidents with a negative impact on the environment, technical and organizational measures are developed and implemented.

5.3.4. Preparedness for potential emergencies, connected with hazardous factors of fire, and response to them are necessary because of a probability of occurrence of associated manifestations of hazardous factors of fire: toxic substances and materials released into the environment from destroyed process units, equipment, devices, products and other assets.

Fire-extinguishing agents used for extinguishing fires of materials, contact with which does not create the danger of occurrence of new seats of fire or explosion, shall not have a dangerous impact on the environment beyond accepted allowable values.

Managed enterprises carry out checks to evaluate their preparedness for use of fire-extinguishing means in case of "fire" emergency. Records, based on the results of such periodic checks, are obligatorily kept according to SP 9.13130.2009.

Concerning preparedness for fire at the ME, the following requirements are provided:

- fulfillment of the "Instruction on Fire Safety" concerning its documentary support (availability of certificates of fire extinguishers, logbooks of fire extinguishers, acts of testing/checking the equipment (including external examination with the objective of checking the package contents of fire extinguishers and locations of their installation (visibility of fire extinguishers and information signs indicating their location, possibility of free access to them), as well as legibility and understandability of guidelines for use of fire extinguishers) / winding of fire hoses); as well as regarding keeping of fire fighting primary means (fire extinguishers, fire hoses, sand boxes, fire points equipped with non-mechanized extinguishing tools and equipment), according to the "Fire Prevention Rules of the RF" and the "Fire Safety Rules of the RK";

- keeping of the fire alarm system and communication means by physical and instrumental check of the system by the APCS service (the name of the service depends on the region) with filling out inspection certificates. The availability of the following documents is provided: a contract for maintenance of the fire alarm system by a specialized company or an order for obliging the APCS to perform maintenance of the fire alarm system and fire extinguishing systems with the inspection schedule created by the APCS and approved by the State Inspection (SMR);

– availability of evacuation plans, operational fire plugs, fire hose cabinets (working taps), fire water storage tanks, a fire enrigen and motor pumps (if available).

### 5.4. Response to Accidents (Emergencies) with a Negative Impact on the Environment

5.4.1. Response to emergencies is a set of measures of organizational and technical nature, which are aimed at minimization, localization and elimination of emergencies consequences.

5.4.2. In case of an emergency at hazardous industrial facilities of the ME, the personnel acts in accordance with the action plan on localization and rectification of the consequences of accidents (APLRCA) at the HIF, the accident response plan (ARP), the emergency response plan (ERP), the oil spill response plan (OSRP) and other documentation regulating these actions. The availability of these Plans is regulated by the requirements of the Law of Industrial Safety of the RF/RK.

5.4.3. The person, who is responsible for timely and correct drawing up of the Plans and their correspondence to the actual condition, is the head of the BS.

### 5.5. Investigation of Accidents (Emergencies) with a Negative Impact on the Environment

5.5.1. Causes of accidents and incidents are investigated in accordance with the established legislative requirements.

5.5.2. Possible reasons of accidents are determined by analysis of consequences of the personnel mistakes during operation and possible consequences of faults, equipment failures, non-compliance with the requirements and rules of environmental safety, established by the regulations and standards, technical documents used during production activity at the main working areas of the enterprise.

5.5.3. Technical investigation of the reasons of an accident is aimed at determination of circumstances and reasons of the accident, the extent of damage, responsible persons, who are to be blamed for the accident, as well as at developing measures on elimination of its consequences and precautions to prevent similar accidents at the given or other regulated facilities.

5.5.4. Written information on adopted measures of investigation of the reasons of an accident is provided by the managing director of the enterprise to the local regulatory bodies and organizations, whose representatives have taken part in the technical investigation of the reasons of the accident within ten days from the expiry date of each item of the list of measures.

5.5.5. Accidents, which have led to emergencies classified as emergencies of natural and technogenic /man-made nature, are investigated as emergencies in accordance with the established procedure of the Government of the RF/RK.

### 5.6. Compensation of Environmental Damage Caused by an Accident (Emergency)

5.6.1. Compensation of environmental damage (harm) caused by accidents (emergencies) is performed on the basis of the court or arbitration court decision on

restoration of the disturbed environmental conditions at the expense of the party to be blamed for the accident and in accordance with the plan of restoration/rehabilitation activities.

### 5.7. Availability of Financial and Material Resources for Prevention of Potential Accidents (Emergencies)

5.7.1. To prevent potential accidents (emergencies) with a negative impact on the environment, timely allocation of the appropriate amount of financial and material resources is planned.

5.7.2. Expenditures of managed enterprises connected with elimination of environmental damage being the result of accidents (emergencies) and payment of penalties for environmental contamination are reflected in the form of the operating log PO-15 “Report on evaluation of environmental efficiency of the EMS”.

### 5.8. Providing Briefings, Emergency Training Exercises and Lessons

5.8.1. Emergency response drills, briefings, emergency training exercises, designed to prevent emergencies, as well as training of actions of the ME personnel in case of emergencies, are provided according to the terms established by the schedules of the ME in form No. 5 of Enterprise Standard on HSE MS and Industrial Safety 010.

### 5.9. Responsibility and Follow-up

5.9.1. General Director of the Company is responsible for creation of conditions for planning and sufficient allocation of resources, which are necessary for prevention of emergencies, accident management, as well as the corresponding personnel training.

5.9.2. Managing Director (General Director for JV Varvarinskoe) of the ME is responsible for timely allocation of sufficient resources, which are necessary for prevention of emergencies, accident management, as well as corresponding personnel training.

5.9.3. Chief Engineer of the ME is responsible for:

- timely and correct drawing up of the accident response plan and correspondence to the actual conditions;
- carrying out checks and control of planned measures for prevention of emergencies at the ME;
- control of the BS preparedness for emergencies and their response.

5.9.4. Heads of a BS are responsible for:

- identification of potential accidents (emergencies) with a negative impact on the environment;
- provision of the raw data to the EMSO for preparation of a list of potential accidents (emergencies) with a negative impact on the environment;
- response to emergencies and prevention of their occurrence.

5.9.5. Head of the Environmental Service of the ME (the position depends on the region) is responsible for creation of a list of potential accidents (emergencies) with a negative impact on the environment and the methodological guideline during identification of potential accidents (emergencies) in the BS.

5.9.6. Head of the Environmental Service of the MC subsidiary coordinates development of a "List of Potential Accidents (Emergencies) with a Negative Impact on the Environment" in the region of ME location.

### 5.10. Elaboration of Measures on Accidents (Emergencies) Prevention

5.10.1. The "List of Potential Accidents (Emergencies) with a Negative Impact on the Environment" includes actions (measures) taken to prevent occurrence of accidents (emergencies):

- possible scenarios of occurrence and development of accidents (emergencies) at the facility;
- when necessary, identification of hazardous materials and their location, as well as description of necessary actions in case of emergencies;
- availability of necessary references to the available external and internal regulatory documents;
- data on interaction with external emergency services;
- data exchange with the parties concerned;
- availability of necessary information during the accident (emergency), for example, availability of equipment layouts, data on hazardous materials, procedures, operating instructions and contact phone numbers;
- methods of accidents elimination at the initial stage, including measures taken by external persons, who may be present at the scene of an accident, for example, contractors or visitors. Top-priority actions of the technical personnel pertaining to elimination of accidents (emergencies), including fire, as well as prevention of their spreading and complications. Taking measures on localization and prevention of drastic consequences of accidents to provide a possibility of prevention of a negative impact on the environmental components. The procedure of interaction with the specialized services;
- protection of documentation and equipment.

## 6. Updates

6.1. Updates to the present DP shall be developed by the MC ED and approved by the HSED Director.

6.2. DP updating is carried out in accordance with the requirements and based on DP 01-006.

## 7. Storage

7.1. The original of the present DP is stored in the MC ED under the assigned reference number.

7.2. The DP is stored in the electronic format on the MC server at the: **K:\ДОТПБиЭ\УООС\СЭМ\...** in PDF format, as well as on the servers of MC and ME subsidiaries in the EMS folder.

7.3. Any controlled copy of the present DP shall be entered into the EMS Document Control Log by the EMSO or its developer as per cl. 5.6.1.4 of DP 01-006.

7.4. After MEE and ETP have read the present DP, the last Read and Understood page is printed with the header to confirm the identity to this DP. The Read and Understood page records facts of making the personnel aware of the requirements of the present DP. The Read and Understood page is stored in the BS as a confirming record.

## Appendix 1
## Form of the List of Potential Accidents (Emergencies) with a Negative Impact on the Environment

APPROVED BY

Chief Engineer

_____ (name of the ME)

_____ (signature, full name)

"__" _____ 20__

**List of Potential Accidents (Emergencies) with a Negative Impact on the Environment**

| Type of activity | Possible accidents (emergencies) | Probability of an accident (emergency) | Level of environmental hazard | Consequences of potential emergency for the environment | Accident (Emergency) prevention measures |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Name of the business subdivision | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## Appendix 2

## Criteria of Evaluation of Environmental Contamination Hazard as a Result of a Potential Accident (Emergency) with a Negative Impact on the Environment

| Environmental hazard of the emergency | Criteria of environmental contamination hazard as a result of a potential accident (emergency) |
|---|---|
| 1 | 2 |
| Extremely hazardous contamination | |
| Atmospheric air | The level of one contaminant or several contaminants exceeds maximum allowable concentration (MAC) at least fiftyfold. |
| | Occurrence of constant smell, which is not characteristic of a given location (season). |
| | Impact of air contaminants on human sense organs: smarting in eyes, lacrimation, unusual aftertaste, rough breathing, redness and other changes of skin, vomit, etc. which several tens of people have at the same time. |
| | Fall of colored rain and other precipitation, occurrence of specific smell or unusual taste of precipitation. |
| Surface water bodies | Maximum one-time level of contaminants of hazard classes I and II, whose concentration exceeds MAC ast least fivefold, and for substances of hazard classes III and IV – at least fiftyfold. |
| | Occurrence of smell, which was not characteristic of water before, with intensity of more than 4 points. |
| | Filming (oil film or film of any other origin) of more than 1/3 of the surface of a water body with an area of up to 6 $km^2$. |
| | Decrease of oxygen levels dissolved in the water to 2 mg/l. |
| | Biochemical consumption of oxygen more than 40 mg/l. |
| | Mass mortality of fish, shellfish, crawfish, frogs, waterweeds and other species of aquatic life. |
| Soils and lands | The content of contaminants of technogenic/man-made origin exceeds MAC at least fiftyfold. |
| | Substances, for which MAC of soil and land contaminants is not established, exceed the corresponding levels of average regional background values hundredfold. |
| | Abrupt changes, which are not connected with metocean conditions and are reflected in insufficient germinating capacity or damage of seeds in the area of more than 50% of the field. |
| | Presence of unauthorized landfills of toxic wastes of hazard classes I and II. |
| Flora and fauna | Mass mortality and disease of fish and/or other aquatic organisms and plants. |
| | Mass mortality and disease of animals. |
| | Contamination outside mining and land allotments of the ME. |

| | |
|---|---|
| | Changes of the status of forest ecosystems (which are not connected with metocean conditions), which are reflected in changing fir needles (leaves) colour to colour. which is not characteristic of tree and shrub species of a given location (season), fall (defoliation) or drying (desiccation) of 30% - 50% of fir needles (leaves), and other signs of natural and technogenic impact on the forest environment. |
| Highly hazardous contamination | |
| Atmospheric air | The content of one contaminant or several contaminants exceeds maximum allowable concentration (MAC) at least twenty-fold and maximum fiftyfold. |
| | Impact of air contaminants on human sense organs: smarting in eyes, lacrimation, unusual aftertaste, rough breathing, redness and other changes of skin, vomit, etc. which several people have at the same time. |
| Surface water bodies | The content of one contaminant or several contaminants exceeds maximum allowable concentration (MAC) at least twenty-fold and maximum fifty-fold. |
| | Occurrence of smell, which was not characteristic of water before, with intensity of 3- 4 points. |
| Soils and lands | Contamination within mining and land allotments of the ME. |
| Flora and fauna | The content of contaminants of technogenic origin exceeds MAC at least twenty-fold and maximum fifty-fold. |
| | Presence of unauthorized landfills of toxic wastes of hazard classes III and IV. |
| Moderately hazardous contamination | |
| Atmospheric air | The content of one contaminant or several contaminants exceeds maximum allowable concentration (MAC) at least threefold and maximum twenty-fold. |
| Surface water bodies | Maximum one-time content of contaminants exceeds maximum allowable concentration (MAC) of contaminants at least threefold and maximum twenty-fold. |
| | Occurrence of smell, which was not characteristic of water before, with intensity of less than 3 points. |
| Soils and lands | The content of contaminants of technogenic origin exceeds MAC at least threefold and maximum twenty-fold. |
| Flora and fauna | Presence of unauthorized landfills of toxic wastes of hazard class IV. |
| Low hazardous contamination | |
| Atmospheric air | The content of one contaminant or several contaminants exceeds maximum allowable concentration (MAC) less than threefold. |
| Surface water bodies | Maximum one-time content of contaminants exceeds maximum allowable concentration (MAC) less than threefold. |
| Soils and lands | The content of contaminants of technogenic origin exceeds MAC less than threefold. |
| | Local contamination of the territory of the ME production site. |
| Flora and fauna | Contamination within the ME production unit. |
| | Contamination within the ME industrial site. |

## Appendix 3

## Criteria of Evaluation of Consequences of a Potential Accident (Emergency) with a Negative Impact on the Environment

**Consequences of a Potential Accident (Emergency) for the Environment**

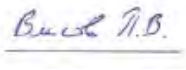
| Irretrievable consequences | Significant consequences | Insignificant consequences | Negligible consequences |
|---|---|---|---|
| The ecosystem is disturbed irrevocably, natural ecosystem restoration is impossible. Sanation, reclamation of the territory and use of specialized equipment are required. | The ecosystem is heavily disturbed. The period of natural ecosystem restoration is minimum 30 years after complete removal of the source of emergency exposure. | The ecosystem is slightly disturbed. Execution of local measures is required within the sphere of responsibility of the enterprise. | The ecosystem is scarcely disturbed. Execution of local measures is required within the sphere of responsibility of the enterprise production unit. |

## Appendix 4
## Criteria of Evaluation of Probability of an Accident (Emergency) with a Negative Impact on the Environment

**Probability of an Accident (Emergency) with Negative Impact on the Environment**

| Probability of an Accident (Emergency) | Criteria of definition of probability of an accident (emergency) with a negative impact on the environment |
|---|---|
| Almost improbable | 0 – 2 cases over the history of observations at the enterprise and at related enterprises (an event which occurs only under exceptional circumstances) |
| Scarcely probable | An event, which is rarely observed at the enterprise and at related enterprises |
| Probable | An event, which sometimes occur at the enterprise and at related enterprises |
| Quite probable | An event, which is intermittently observed at the enterprise and at related enterprises |
| Almost certain | An event, which is regularly observed at the enterprise and at related enterprises, or an event. which occurs in most cases |

# APPROVED BY

| | | | |
|---|---|---|---|
| HSED Director | A.V.Savchenko |  | 25.12.2014 |
| HR Director | D.O.Razumov | | 25.12.2014 |
| Chief Legal Officer | I.I.Kapshuk | | 25.12.2014 |
| Checked by | | | |
| Compliance Manager | P.V.Vlasov |  | 25.12.2014 |

# Read and Understood List

**for employees of** _____

*(name of the business subdivision, Enterprise)*

| Full name of an employee familiarized with the document | Position | Signature | Date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**MINE CLOSURE AND REHABILITATION PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **KZ10061** |
| **VERSION:** | **V2.0** |
| **REPORT NUMBER:** | **MM5** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL PROJECT**

# MINE CLOSURE AND REHABILITATION PLAN

**OCTOBER 2016**

**PREPARED BY:**
David Brignall Regional Director

**APPROVED BY:**
Chris Broadbent Director

*This is a Draft Report and has been provided for the purpose of checking and comment only. WAI cannot guarantee the accuracy or completeness of facts, interpretation, conclusions or recommendations contained herein and reserves the right to alter these. The Client and others should not rely on the content of this draft report until it has been expressly signed off and finalised on behalf of the Company.*



ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 FRAMEWORK MINE CLOSURE REHABILITATION PLAN ..... 1**
1.1 Introduction ..... 1
1.2 Scope and Purpose ..... 1
1.3 Approach ..... 2
1.4 Assumptions and Unknowns ..... 2
1.5 Summary Project Context ..... 3
1.6 Existing Site Conditions ..... 3
1.7 Acid and Metalliferous Drainage (AMD) ..... 4
1.8 Legislative and Other Requirements ..... 5
1.9 International Obligations ..... 8
1.10 Corporate Drivers ..... 13
1.11 Approach to Closure ..... 14
1.12 Risk/ Opportunity Assessment ..... 15
1.13 Generic Approaches ..... 16
**2 ASSUMPTIONS ..... 17**
2.1 Project Components, Closure and Rehabilitation ..... 19
2.2 Kyzyl Project Closure Activities ..... 20
2.3 Closure Management and Implementation ..... 33
2.4 Development of Closure and Rehabilitation Planning ..... 33
2.5 Closure Criteria ..... 34
2.6 Closure Timing ..... 35
2.7 Responsibilities ..... 35
2.8 Review and Development ..... 35
2.9 Implementation ..... 36
2.10 Temporary Closure (more than three months) ..... 36
2.11 Premature Closure ..... 37
2.12 Post-Closure Monitoring and After-care ..... 37
2.13 Preliminary Closure and Rehabilitation Cost Estimate and Closure Fund ..... 38
**3 CONCLUSIONS AND COMMITMENTS ..... 41**
3.1 Management Plan Commitments ..... 41

**TABLES**

Table 1: Generic International Best Practice Expectations Relating to Mine Closure and Post-closure Planning (adapted from IFC/WBG EHS Guidelines for Mining and ICMM documents) ..... 11
Table 2: Indicative Closure and Post-Closure Monitoring Programme ..... 38
Table 3: Preliminary Closure Costs ..... 40

# 1 FRAMEWORK MINE CLOSURE REHABILITATION PLAN

## 1.1 Introduction

Wardell Armstrong International Limited (WAI) has been instructed by Polymetal to develop a framework mine closure and rehabilitation plan (MCRP) as part of the wider review of the environmental and social impact assessment (ESIA) and feasibility study (FS) processes, for the proposed Kyzyl Project located in the East Kazakhstan Region (Oblast) of Kazakhstan.

Mining is a temporary land-use, all mines eventually close. It is the ultimate purpose of a MCRP, and its subsequent implementation, to mitigate the impacts of mine closure on the surrounding environment and the local and regional economy and society. Best practice dictates that mining companies should begin planning for closure at the earliest opportunity in the life of the mine to reduce the negative impacts of mine closure and enhance post-closure opportunities.

In planning for mine closure and rehabilitation, Polymetal will use the following guiding principles to drive the overall process:

- Future public health and safety are not compromised;
- Adverse impacts on local communities are minimised;
- Residual environmental impacts are minimised and environmental resources will not be subjected to physical and chemical deterioration over the long term;
- Leave a positive socio-economic contribution to the local community and surrounding region;
- Site after-use is beneficial, sustainable and acceptable to the mine owners, local communities and the regulatory authorities; and
- Closure and rehabilitation will be fully funded without recourse to the public purse.

## 1.2 Scope and Purpose

This framework MCRP outlines the broad principles for developing a comprehensive and detailed plan and process towards the eventual closure and rehabilitation of the proposed Kyzyl Project. This plan will need to be further refined during the mine life to produce a detailed MCRP.

The scope of this framework MCRP is to:

- Initiate a process of on-going planning and development of the closure and rehabilitation of the Kyzyl mine, particularly:
  - The planning of time-lines and costs;
  - Consider the expected final landform and surface/sub-surface rehabilitation, including removal of plant and equipment and stabilisation and treatment of tailings facilities and waste rock dumps;
  - Provide risk assessment to help set priorities for preparatory work;
  - Analyse different options as the plan is developed;

  - Detail the management of how closure will be implemented; and
  - Describe the availability and quantity of skilled resources for the realisation of the plan;
- Detail proposals for post-closure aftercare and monitoring arrangements;
- Inform stakeholders of the expectations of Kazakhstan legal and regulatory requirements, international best practice and compliance in this regard; and
- Establish a preliminary estimate of the closure and rehabilitation costs.

As some of the Project details are not final at this early stage in the life of the mine, this framework MCRP has been prepared based on anticipated conditions at the end of the mine's operational life. This plan will need to be reviewed and modified regularly to account for changing conditions over time.

### 1.3 Approach

This framework MCRP is the first step in developing a detailed plan for the eventual closure of the Project components. It outlines broad closure objectives and strategies that will be further refined during subsequent updates to this plan to eventually develop a detailed MCRP in readiness for implementation of the closure phases. This plan introduces the closure objectives and strategies that have been developed to mitigate the negative environmental and social impacts anticipated at closure and provides recommendations for future technical studies to reduce current uncertainties and/or to refine and advance this plan.

Closure plans are dynamic, beginning as conceptual designs based on objectives and strategies developed early in the mine life and evolving into plans with detailed executable designs to support final rehabilitation and aftercare. This will include developing performance indicators and finalising the design criteria for final rehabilitation.

Future MCRP updates will be integrated with the life of mine plans to optimise active revegetation techniques with areas that are progressively closed and prepared for rehabilitation. In addition, the development of specific procedures (e.g., soil salvaging and stockpiling, cover material specifications, drainage and erosion controls, ecological restoration, general rehabilitation, associated research, community participation, land-use planning, etc.) will be developed this and other related plans (for example the SEP).

### 1.4 Assumptions and Unknowns

This framework MCRP has been developed while mine elements are still being designed and therefore it has been necessary to apply various assumptions. These include, but are not limited to, the following:

- The pit wall chemistry is assumed to be similar to that of the waste rock with respect to its high sulphide mineralisation and related acid-forming potential;

- The groundwater depth, rebound and potential in-flow rates / volumes to the open pit at closure are not currently known. Neither is the permeability of the open pit geology, fracture or fault regimes which may control drainage. Therefore, at present, the in-pit drainage closure scenario cannot be accurately anticipated. This will affect the closure and rehabilitation options chosen for the pit; and
- Surface and ground water at the site will need post-closure monitoring and treatment. A nominal post-closure monitoring and aftercare period of five years is given; however, achieving the 'walk away' stage of aftercare may take longer than this.

The current assumptions and unknowns will need to be updated in order to finalise this plan and provide a higher degree of confidence in any projected costs.

### 1.5 Summary Project Context

An environmental impact assessment for the Project is currently being prepared by Wardell Armstrong. In addition, a project description has also been prepared by Wardell Armstrong and has provided much of the contextual background information for this MCRP.

The proposed plan for the restart of mining at the Kyzyl is for initial open pit mining, followed by proceeding to underground mining, accessed through the base of the open pit.

According to the Wardell Armstrong ESIA document (in preparation), the key environmental sensitivities related to the Project will include: social issues and potential impacts to groundwater/ surface water quality and changes to the flow regime caused by surface erosion and sedimentation.

### 1.6 Existing Site Conditions

The project has a long history of development from 1956 to the present day, and is currently operating under Care and Maintenance. For this reason, the Project site facilities can be divided into three groups:

- Existing;
- Reconstructed/ Refurbished (which are being upgraded); and
- New facilities.

Existing infrastructure includes:

- Main and auxiliary production facilities which will be dismantled and removed before start-up of production. Some existing facilities will also be transferred to the list of assets of the Auezov authorities; and
- The remaining existing facilities will be used by the operator (BMV) on a permanent basis over the Life of Mine (LOM) period or as temporary buildings and structures for the construction period. Some of them will be used after reconstruction/upgrading.

The following components/ facilities will be reconstructed during Stage 1 (Open Pit) of the Project schedule:

- Pit drainage settling sump – reconstruction of Open Pit No 2, used currently as a water reservoir;
- Sanitary and amenity building – reconstruction of the former mine rescue team building;
- Office /administrative building – reconstruction of the former office building;
- Materials and equipment storage – reconstruction of the central storage building;
- Bund Wall No 2 – reconstruction of the existing Tailings Storage Facility (TSF) dam; and
- Core storage – reconstruction of the mobile mechanical division building.

The following shall be reconstructed at Stage 2 (Underground Mining):

- Western and Eastern Ventilation Shafts;
- Capital Shaft;
- Pithead building of the Capital Shaft, the Capital Shaft hoist building – reconstruction of the Capital Shaft surface set of facilities;
- Backfill plant – reconstruction of the ore kiln charging building; and
- Mine water treatment station.

All other facilities will be newly constructed.

Previous mining-related land disturbance has taken place in and around the complex resulting in extensive landscape degradation. There has been limited soil storage associated with past activity. Areas of soil disturbance occur, which may be substantial in some areas and soils have been eroded in areas of high disturbance.

In addition, a range of new facilities are proposed which are discussed further in Section 2.1.

### 1.7 Acid and Metalliferous Drainage (AMD)

The main geochemical issues under consideration for the Project are that of potential Acid Rock Drainage (ARD) from sulphides, arsenopyrite and arsenic (As) mobilisation potential as well as leaching of other metals.

ARD, also referred to as acid mine drainage (AMD) or metalliferous drainage, occurs when sulphide minerals, particularly pyrite (FeS2), chalcopyrite (CuFeS2) and arsenopyrite (FeAsS), oxidise on exposure to oxygen (from air) and water. Mining and extraction of sulphide-bearing minerals tends to increase the potential for ARD, with rock being broken up and thereby greatly increasing surface area of exposed sulphide minerals to accelerated weathering processes and oxidation.

Several studies have been undertaken in relation to the Project assessing ARD potential. These include:

- EGi Ltd - Geochemical Assessment of Waste Rock and Ore, Doc no: 8553/920, August 2010;
- EGi Ltd - Geochemical Assessment of Tailings, Doc no: 8553/991 March 2011;

- EGi Ltd – Project Status Summary, July 2012;
- Sample site locations Drawing;
- Polymetall Engineering JSC - Acid Neutralisation/Generation Potential of Waste Rock (sample T-357), January 2015; and
- Bakyrchik Acid Generation Report Appendices.

Several conclusions have been identified from these studies as follows:

Overall waste rock and ore findings include the following:

- The ore material is higher in S% (sulphides) than waste rock;
- 94% of waste samples were non-acid forming (NAF);
- 38% of ore samples were PAF or in the 'uncertain' acid forming range;
- All of the old WRD grab samples had low sulphur, <0.5%S, and all were NAF;
- The low proportion of potentially acid forming waste rock is likely to show a time lag of 2-6 months before start of ARD production;
- Total S can be used as an indicator of potential ARD (0.5%S cut-off NAF/PAF);
- Arsenic is elevated in almost all samples, and may be mobilised even in neutral/alkaline pH; and
- Ore material may generate acid depending on how long it is stored prior to processing. This may be a particular issue for any low grade stockpiles.

In summary the following conclusions are presented in the context of the MCRP:

- ARD is not likely to be a major issue at Kyzyl, but ongoing geochemical studies and regular monitoring are required to continually assess and update this conclusion;
- There could be a 2-6 month time lag on ARD initiation from waste rock with high enough S%;
- Ore in the ROM and Low Grade stockpiles could be ARD producing if left too long;
- High S% rock exposed in pit wall faces for extended periods may also generate acid;
- The requirement for further geochemical studies on the flotation tailings. While they are expected to have low ARD potential, there may be arsenic- and other metals leaching risk; and
- Backfilled cemented tailings and waste rock may release as after time and needs further investigation.

A comprehensive AMD management plan remains to be produced. While there are still questions outstanding on the tailings waste geochemistry, although ARD is unlikely to be an issue, conservative mitigation measures will be implemented, until such time as further geochemical studies have been completed and the ARD management plan prepared.

### 1.8 Legislative and Other Requirements

The principal legislative act governing mining activities in the Republic of Kazakhstan ("RoK") is the RoK Law on Subsoil and Subsoil use dated 24 June 2010 No. 291-IV (the "Subsoil Law").

There are also numerous Decrees of the RoK Government and orders of the ministers of (i) energy, or (ii) investment and development which regulate specific issues in subsoil use.

Mining activities are regulated through the award of mining contracts which are obtained either through competitive procedures or through direct negotiations for (i) certain RoK national companies (depending on the type of mineral according to allocation of responsibilities), or (ii) holders of the exploration right that made the commercial discovery and assessed it as confirmed by state expertise.

There are two so-called competent authorities (the "competent Authority") relevant to this facility, specifically:

1) The Ministry of Investment and Development (the "MID") regulates solid minerals contracts (formerly known as the Ministry of Industry and New Techonologies and as the Ministry of Energy and Mineral Resources); and
2) The regional akimats regulate commonly occurring minerals.

The MID also supervises the mining industry through tis subordinate, the Committee on Geology and Subsoil Use (the "Geology Committee"). The Geology Committee has regional departments called TsentrKazNedra (for central territories), Zap KazNedra (for western territories), SevKazNedra (for Northern territories), VostKazNedra (for eastern territories) and YuzhKazNedra (for southern territories).

The issues of (i) local content in goods, works, services and staff, and (ii) procurement of solid minerals subsoil users are resolved by the MID taking into consideration the view of the National Agency on Development of Local Content JSC ("NADLoC").

The mining industry in RoK is affected by the following legislative acts:

1) The RoK Tax Code dated 10 December 2008 (the "Tax Code");
2) The RoK Labour Code dated 15 May 2007;
3) The RoK Environmental Code dated 9 January 2007;
4) The RoK Land Code of RoK dated 20 June 2003 (the "Land Code");
5) The RoK Water Code of RoK dated 9 July 2003;
6) The RoK Law on Architecture, Town-Shipping and Construction Activities dated 16 July 2001;
7) The RoK Law on Permits and Notifications dated 16 May 2014;
8) The RoK Custom Code dated 30 June 2010 No.296-IV and the Customs Code of the Customs Union (Annex to the Agreement on the Customs Code of the Customs Union dated 27 November 2009 No.17) (customs issues); and
9) The Rules of Procurement of Goods, Works and Services at Performance of Subsoil Use Operations approved by the RoK Government Decree dated 14 February 2014.

Article 72 (Termination of Contract's Validity) of the Subsoil Law contains a number of grounds entitling the Competent Authority to unilaterally cancel a subsoil use right in case of violation by a subsoil user's of its obligations. Such grounds, among others, include: a subsoil user's failure to rectify more than two breaches of contractual obligations within the timeline set out by the Competent Authority (for physical obligations – six months, for financial obligations – three months, and one month for other obligations); transfer of the subsoil use right or the Objects without prior obtaining of the Consent, etc.

According to Article 111 (Liquidation and Conservation of Subsoil Use Objects) of the Subsoil Law, after the termination of subsoil use operations or the depletion of mineral resources, a subsoil user shall immediately proceed to work on the liquidation or conservation of the subsoil use objects (e.g. mines). If an urgent decision on the termination of production is required, the subsoil user must carry out a set of measures for the conservation of production units before their liquidation or conservation.

The liquidation or conservation works are carried out on the basis of a liquidation or conservation plan that has been:

(i) developed by a licensed project company,
(ii) agreed to by authorities in the fields of environmental protection, study and use of subsoil, industrial safety, sanitary-epidemiological service, land resources management, and
(iii) approved by the subsoil user, the operation is financed by the liquidation (abandonment) fund of the subsoil user and, if it is not sufficient, at the expense of the subsoil user itself.

The liquidation or conservation of subsoil use objects is considered complete after the signing of the act of acceptance by the commission established by the Competent Authority, which consists of officials in the fields of environmental protection, study and use of subsoil, industrial safety, sanitary-epidemiological service and land resources management, and by the regional local executive body.

Surface rights (known in Kazakhstan as land use rights) are separate from mining rights. According to Article 68.5 (Execution and Registration of Contract) of the Subsoil Law, if the land plot where subsoil use operations will be conducted is in the State's property, the relevant regional Akimat provides such land.

If land plots where mining is supposed to be undertaken is owned or leased by a third party (an individual or entity), the subsoil user shall conclude a relevant agreement with such owners/leaseholders. Normally, the subsoil user shall reimburse losses of agricultural activity (due to withdrawal of land plots used for agricultural activities). In certain cases subsoil users are obliged to conclude servitude contracts.

Any subsoil user is entitled to:

(i) return parts of its contracting territory, or

(ii) demand pre-scheduled termination of the subsoil use contract through court proceedings or under the grounds set out by the subsoil use contract. In both cases, the subsoil user shall preliminarily carry out relevant liquidation or conservation works.

## 1.9 International Obligations

Kazakhstan participates in the following international environmental and social conventions, which in most cases supersede domestic legislation.

- Convention on environmental impact assessment in trans-boundary context (ESPOO) – joined 31st January 1994.
- Basel Convention on control over trans-boundary shipment of dangerous waste and their disposal – signatory since 3rd June 2003; regulates trans-boundary movements of hazardous wastes and provides obligations to Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The Kyzyl project will generate hazardous wastes.
- Vienna Convention on ozone layer safety (dated 22nd March 1985) – Accession on 26th August 1998; aims to ensure global co-operation for the protection of the ozone layer. The Kyzyl project should aim to reduce or eliminate emissions of anthropogenic ozone depleting substances.
- UN/ECE Convention on long-range transboundary air pollution (December 1979).
- UN/ECE Convention on the transboundary effects of industrial accidents (Helsinki 1992).
- Montreal Protocol on ozone destructing substances – Accession on 26th August 1998.
- UNO Frame Convention on climate change – KR joined by KR Law of January 14, 2000, # 11.
- Kyoto Protocol to UNO Frame Convention on climate change – ratified on 19th June 2009; Introduces emissions targets. The Kyzyl project's emissions will count towards Kazakhstan's total emissions output.
- Rio Convention on Biological Diversity – Accession on 8th September 2008; promotes conservation of biological diversity and sustainable use of its components.
- Cartagena Protocol in biological safety to the Convention on biodiversity – Accession on 8th September 2008.
- The Agreement on Cooperation among CIS countries in the field of ecology and environmental protection (1999).
- CIS countries cooperation in the field of environmental monitoring (1999).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), or the Washington Convention (accession 2000; Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival).
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (deposited 2007; aims for the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.
- The government of Kazakhstan has ratified the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, also known as the Aarhus Convention – signatory in January 2002. The Aarhus Convention requires

the government to grant the public rights regarding access to information on the environment, including information on the environmental impacts of corporate activities, access to which is available only to the relevant environmental authority. This ecological information should be provided in advance to any affected party.

- Stockholm Convention on Persistent Organic Pollutants – signatory 2001, accession 2007; Ensure the limitation of pollution by persistent organic pollutants (POPs), the Convention defines the substances in question whilst also leaving open the possibility of adding new ones, and it also defines the rules governing reduction, importing and exporting those substances. Substances covered by this convention may potentially be used in this Project and guidance or restrictions governing these substances will be adhered to.
- Convention of European and Mediterranean organization on plant protection.
- International Labour Organisation (ILO): The project will need to employ workers and recognise these principles.
    - Convention on Forced Labour (#29, ratified 2001; adopts proposals to eliminate forced or compulsory labour);
    - Convention on Freedom of Association and Protection of the Right to Organize (#87, ratified 2000; protects the right to freedom of association and protection of the right to organise);
    - Convention on the Right to Organise and Collective Bargaining (#96, ratified 2001; determines that workers shall have protection from discrimination and interference);
    - Convention on Equal Renumeration (#100, ratified 2001; adopts proposals on the principle of equal remuneration for men and women for work of equal value);
    - *Convention on the Abolition of Forced Labour* (#105, ratified 2001; stipulates that all parties shall eliminate and will not make use of any form of compulsory forced labour;
    - Convention on Discrimination [Employment and Occupation] (#111, ratified 1999; promotes equality of opportunity and treatment in employment and occupation);
    - Convention on Minimum Age (#138, ratified 2001; pursues the abolition of child labour and increases the minimum age for admission to employment);
    - Convention on the Forms of Child Labour (#182, ratified 2003; obliges parties to take effective measures to prohibit and eliminate the worst forms of child labour).
- Other UN conventions: The project will need to employ workers and recognise these principles.
    - Convention on the Elimination of All Forms of Discrimination against Women (ratified 1998, sets out an agenda to end discrimination against women). The project will employ workers and Polymetal will need to recognise the requirements for gender equality in the Project's HR policy and recruitment process.
    - Convention on the Political Rights of Women (ratified 1999, gives women the right to vote or hold office, as established by national law, on equal terms with men and without discrimination on the basis of sex);
    - Convention on the Rights of Persons with Disabilities (ratified 2006, promotes non-discrimination and equality of opportunity);

- Convention to Suppress the Slave Trade and Slavery (ratified 2008, undertakes to prevent and suppress the slave trade and to progressively bring about the complete elimination of slavery in all its forms);
- Convention for the Suppression of the Traffic in Persons and of the Exploitation of the Prostitution of Others (ratified 2005, requires state signatories to punish any person who "procures, entices, or leads away, for the purposes of prostitution, another person, even with the consent of that person" and/or "exploits the prostitution of another person, even with the consent of that person");
- International Covenant on Economic, Social, and Cultural Rights (ratified 2006, promotes equal rights of men and women to enjoy all economic, social, and cultural rights);
- Convention against Torture and Other Cruel, Inhuman, or Degrading Treatment or Punishment (ratified 2008, requires states to take effective measures to prevent torture within their borders, and forbids states to transport people to any country where there is reason to believe they will be tortured;
- UNICEF Convention on the Rights of the Child (ratified 1994, a human rights treaty setting out the civil, political, economic, social, health, and cultural rights of children);
- International Convention on the Elimination of All Forms of Racial Discrimination (ratified 1998, undertakes to eliminate racial discrimination in all its forms and promotes understanding);
- UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (ratified 1972, acceptance 1994; confirms the protection and preservation of the world's cultural and natural heritage);
- UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (ratified 2011; Purposes are to safeguard intangible cultural heritage, ensure respect for the tangible cultural heritage of the communities, groups, and individuals concerned; to raise awareness at the local, national, international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof.

### *1.9.1 Expectations of Good International Industry Practice Relating to Mine Closure*

The International Finance Corporation (IFC) Performance Standards (PSs), IFC/ World Bank Group (WBG) General Environmental, Health and Safety (EHS) Guidelines, and the European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy and Performance Requirements contain little detail on mine closure, although the IFC/ WBG Mining EHS Guidelines contain a short discussion on the issue. The International Council on Mining and Metals (ICMM), the international mining industry's CEO-led association for developing and disseminating sustainable development best practice in the industry, has produced best practice guidance for closure planning and funding. It is recommended that the development of the Project's closure planning follows the guidance of the ICMM document, *Planning for Integrated Mine Closure*, which contains a comprehensive and easy to use tool-kit to ensure mine closure planning meets the expectations/ requirements of international best practice. Expectations for best practice mine closure are summarised in Table 1.

**Table 1: Generic International Best Practice Expectations Relating to Mine Closure and Post-closure Planning (adapted from IFC/WBG EHS Guidelines for Mining and ICMM documents).**

**Timing**

- **At the outset:**
  - Should be considered as early in the planning and design stages as possible;
  - A draft plan should be prepared prior to the start of production;
  - For short life mines a fully detailed plan with guaranteed funding should be prepared prior to the start of operations.
- **Finalising the plan:**
  - Should be site specific and depends on many factors, such as potential mine life;
  - All sites require some form of active restoration during operations;
  - Plans to be modified, as necessary, during the project construction and operational phases, but should include contingencies for the temporary suspension of activities and permanent early closure, which should meet the objectives of financial feasibility and environmental integrity (outlined below).

**Socio-economic considerations**

Incorporate both physical rehabilitation and socio-economic considerations as an integral part of the project life cycle so that:

- Future public health and safety are not compromised;
- Site after-use is beneficial and sustainable for the affected communities for the long term;
- Adverse socio-economic impacts are minimized and socio-economic benefits maximized;
- Site-related cultural aspects are incorporated into planning.

**Consultation**

- Address beneficial land use, which should be determined using multi-stakeholder processes that include regulatory agencies, local communities, traditional land users, adjacent leaseholders, civil society and other impacted parties;
- The plan should be previously approved by the relevant national authorities;
- The plan should result from consultation and dialogue with local communities and their government representatives.

**Process**

- Update regularly and refine to reflect changes in mine development and operational planning, as well as changes in environmental, socio-economic conditions and circumstances, and the regulatory environment;
- Maintain records of the mine works as part of the post-closure plan.

**Aftercare and Monitoring**

- Include appropriate aftercare and requirements for continued monitoring of the site, pollutant emissions and related potential impacts;
- Duration of post-closure monitoring should be defined on a risk basis; however, it typically requires a minimum period of five years after closure.

**Financial Feasibility**

- Estimated closure and post-closure costs, including aftercare and monitoring, should be included in the business feasibility analyses during the project's planning and design stages;
- As a minimum the availability of funds should cover all the costs of closure and aftercare commitments at any stage in the mine life cycle, including a provision for early or temporary closure;
- Closure funding requirements should be reviewed annually and the funding arrangements adjusted to reflect any changes.

**Physical integrity**

- All permanent structures should remain stable so as not to impose an environmental or a public health and safety hazard resulting from physical failure or deterioration;

| |
|---|
| • Tailings structures should be decommissioned so as to minimize water accumulation on the surface, allowing such waters to drain readily and enabling these drainage structures to cope with the maximum probable flood event;<br>• Drainage structures (spillways, drains, diversion ditches) must continue to be maintained as required after closure (they are easily blocked during storm events);<br>• Structures should not erode or move from their intended location under extreme events or perpetual disruptive forces;<br>• Unguarded roads, shafts and other openings should be effectively and permanently blocked from all access to the public, pending conversion to a new land use based on changed conditions at the site while allowing for such maintenance and wildlife access as deemed necessary;<br>• Passive venting systems should be considered where there is a risk of methane emanating from disused mine workings. |
| **Chemical integrity**<br>• Surface and ground waters should be protected against adverse environmental impacts resulting from mining and processing activities;<br>• Leaching of chemicals into the environment should be prevented so as to avoid endangering public health or safety or exceeding water quality objectives in surface or ground water systems. |
| **Ecological integrity**<br>• This is partially determined by implementation of the above factors, but importantly includes the requirement for habitat restoration that is ecologically beneficial;<br>• The plan should contain comprehensive measures for active ecological restoration of mine workings during the operational phase, according to a plan approved by the relevant regulatory authorities;<br>• Such planning should also include the participation of local government and communities. |
| **Connectivity**<br>• Consider/ encourage forward-thinking approaches to environmental restoration that provide socio-economic opportunities and vice versa;<br>• Integrate closure and rehabilitation thinking beyond the confines of the site with respect to physical and cultural linkage with the surrounding environment and communities. |

### *1.9.2 Stakeholder and Community Involvement*

It is accepted good practice that the views of stakeholders and local communities will be considered and debated in the formulation of MCRPs. It is expected that this should ensure that there is:

- Disclosure of information regarding plans for closure and retrenchment of the workforce;
- Disclosure of information regarding the assessment of closure related impacts; and
- Consultation on environmental and social rehabilitation measures.

To minimise employee uncertainty and community disruption, community engagement and development activities, as well as measures taken to improve the ecological state of the Project site, should be formalised and continue throughout the life of mine (as the equivalent of “active restoration” in ecological terms), the aim being to build community resilience to mine closure.

## 1.10 Corporate Drivers

The Polymetal environmental and health and safety policies state:

"Environmental protection tailored to the nature and extent of the Company's footprint is one of our top priorities, extending to all stages of management, design and implementation of the mining and processing of gold and silver-bearing ores, and production of gold and silver. The Company systematically improves the efficiency of its existing environmental management systems and ensures continuous improvement of its environmental protection activities. The Company applies, wherever possible, the most modern technology, equipment and work practices that minimise the impact on the environment. In course of its operational activity, the Company ensures compliance of its operations with the regulatory requirements of environmental law, as well as other with requirements related to its environmental aspects, to which it has adhered. The Company tackles environmental safety and environmental management issues in a systematic and comprehensive manner, creating the foundation for the establishment and analysis of environmental objectives and targets."

"The Company uses best management practices to address the nature and scope of health and safety risks that our employees are facing. The Company consistently enhances the effectiveness of the Health and Safety Management System in place and ensures continuous improvement of its health and safety procedures. The Company aims to constantly reduce possible health risks related to its employees and takes measures to prevent work-related injuries. In the course of its business the Company complies with the health and safety legislation requirements. The Company tackles health and safety issues in a systematic and comprehensive manner."

The 2013-2014 Sustainability Report states:
"We have developed a robust environmental management system (EMS) that complies with increasingly sophisticated national and international standards and regulations. This system is overseen by dedicated environmental teams, and focuses on resource and energy efficiency, pollution prevention, use of modern equipment and technologies and employee engagement."

"Polymetal's overall approach to sustainability is guided by the UN Global Compact, to which the Company has been a signatory since 2009. Our strategy is designed to meet the requirements of this voluntary international standard and ensure compliance with its ten principles in the areas of human rights, labour, environment and anti-corruption. We are also an active member of the UK Global Compact Network Russia.

## 1.11 Approach to Closure

### *1.11.1 Target Closure Outcome and Goals*

Based on the generic principles of mine closure good practice, this MCRP sets out the target closure outcome and related closure goals to allow the Project's development to proceed in a manner that does not inadvertently disadvantage Polymetal's later ability to minimise social, environmental and economic liabilities and instil sustainable benefits beyond closure. The target closure outcome must be based on local community and government buy-in. This is likely to require stakeholder and community engagement to develop a closure vision that meets both company and community perspectives of the future. The provisional target outcome for this framework MCRP is to:

Ensure that when mining ends, the post-closure landscape will be safe for people, livestock and wildlife with ecological integrity restored.

This will be further refined during the life of mine according to the processes and procedures outlined in this plan. This target outcome will be met by delivering the generic closure goals outlined below:

- Ensure no net loss of biodiversity and minimize long term impacts on ecosystem services provided to local people;
- Meet statutory rehabilitation criteria established by the Kazakhstan authorities in order to successfully relinquish the site;
- Minimise future liability for Polymetal associated with the closed project site;
- Initiate a process of continuous and adaptive planning and management regarding closure and rehabilitation of the Project site, including:
    - Active rehabilitation during operations where possible;
    - Designing facilities that are compatible with the target closure outcome and goals;
    - Developing preliminary closure and rehabilitation schedules and costs;
    - Creating preliminary post-closure landform designs and rehabilitation plans, including removal of plant and equipment and the stabilisation and treatment of contaminated land and waters, waste dumps and pits;
    - Producing a management plan for execution of closure and rehabilitation activities;
    - Identifying the skillsets and related resources required for executing the MCRP; and
    - Developing a preliminary post-closure monitoring and aftercare programme.
- Inform stakeholders of the closure expectations of international best practice and national requirements and discuss how the Project closure outcome and goals, and the strategies for meeting them, comply with these expectations;
- Restore ecological integrity of the post-closure landscape by appropriate, early research into restoring the natural vegetation;
- Consider and evaluate potential alternative end uses for the Project;
- Provide a preliminary closure and rehabilitation design to support the feasibility study; and

- Develop a realistic closure and rehabilitation cost estimate based on the framework MCRP, industry best practice, and relevant national and international obligations.

The proposed Project provides an opportunity to deliver a substantial environmental and community benefit in reclaiming and rehabilitating the extensive disturbance and environmental impacts resulting from previous mining activities at the site, at little extra cost over the life of mine, providing a net positive impact on closure, assuming good practice techniques are followed throughout.
This plan encourages a "design and mine for closure" approach that will ensure that the design of infrastructure, methods and processes and their subsequent realisation will seriously consider and deliver the final landform, ecological integrity and socio-economic benefits. Processes of active restoration and on-going community development activities from the start of the Project will ensure that ecological integrity and community resilience is built prior to the closure phase being reached, while reducing final closure costs.

Many Project details are not final at this early stage in the life of the mine, therefore this MCRP has been prepared based on anticipated conditions at the end of the mine's operational life. The MCRP is intended as a foundation for regular review and development to enable increasing detail to be included and to account for adaptation to changing conditions during the life of mine.

### 1.12 Risk/ Opportunity Assessment

All closure planning should consider the risks and opportunities presented and develop actions based on sound knowledge of these risks/ opportunities, identifying the potential issues that could elevate the risk of undesirable closure outcomes and/or reduce the likelihood of beneficial opportunities being realized.

According to ICMM's Planning for Integrated Mine Closure: Toolkit, a structured risk/ opportunity assessment process should:

- Minimize the negative consequences of closure;
- Maximize the positive benefits of closure;
- Minimize the likelihood that closure goals are not met; and
- Maximize the likelihood that opportunities for lasting benefits are captured.

Six types of risk are identified and are listed below in no particular order:

- Health and safety;
- Natural environment, including biodiversity and ecological issues;
- Social;
- Reputational;
- Legal; and
- Financial.

These types of risk should be noted as risk factors that require control and monitoring during the closure planning process and in future versions of this MCRP.

## 1.13 Generic Approaches

### *1.13.1 Approach to Surface Infrastructure Decommissioning, Demolition and Reclamation*

Surface infrastructure will be decommissioned, demolished and reclaimed according to the following generic processes:

- Potential post-closure after-uses of buildings or other infrastructure by local communities will be determined;
- All infrastructure sites will be inspected to identify and record any hazardous materials and building materials that could be salvaged and have scrap value;
- All hazardous and/or recyclable materials should be removed from the surface infrastructure and be transported off-site or be collected by an approved contractor for appropriate disposal or re-use;
- Surface infrastructure will be demolished by machinery or explosives and then loaded for removal using mainly ex-mining equipment/ machinery;
- Surface infrastructure will be removed to a depth of 1 m below ground level. Sub-surface structures will be backfilled or sealed off;
- Foundations not affected by deterioration or contamination may be retained for future use (if this has been identified) or broken up and buried to a minimum depth of one metre;
- During closure, should any structure or item have intrinsic value other than its scrap value, this will be recovered as long as the total rehabilitation cost is not increased. This option can only be evaluated at closure and possible returns arising from salvage or scrap are not included in this plan;
- The following key infrastructure components will be removed unless a post-closure re-use can be found:
    - Roads;
    - Ore processing plant;
    - Water supply infrastructure;
    - Pipelines;
    - Onsite power supply;
    - Communications;
    - Domestic & sanitary wastes.

All of the above will be removed, ripped and revegetated;

### *1.13.2 Approach to Surface Rehabilitation and Restoration*

The rehabilitation and restoration of the surface will involve the general activities introduced below:

- Ensure that the final post-closure landscape forms and features will integrate and be compatible with the surrounding natural topography and land use patterns;
- Restore as much of the Project footprint as possible to be consistent with the identified post-closure land uses;
- Design for closure to minimize slope instability, soil erosion, dust and sedimentation;
- Provide a safe and stable final structure and ensure long-term physical and chemical environmental stability. Plan and ultimately manage groundwater rebound;
- Re-profile site topographies to the final, post-closure landforms, including surface levelling and backfilling as appropriate;
- Restore natural drainage patterns, which may require accommodating any new landform structures;
- Restore the site to allow for proposed future land use by means of ground preparation and revegetation of stabilised land surfaces and adequate provision for aftercare and monitoring; and
- Stabilise the site with a self-sustaining vegetation cover and to (as a minimum) restore biodiversity.

### *1.13.3 Approach to Social Closure and Community Issues*

As with actively managed ecological restoration during the mine life leading to better overall results at a lower ultimate cost, ongoing community development and stakeholder consultation will build resilience in the community and its people so that they can adapt to the inevitable closure of the mine. Key to this is regular, two-way consultation between the mining company and the community and other stakeholders. Ideally, community participation should lead to shared decision making with respect to closure related issues.

The mine will be a major local employer in the region, so it is probable that after mine closure the local population will decline markedly. In such circumstances, beneficial closure outcomes can still be delivered by focusing on the development of individuals so that they can take their skills and knowledge with them. This will be enabled by Polymetal working with and strengthening local community institutions and capacity building. Social and community closure-related activities should also be based on such an approach.

## 2 ASSUMPTIONS

The following assumptions have been made in developing this framework MCRP:

- Polymetal will develop and operate the Project according to good international industry practice, such as ICMM, the IFC PSs and the EBRD PRs;

- Full site closure will occur on completion of the 2nd Stage Underground Mining following the 1st stage Open Pit Mining;
- No hazardous materials (excluding fuel, solvents and reagents associated with mineral processing, site maintenance, water treatment and fuelling stations or chemicals for on-site assay tests) will be used on site that would create problematic conditions for closure or require specially designed closure units;
- Safe pit slopes will be developed during mining by standard engineering techniques;
- Although large areas of the Project area have been extensively disturbed, there are some sensitive receptors that include surface water features, aquifers and the local communities;
- Prior to developing mining and related activities, soil-forming materials (topsoil and subsoil) will be stripped and stockpiled and managed according to best practice for re-use during revegetation activities;
- The hazardous surface infrastructure that remains following closure, such as the TSF and waste rock dumps have a low pollution potential and therefore present little risk of significant contamination post closure;
- Following closure, most on-site buildings and structures are expected to be removed;
- A detailed description of the mining operations for the life of mine will be provided in subsequent updates of the MCRP, which will include the following:
  - Type and method of mining and number of hectares directly affected annually with impacts;
  - Overburden and mineral removal plan and production by tonnage; and
  - Major equipment to be used.
- Revegetation research will be carried out during the life of the Project to enable enhanced success on closure while reducing related overall costs;

  ARD is not likely to be a major issue at Kyzyl during the open pit mining phase, but ongoing geochemical studies and regular monitoring are required to continually assess and update this conclusion. An AMD Management Plan will be produced that shall inform the development of appropriate management and closure activities;
- There will be sufficient material stockpiled during operations or available within the mining licence areas to provide suitable and appropriate quantities of cover materials for all affected areas during closure and rehabilitation. Growth media retained for restoration will be handled and managed according to best practice and stored to enable easy access when required;
- The cost estimate has assumed that mining equipment available during the active mining operations would be utilized for closure activities supplemented as needed with specialised equipment for activities such as revegetation;
- The closure process is assumed to include the removal and salvage of mining equipment, materials, structures and infrastructure (including rehabilitation of access roads and tracks) and revegetation, leaving only the features and/or facilities required for site access for purposes of on-going monitoring, or to satisfy yet to be determined post-closure uses;
- The financial value of the salvage value of the mine equipment and key infrastructure facilities has not been included in this cost estimate; and

- Polymetal will institute appropriate community development activities during the life of the mine that will assist in off-setting some of the socio-economic mine closure impacts.

The above should be reviewed and updated during the periodic reviews of the MCRP during the life of mine.

## 2.1 Project Components, Closure and Rehabilitation

The Kyzyl Project will be developed in two stages, Stage 1 includes development of the open pit including waste dumps and ore stockpile from 2016 – 2026, and Stage 2 from 2026 scheduled to 2039 including development of underground facilities from the base of the open pit starting in central and western areas, followed by eastern area development.

These stages consist of the following major components:

Stage 1 Open Pit

- Material storage facilities:
  - Ore stockpile (buffer);
  - Topsoil storage; and
  - Waste dump.
- Ore preparation facilities:
  - Crushing plant and conveyor;
  - Process plant;
  - Tailings thickener;
  - Recycle water tank;
  - Laboratory; and
  - Concentrate storage.
- Tailings storage facility.
- Supporting infrastructure:
  - Heat and power supply facilities;
  - Utility facilities (Pump houses with water tanks);
  - Office and amenity block;
  - Access and support roads;
  - By-pass road (Bursak);
  - Fuel and lubricant storage and unloading;
  - Explosives area (ammonium nitrate);
  - Explosives laboratory;
  - Security and firefighting facilities;
  - Repair and maintenance facilities;
  - Reagent Storage facility; and
  - Sewage treatment Plant.

Stage 2 Underground Mining

- Components include:
  - Five vertical shafts;
  - Ventilation shafts and fan systems;
  - Paste backfill plant;
  - Surge tank;
  - Pit head buildings; and
  - Cement silos.

The proposed site layout is provided in Drawing 1.2.

## 2.2 Kyzyl Project Closure Activities

The Kyzyl Project MCRP includes all the facilities, such as the open pit, underground mine, ore processing facilities, tailings management system, waste dumps, carbon product storage, topsoil stockpile, water management and ancillary facilities, such as power facilities, workshops, access roads and other facilities/site infrastructure.

Issues to be considered during the closure planning stages of mining at Kyzyl include:

- Hydrological;
- Hydrogeological;
- Contamination;
- Health and safety and worker and public safety;
- Community and social; and
- Sustainable structural integrity.

These are discussed in association with the principal closure activities as follows:

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| Open Pit | The open pit is located in the northern part of the allocated Project land, covering an area of 128.7ha. Overburden stripped during the open pit construction will be hauled to the waste dump. Some overburden may be used for construction of the main and auxiliary facilities, such as tailings storage facility, roads, etc. These operations will take two years (from the second half of 2016 to the first half of 2018) and comprise approximately 40 million m3 rock mass.<br><br>The in-pit sumps are to continue removal of water from the pit during the entire underground mining period. After this time, it is planned that a pit lake will be formed in the deep portion of the pit due to inflow of groundwater and precipitation into the mined void. The key Kyzyl pit lake parameters will be as follows: water surface elevation - 380m; water surface area – 1 150 000m2; maximum lake depth - 320m; volume - 118 million m3.<br>The pit area to be ponded is 115ha and to be self-revegetated is 24ha. According to preliminary predictions, pit ponding by streams, groundwater and precipitation, will take more than 35 years after completion of the underground mining. | Key issues associated with closing the open pit are:<br>• Slope failure causing a safety hazard;<br>• Access to the lake causing a safety hazard;<br>• Wind-blown dust; and<br>• Potential for AMD generation. | The rehabilitation of the pit involves creation of a pit lake that takes place after the underground mining of ore reserves is completed and the removal of the in-pit sumps with dewatering pumps. Pit walls will be profiled if required to ensure a stable land form at closure.<br>Rehabilitation includes restoration of disturbed land and surface terrain through natural and active revegetation. This will prevent dust generation and assist with a final restored structure that fits in with the surrounding environment.<br>Warning signs will be placed at 150m intervals.<br>Further work will be undertaken during the life of mine to determine the groundwater quality at closure and to develop appropriate mitigation/treatment methods. |
| Underground Mine | Underground mining will commence upon completion of open pit mining at the Kyzyl deposit. The gold | Key issues associated with closing the underground mine are: | In order to successfully extract the ore drifts, a cemented tailings paste backfill system has been selected for completion of backfilling |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | mineralization is spatially divided into three areas for underground mining: Western, Central and Eastern areas.<br>The existing underground infrastructure includes five vertical shafts; these are the Skip Shaft, Capital Shaft, Central Ventilation Shaft, East Ventilation Shaft, and West Ventilation Shaft.<br>The Kyzyl Project deposit proposes using a cut and fill methodology. This method is proposed based on the geometry of the ore body, ground conditions, and to maximise high gold recovery. | • Ground subsidence causing a safety hazard;<br>• Potential public safety hazards and contamination risk resulting from infrastructure that is not removed; and<br>• Potential for AMD generation. | activities. A paste backfill plant will be constructed on the surface in the existing fine ore building. The surge tank and cement silos are to be located outdoors close to that building.<br>Tight backfilling of all ore drifts will be necessary to limit unravelling of the rock mass. Filling operations will need to be strictly controlled in order to permit safe extraction below previously mined-out areas. The closure costs associated with backfilling operations is included within the CAPEX and OPEX for the site.<br>Other closure activities will involve closure of mine shafts/ventilation shafts/fan systems, dismantling of pit head buildings, dismantling of all other equipment and buildings, removal and disposal/recycling.<br>Further work will be required during the life of mine to determine the groundwater quality at closure and to develop appropriate mitigation /treatment methods. |
| **Material Storage Facilities** | | | |
| Waste Dump | The overburden dump is located in close proximity to the open pit. Water drainage and diversion ditches will be constructed along the dump perimeter to collect contaminated runoff from the overburden dump area in settling sumps. The levelled overburden dump surface will be sloped along the outside perimeter towards the open pit to prevent ponding of surface rain and melt waters.<br>The total area of the land occupied by the waste rock dump is 390ha.<br>At the final stage of mine development, the waste rock dump will have the following parameters: | Key issues associated with closing waste rock dumps are:<br>• Slope failure and internal instability causing a safety hazard;<br>• Wind-blown dust;<br>• Surface water run-off mobilising and depositing sediments, which may be potentially contaminating, including high sediment loads in storm water discharges to natural and man-made water courses;<br>• Visual impact;<br>• Potential for AMD generation; and | The following provides a list of activities that will be required at closure:<br>• Topsoil removal prior to TSF construction, loading and delivery to temporary stockpiles;<br>• Rough and final surface grading, slope minimisation;<br>• Removal of process installations and construction debris from the rehabilitated area;<br>• Maintaining facilities until the rehabilitated land is transferred to a land user;<br>• Topsoil application to surfaces of rehabilitated TSF;<br>• Conduct detailed AMD assessments of potential and existing waste rock materials to determine the related risk of AMD generation. Benign rock- |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | • Maximal height - 105m (first tier - 55m, second tier - 50m);<br>• Minimal width of safety berms - 20m;<br>• Slope angle of each tier – 340;<br>• Maximal length – 3500m;<br>• Maximal width – 1500m; and<br>• area - 390ha.<br>Confirmation is required whether it is planned to construct the TSF and on-site roads from waste rock from the mine. These proposals will also need to be included in future iterations of this MCRP and to consider ARD management of these materials. | • Metalliferous drainage – neutral and/or acidic. | types to be back-filled or deposited at surface;<br>• Carry out revegetation research during the life of mine to determine optimal revegetation strategies;<br>• Re-profile dumps to the surrounding topographic shapes and gradients, ideally designing these in advance to minimise secondary handling at closure. Re-grade to allow adequate surface run-off;<br>• Carry out active restoration where feasible;<br>• Apply cover layer/cap (depending on the results of the AMD assessment) of soil-forming materials over the slopes, catch benches and top surfaces according to the thicknesses determined by the ecological restoration research programme;<br>• Revegetate accordingly; and monitor surface run-off and sub-surface seepage for physical and chemical parameters, including AMD and other contaminants. |
| Topsoil Storage | The existing topsoil will be stripped from the site surface and stacked in a designated storage area prior to commencement of construction for further use in landscaping of the Project site facilities and, after implementation of engineering solutions within the special closure plans, developed for the Project as a whole and individual facilities, for recultivation of disturbed lands. | Erosion of soil resulting in loss of nutrients, soil structure and quality. | Soil materials (topsoil and subsoil) should be collected and stored separately, according to good practice, and protected from erosion before being replaced. Alternative methods of soil placement are possible, such as loose-tipping, that reduces compact (and therefore costs) and, ultimately, restoration success. The application of chemical fertilisers is not considered good practice. Consider the formation of substitute soil-forming materials from benign minerals wastes and existing organic wastes.<br>Provide on-going monitoring and evaluation of the success, or otherwise, of existing restoration, using the outcomes from this |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | | | monitoring to inform future restoration practices. |
| Carbon Product Storage | The ores at Kyzyl are classified as low-grade and low-sulphide by their composition and textural features. They are not uniform in oxidation.<br>The gold is disseminated in sulphide minerals, primarily in arsenopyrite and pyrite. The main detrimental ore components are organic carbon and arsenic.<br>The carbon concentrate storage will represent a 15m high single-tier stack, formed on the prepared waterproof liner, using a top-down approach, by truck dumping of carbon product with subsequent bulldozer levelling of the surface.<br>At the final stage of mine development at Kyzyl, the carbon product stockpile will have the following morphometric parameters:<br>• Number of tiers - 1;<br>• Maximal tier height - 15m;<br>• Tier slope angle – 270;<br>• Maximal length – 490m;<br>• Maximal width – 140m; and<br>• Area - 5.6ha. | Key issues associated with closing the Carbon Product Storage facility:<br>• Slope failure and internal instability causing a safety hazard;<br>• Wind-blown dust;<br>• Surface water run-off mobilising and depositing sediments, which may be potentially contaminating, including high sediment loads in storm water discharges to natural and man-made water courses;<br>• Visual impact;<br>• Potential for AMD generation; and<br>• Metalliferous drainage – neutral and/or acidic. | The rehabilitation scope of work for the carbon product storage includes the following measures:<br>• Grading of the carbon product stockpile surface by a bulldozer;<br>• Application of 10-20 cm thick clay layer onto the graded stockpile surface and compaction;<br>• Placement of a geonet onto stockpile slopes to prevent surface slipping and to enhance the protective clay layer; and<br>• Filling the geonet cells with clay material and compaction.<br>The settling pond is designed for rough clarification of the run-off from the carbon product storage. The main drainage gradient will be towards the drainage settling sump of the carbon concentrate storage.<br>Surface grading shall minimise impacts of the carbon product storage on the environment relating to wind and water erosion. |
| TSF | Flotation tails from the plant will be disposed of at the new TSF. The dam will be constructed in four stages. The starter dam will be 20 m high. The second, third, and fourth-stage expansions will be 5 meter high each and will be filled from the side of downstream slope of the dam. The design of the containment dam is predetermined by the availability of local construction materials, as | Key issues associated with closing the TSF are:<br>• Stabilising the outer embankment slopes and surface capping layer to minimise topsoil loss and prevent gully erosion;<br>• Consolidation of the tailings mass prior to capping;<br>• Potential seepage or minor release through the TSF embankments leading to | The following provides a list of activities that will be required at closure:<br>• Tailings will be deposited during operations to approach the anticipated final top surface geometry at closure;<br>• Penstocks will be sealed and all delivery pipes, pumps and related infrastructure will be removed for appropriate after-use or disposal;<br>• The settling pond will be removed from the TSF area. Pond water will be discharged |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | well as by environmental and economic circumstances. The maximum total height of the tailings dam after all expansions will be 35m.<br><br>After ceasing operations, the TSF is subject to reclamation. Reclamation activities are aimed to eliminate environmental pollution after the TSF has been closed.<br>After water has been completely discharged from the tailings pond and groundwater level has become lower in tailings mass, the actions are taken to eliminate surface erosion, prevent dust emissions from tailings, and ensure their integrity. | contamination of surface water courses; and<br>• Potential seepage through the TSF liner leading to groundwater contamination.<br>Actively managed restoration of the TSF is required to meet the closure requirements of slope stabilisation and revegetation. Active closure and rehabilitation activities are likely to continue for up to five years after decommissioning, with monitoring and passive maintenance continuing for a further five to six years. Determination of this period will be finalised during the life of mine. | into a receiving water body during flood periods. The water discharged from the tailings pond is mixed with clean surface water and diluted;<br>• The tailings impoundment is designed to have a 1.5 mm thick polyethylene film liner.<br>• Once the TSF has dried sufficiently, it will be re-profiled to achieve the final design geometry;<br>• The tailings mass may need consolidation by the installation of granular drainage layers and vertical drains;<br>• A water diversion ditch is established in the TSF area to provide for discharge of precipitation fallen within the TSF area into the tributary of the Alaigyr creek. The TSF area is graded so as to be sloped to the water diversion ditch. The graded surface is covered with a 0.2m thick fertile and potentially fertile soil layer; and<br>• The graded area will be self-revegetated with trees and shrubs. The stream diversion channel, water diversion ditch and cut-off drains will continue functioning.<br>The degree and extent of surrounding soil and groundwater contamination will be assessed and a soil/groundwater remediation strategy will be developed as necessary according to best practice.<br>Rehabilitation of the TSF will involve covering with an engineered capping system and subsequently revegetating the topsoil layer to produce a final, stabilised ground cover. The capping system will be designed to produce a domed structure to enhance and control run-off, establish an appropriate vegetation cover, minimise infiltration of precipitation by |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | | | shedding surface water down gradient of the TSF; control wind and water erosion of the embankments and surfaces; and reduce the potential for AMD by minimising the percolation of oxygen and water. |
| **Ore Processing and Related Facilities** | | | |
| | The following facilities are designed to fit within a single block in the south-eastern part of the Kyzyl deposit: ore processing facilities, offices and amenities block, repair and maintenance facilities, utilities, heat and power supply and storage facilities (except explosives storage), ammonium nitrate storage, and the pump house with water tanks for household and drinking water supply and boiler house of Auezov Town, This site is outside water protection/buffer areas, blast-induced fly-rock danger zones, and the hazard zone of the explosives storage site.<br>The comminution plant includes the following buildings and facilities:<br>• Primary crushing station;<br>• Two conveyors; and<br>• Crushed ore stockpile with a reclaim tunnel.<br>Other processes include:<br>• Grinding, Carbon and Intermediate Flotation;<br>• Sulphide Flotation;<br>• Gravity Separation of the Combined Sulphide Concentrate;<br>• Dewatering of Process Streams;<br>• Flotation Tailings Thickening;<br>• Carbon Product Thickening; | Key issues associated with closing the ore processing plant and related facilities are:<br>• Potential soil contamination around the plant and related infrastructure from hydrocarbons and processing reagents beneath the plant, in plant rubble and other related (e.g. storage) facilities;<br>• Cyanide contamination, which is a particular risk and human hazard; and<br>• Worker/public safety hazards from structures that have not been removed. | The following provides a list of activities that are likely to be required at closure:<br>• Assess degree and extent of contaminated land in the footprint of the plant and its surroundings;<br>• Remove hydrocarbons, reagents and other raw materials from buildings and return to suppliers or dispose of appropriately according to regulatory requirements;<br>• Flush and drain pipework ensuring all material is removed;<br>• Decommission and decontaminate cyanide equipment according to ICMC guidelines;<br>• Remove items of equipment with resale value, e.g. crushers, mills, etc.;<br>• Decontaminate building materials exposed to hazardous chemicals by washing, sand blasting or chemical decontamination, as appropriate. Dispose of wash water in accordance with regulatory requirements;<br>• Demolish infrastructure; and<br>• Treat contaminated soils as required and according to best practice. |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | • Sulphide Concentrate Thickening ;<br>• Sulphide Concentrate Handling; and<br>• Sulphide Concentrate Thickening.<br>The Run of Mine (ROM) ore stockpile will be located adjacent to the process plant. The maximum stockpile capacity is 115,000m³.<br>The construction of the stockpile will include a 0.5m waterproof liner and 1.75m aggregate layer. | | |
| **Mine Site Infrastructure** | | | |
| | The following infrastructure components will require removal and rehabilitation at the cessation of mining and processing operations:<br>• Accommodation blocks;<br>• Administration blocks;<br>• Security fencing, extending around the perimeter of the complex;<br>• Sewerage facility;<br>• Workshops, including mechanical maintenance and electrical workshops;<br>• Storage facilities;<br>• Fuel station and storage;<br>• Parking and heavy plant areas;<br>• Ore stockpile areas;<br>• Explosives storage area; and<br>• Electricity substations. | Key issues associated with removal of the mine infrastructure are:<br>• Potential soil contamination around and beneath the sites in question;<br>• Potential groundwater contamination around and beneath the site;<br>• Potential worker/ public safety hazards resulting from infrastructure that is not removed; and<br>• Potential future use of mine buildings or other infrastructure after closure. | The following activities associated with infrastructure will be undertaken at the cessation of mining and processing operations:<br>• During the life of mine, explore and confirm whether infrastructure can be used by a third party after closure. If so, ensure that the infrastructure component is safe and that appropriate contracts controlling the hand-over of liability are in place;<br>• Remove items of resale value. If there is no value, consider whether a local contractor will remove items at no cost;<br>• Return fuels and chemicals to suppliers or arrange for their disposal according to national legislation;<br>• Remove underground storage tanks and clean for re-use or recycle;<br>• Demolish surface infrastructure and remove for reuse or salvage, or bury inert material;<br>• Identify areas of soil contamination and remediate as required; |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | | | • Rip to reduce areas of compaction; and<br>• Landscape to a suitable topography and revegetate; and remove security fencing in areas where it is no longer required, for reuse or salvage and bury inert materials.<br>Demolition of buildings and structures will be carried out according to a demolition/closure project for the entire mine or for individual production facilities.<br>After the demolition of buildings and structures, rough and final grading of the surface will be performed to form the slopes that are close to natural flow slopes. Final grading will employ the stockpiled topsoil, which is to be removed during earthworks for the Kyzyl mine site planning.<br>Some open earth ditches will be considered to prevent surface water ponding.<br>Existing mine roads will be used for access to rehabilitated sites.<br>Mine engineering rehabilitation of disturbed lands will employ mainly the equipment, which is used during the open pit operation. |
| **Utilities** | | | |
| | Utilities to be included within the closure plan for the project consists of roads, pipelines and power lines. This includes roads, water supply infrastructure including industrial water and potable water pipework and pumping stations, on-site power infrastructure, waste water pipelines and effluents, and monitoring wells and exploration boreholes that are no longer in use. | The main issue associated with removal of infrastructure is likely to relate to the possible continued use of roads and power infrastructure by local people post closure.<br>Monitoring wells and pipelines can act as pathways for the mobilisation of contaminants if left in situ. | • Roads: maintain roads for access during the early years of the closure and rehabilitation phase. Some roads will be required for access for post-closure monitoring and aftercare activities. When a road is no longer required, where there is no beneficial post-closure use to the community identified, regrade, rip and revegetate;<br>• On-site power infrastructure: power lines constructed as part of the Project will be dismantled and removed where there is no beneficial post-closure use to the community. Once no longer required, dismantle the |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | | | substation, salvage and reclaim. All cables and pylons will be removed. Concrete slabs will be broken up, taken off site or buried in an appropriate manner;<br>• Water supply infrastructure including industrial water and potable water pipework and pumping stations shall be removed. Pipelines for potable and industrial water and effluents shall be removed. In particular, surface and shallow pipes shall be removed, cleaned and re-used or recycled. Pipes at depth shall be plugged. Land surface to be restored and revegetated; and<br>• Monitoring wells and exploration boreholes that are no longer in use should be backfilled or capped. |
| **Other Raw Materials** | | | |
| | The fuel and lubricants storage site will be 200m north-west of the processing facilities. The site has its own storm water treatment facilities, where polluted runoff from all over the storage area is collected and treated.<br>The ammonium nitrate storage will be in the north-eastern part of the allocated land, 400m from the dump. It is adjacent to the road heading to the explosives storage to minimise transportation costs.<br><br>The explosives storage site will be away from the other Project facilities, 500m north-east of the ammonium nitrate storage. The minimum allowable distances to the Kyzyl facilities, as required to prevent propagation by blast | The main issue associated with removal of infrastructure concerning raw materials is likely to relate to possible residual contamination and mobilisation of contaminants. | All structures will be removed. Concrete slabs will be broken up, taken off site or buried in an appropriate manner.<br>Areas of soil contamination will be identified and remediated as required.<br>Areas to be regraded and revegetated. |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | (shock wave), as well as minimum safe distances to the transportation lines, were taken into account when selecting the explosives storage site.<br>The boiler house with a flue gas stack and coal and ash storages, designed for the needs of Auezov Town, will be in the town western edge, between the existing sewage pump station and treatment facilities. | | |
| **Water Management** | | | |
| | Two aquifers fed by the Kyzylsu River are located within the territory of the project. Whilst the aquifer inflow is low, pit dewatering will be required prior to mining. Dewatering is scheduled for both the open pit and underground stages of the project.<br>Two pump houses, one to the west and one to the east, are located at the base of the corresponding pit, pumping inflow water via a pressure pipeline to the open pit water settling pond. The pump houses will be relocated to lower levels as the pit deepens. | Release of contaminants, water erosion and flooding. | On the cessation of pit water pumping, groundwater will rebound and the cone of depression surrounding the pit will become shallower. The degree and extent of this groundwater rebound is not currently known and it is recommended that this be modelled as part of the closure planning process.<br>Geochemical modelling and prediction of post-closure AMD and water accumulation will be advanced during the life of mine with the results included in future iterations of the MCRP. This will enable a more accurate determination of post-closure water treatment options, if necessary, with a more detailed costing of and further optimisation of the MCRP. |
| **Social** | | | |
| Workforce | A major socio-economic impact of closure will be on the mine employees who will be made redundant. Polymetal recognises the importance of providing timely information to employees who are likely to be affected and will offer various forms of support in the period leading up to retrenchment to avoid a drastic change in living | Key issues associated with the closure and the workforce are:<br>• Poor communication leading to low morale, reduced productivity and corporate reputational damage;<br>• Large-scale redundancies;<br>• Workforce leaving the area to seek | The following provides a list of activities that are likely to be required at closure:<br>• Provide capacity-building, re-skilling and opportunities for empowerment during the mine life, aiming to make retrenched employees more employable, better equipped to make life decisions and more able to survive redundancy;<br>• Inform all employees 12 months in advance of closure, giving key |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | standards. The company is aware of the risk of local dependency on the mine for employment and aims to promote economic diversification through stakeholder engagement and community development initiatives and training and awareness programmes during the life of mine.<br>Employees will be retrenched in three stages.<br>Stage 1: General Tranche. A large number of employees at all levels, whose roles become redundant at or near the end of the mine's production life, will be retrenched first.<br>Stage 2: Closure Team. A small closure team comprised of at least one manager and a number of relevant technical specialists will be retained for the duration of the closure phase to manage related tasks. The labour intensive elements of closure may be carried out by specialist contract labour or by Polymetal employees with the requisite skills. In the latter case, these employees would be excluded from Stage 1 and would form part of the closure team. Once all closure actions are completed, the closure team would be retrenched.<br>Stage 3: Post-Closure Monitoring Team. A skeleton team of specialists would be retained after Stage 2 to carry out post-closure environmental and social monitoring actions.<br>Polymetal will take a decision at the time of | employment elsewhere; and<br>• Lack of transferable skills and education. | dates such as the last day of paid work for each stage of redundancy, the consultation period, etc.;<br>• Base the selection process for the closure and monitoring teams objectively on qualifications, skills and experience;<br>• Hold consultation meetings with each employee to impart detailed information about closure and to discuss their issues and concerns. Any specific requests for support, such as recommendations to other companies, can be dealt with through these meetings;<br>• Plan for and fund retrenchment according to national requirements;<br>• Ensure meaningful two-way communications with employees;<br>• Develop an employee retrenchment and retraining strategy;<br>• Nearing closure increase fiscal expenditure to assist with pension funds and redundancy payments;<br>• Consider voluntary redundancies;<br>• Consider retraining schemes;<br>• Sponsor counselling for those who require it, delivered by skilled professionals to small groups of employees to assist with their financial pressures, minimise distress and to find practical solutions to their immediate situation as well as their long term survival;<br>• Provide medical screening for mining related diseases such as silicosis so that timely support can be given where needed; and<br>• Offer business counselling. |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | closure on whether a small team of employees will be retained on part-time or variable hours contracts to carry out monitoring tasks, or whether a specialist environmental contractor would be better suited to this work. It might also be suitable to engage a locally-active non-government organisation (NGO) to undertake the relevant social and community monitoring tasks, managed remotely by Polymetal. | | |
| Community | The residents of the region are generally supportive of the Project's development. There are high local expectations for employment and economic development resulting from the mining activities and the possibilities of resettlement in relation to the mine's expansion. These high local expectations require good management.<br>The local economy will have a high level of dependence on the Project. In the absence of measures to diversify the local economy and skills base and develop alternatives to the Project following closure, the existing and anticipated migrant population will continue to be livelihood-dependent on the Project. Under these circumstances, mine closure will be a catalyst for emigration from the area following the cessation of Project employment. | Key closure issues associated with the community are:<br>• Community dependency on the mine leading to socio-economic collapse on closure;<br>• There will be indirect socio-economic impacts, particularly affecting supply chain businesses and services and social services supported by Polymetal;<br>• Mining companies commonly commit expenditure on local community development near the end of the mine life, usually too late to significantly alter the overall closure outcome; and<br>• Emigration of the educated, skilled and young leading to an ageing demographic profile, fragmentation of community based networks and reduced familial support. | The following provides a list of activities that are likely to be required at closure:<br>• A Polymetal stakeholder engagement plan will be implemented, a community development plan implemented at the earliest opportunity during the Project will build community resilience to closure;<br>• Mine stakeholders, including statutory agencies and the local community, will be informed 12 months in advance of closure;<br>• Consultation meetings will be held with relevant organisations and groups with a close relationship with the mine, such as the affected authorities and service providers, to work out the transfer of responsibilities from the company, and through existing communication routes between the company and the local communities;<br>• Those stakeholders with a significant interest in mine closure will be identified early in the mine life. Adequate resources will be provided for this process and, where possible, Polymetal will work with communities and other stakeholders to manage the potential social and |

| Closure Aspect | Detail | Closure Issues | Closure Activities |
|---|---|---|---|
| **Mines** | | | |
| | | | environmental impacts of closure of its operations; and<br>• The issue of mine closure will be incorporated into the existing stakeholder engagement plan as a standing agenda item for discussion. |

## 2.3 Closure Management and Implementation

The following considerations must be taken into account in the development and delivery of closure planning and, ultimately the closure event itself and post-closure monitoring and aftercare:

- Allowance for early or premature closure;
- Accountability for development of the MCRP and its implementation;
- Access to sufficient resources to enable delivery of the plan; and
- Ongoing management and monitoring requirements post-closure.

## 2.4 Development of Closure and Rehabilitation Planning

This framework MCRP is a starting point from which the ultimate MCRP, final design criteria and final closure design will be developed. This plan will be periodically reviewed to incorporate any significant changes to the mine plan, the closure design criteria, closure design, and closure cost estimate. Relevant stakeholder and community input will be necessary throughout this period. Such an approach will enable the final MCRP to incorporate the currently unforeseeable influences of:

- Improvements in technology enabling the re-processing of mineral wastes or low-grade ores (which may assist the cost and/or process of rehabilitation);
- The potential for re-mining on the site in different economic circumstances;
- The discovery of new ore bodies nearby resulting in the retention of the processing plant as a centralised operation;
- Changes in legislation in relation to mine closure;
- Changes in regulation relating to environmental monitoring/ natural resource usage standards (water, soils, air);
- Changing community expectations; and
- Changing stakeholder priorities.

The MCRP will be fully integrated with the life of Kyzyl mine plan, especially with regard to environmental and socio-economic management issues. It will form part of the Project's overarching environmental and social management system.

Guidance may be required in carrying out periodic studies of closure options to reduce uncertainties, risks and opportunities associated with closure and rehabilitation.

The closure and rehabilitation objectives, strategies and success criteria adopted for the Project need to be acceptable to all stakeholders and comply with the expectations of international best practice. The success criteria are intended to reflect the unique environmental, social and economic contexts of Project. Closure and rehabilitation design and success criteria will be developed during the operational phase as a benchmark for successful (active and final) rehabilitation.

During the development of the MCRP, different closure and rehabilitation goals will be developed for different Project sites. Aftercare can be considered as a hierarchy of three generic elements requiring successively more input as the hierarchy is ascended:

- Walk away – the preferred option, where no additional monitoring or maintenance is required after the rehabilitation work has been carried out, over and above the management normally associated with land in the selected end-use. This is often difficult to achieve;
- Passive aftercare – an on-going need for occasional monitoring and infrequent minor maintenance of surface water controls, passive water treatment systems, cover systems, or other structures; and
- Active aftercare – the site requires on-going operation, maintenance and monitoring. This typically applies to the management of AMD. This is the least preferred option and requires significant managerial and financial inputs.

## 2.5 Closure Criteria

The standards to be adopted for closure need to be both acceptable and achievable. They will be based on Kazakhstan requirements and good international industry practice, applied in a local context. Closure and rehabilitation design and success criteria are intended to reflect the unique environmental, social and economic circumstances of the Project. Indicators will be developed, over the life of mine, as a benchmark for successful closure and rehabilitation of the sites. The following generic completion criteria are suggested to indicate that closure has been successfully achieved. These criteria will be reviewed as part of the ongoing closure planning process and will evolve to become more bespoke. They include:

- Water and air quality are consistently within the limits agreed with the local environmental authority;
- Appropriate vegetation cover has been achieved in terms of species mix and density;
- the required monitoring and maintenance contracts are in place;
  Open pit walls, waste rock dumps and the TSF are formally classified as stable for the long term by a competent, professional engineer;
- Employee separation has been completed with post-closure pension funds established and operational;
- All accounts are settled;
- All steps in the MCRP are completed and verified by an independent reviewer;
- A closure certificate has been received from the relevant Kazakhstan authority and relevant other parties; and

- The remainder of the closure fund has been transferred to either the state or the new land owner with responsibility for managing the site (which could also be the state).

## 2.6 Closure Timing

For all mining projects it is imperative that a high priority is given to producing a detailed MCRP very early in the mine life and to regularly review the MCRP throughout the LoM.

## 2.7 Responsibilities

At an early stage a multi-disciplinary and multi-stakeholder closure team will be set-up to take responsibility for and control of the closure planning process throughout the life of mine. The team should contain high-level corporate representation as well as mine management personnel. The mine closure issue will become, at the earliest stage, part of the portfolio of a board director. Day-to-day responsibility for the plan will lie with the project manager, site superintendent and the environmental and community manager(s).

The company's human resources and community relations departments will be responsible for communicating the plan within the company and with stakeholders, including local communities and regulatory agencies. Communication methods will follow those documented in the stakeholder engagement plan, which will be developed to cover the detailed consultations required around closure planning and closure itself. Feedback from meetings, workshops, etc. will be recorded and taken into account in developing the detailed plan.

Following final closure, the Project sites will be inspected by a qualified, competent expert on an annual basis in accordance with the procedures set out in this plan, until it has been determined that the closure objectives have been met.

## 2.8 Review and Development

This framework MCRP will be reviewed and updated during the life of mine, including the design and construction phases. This will enable the principle of "design for closure" to be implemented at the earliest stages, ultimately reducing final closure costs. The MCRP will undergo an annual, high level review to verify the financial provisions and to consider the importance of key issues in relation to the plan, as well as ensuring that it remains consistent with national laws. Every three years, the financial provisioning for closure will also be reviewed in detail. Considerations will include:

- Has the mine plan changed?
- Has the Project footprint changed?
- Has the life of mine increased or decreased?
- Have new environmental issues been identified?
- Have new socio-economic issues been identified?
- Have new cultural issues been identified?

- What are the effects of any changes to the environmental and social management plans?
- Have any corporate sustainability drivers changed?
- Has the legislative framework changed?
- What lessons have been learned from active rehabilitation and how can these be incorporated?

If significant differences in any aspect of the plan are identified as a result of the high level annual review, the relevant section of the plan will be updated accordingly. Thereafter, given the short mine life, detailed technical reviews and updates will take place at two-yearly intervals and at key stages in Project development that will yield significant new information that will affect the scope and costs of the plan.

Closure financing will become increasingly accurate (to 5% two years prior to expected closure) as the Project progresses.

## 2.9 Implementation

When the decision is made to permanently cease operations, the final MCRP will include a full description of the infrastructure in place, of the decisions which will need to be taken to determine which installations will be dismantled, and which features may be offered to other post-mining users, as discussed during the development of the plan over the preceding years.

The closure phase will be carried out in a logical manner as follows: withdrawing of equipment for salvage/ sale; shutting down services; removing buildings, foundations and structures; regrading slopes; ground preparation and revegetation.

The MCRP will be implemented within the framework of the environmental management system, which will include a number of management plans, procedures, policies, initiatives and objectives, developed during the early stages of the project and subsequently. Adjusting these plans specifically for closure will ensure that the Project continues to operate within carefully prescribed limits and according to company and legislative requirements.

Although the MCRP will primarily address closure on exhaustion of the mineable resources and completion of processing of stockpiled ore, it must also provide for orderly decommissioning and rehabilitation should premature closure be required.

## 2.10 Temporary Closure (more than three months)

In case of a temporary cessation of activities, security personnel will continue to ensure that access to the site is restricted only to authorised people. Hazardous materials storage will continue as during operations, but the various buildings where they are stored will be locked. All entrances to mining areas will be locked. Environmental sampling will continue at the same frequencies as during normal activities if it is safe for staff to do so. Visual inspection of the installations will be carried out on a daily

basis. Related security protocols to cover this should be more thoroughly detailed in the company's risk management plan.

## 2.11 Premature Closure

If early closure occurs for any reason, local communities and regulatory authorities should be advised and consultation could take place if conditions allow it. Depending on the reason for early closure, the temporary closure measures or final closure measures would be applied. Sufficient closure funding should have been accrued during the early phases of the project to cover the costs of early closure.

## 2.12 Post-Closure Monitoring and After-care

Site maintenance and security will continue during the early years of closure and post-closure monitoring and may last up to 10 years or more, based on risk analysis and environmental monitoring results. An indicative monitoring programme is provided in Table 2. Activities during this period will occur in accordance with the operational environmental management and monitoring plan and the final closure design requirements.

This plan will be developed during the life of mine and build on the routine monitoring requirements and practices carried out during this period. It will include the monitoring of all sensitive receptors: air, soil, groundwater and surface waters, and vegetation on rehabilitated areas. Post-closure monitoring of groundwater in the vicinities of the TSF and waste rock dumps will be particularly important and will continue using monitoring wells installed during the development of the sites. Post-closure aftercare will include the maintenance of vegetation and drainage channels to minimise long term erosion risks. Site security will be necessary during the early post-closure years as external contractors and workers involved in closure/ post-closure activities work on-site. Security fencing and gatehouses should remain for a minimum of two years after closure. Other post-closure security features will include lockable gates, signage and regular security patrols.

Towards the end of the life of mine the environmental monitoring records will be reviewed to establish whether there are any outstanding regulatory or lender requirements to be met before final closure can proceed.

| Table 2: Indicative Closure and Post-Closure Monitoring Programme | | | |
|---|---|---|---|
| **Component** | **Monitoring Type** | **Frequency** | **Duration (years)** |
| **Open pit/ Underground mine** | Water quality | Yrs 1-3; quarterly<br>Yrs 4 & 5; six-monthly | 5 |
| | Water levels | Yrs 1 & 2; monthly<br>Yr 3; quarterly<br>Yrs 4 & 5; six-monthly | |
| | Vegetation establishment | Annually | |
| | Stability/subsidence – visual inspection | Annually | 5 |
| **TSF** | Cover performance & integrity | Yr 1; 2-monthly<br>Yrs 1-4; six-monthly<br>Yr 5; annually | 5 |
| | Embankment integrity & stability | | |
| | Groundwater quality | Yrs 1-3; quarterly<br>Yrs 4 & 5; six-monthly | 5 |
| | Groundwater levels | Yrs 1 & 2; monthly<br>Yr 3; quarterly<br>Yrs 4 & 5; six-monthly | |
| | Soil properties | Annually | |
| | Vegetation establishment & metal uptake | | |
| **Waste rock dumps** | Groundwater quality | Yrs 1-3; quarterly<br>Yrs 4 & 5; six-monthly | 5 |
| | Surface water quality | Yrs 1-3; quarterly<br>Yrs 4 & 5; six-monthly | |
| | Visual & geotechnical assessment of slopes | Yrs 1-2; six-monthly<br>Yrs 3-5; annually | |
| | Soil properties | Annually | |
| | Vegetation establishment & metal uptake | | |
| **Processing plant & related facilities & site infrastructure & utilities** | Air quality monitoring | Annually | 5 |
| | Soil properties | | |
| | Vegetation establishment & metal uptake | | |

## 2.13 Preliminary Closure and Rehabilitation Cost Estimate and Closure Fund

This framework MCRP preliminary cost estimate includes the full closure and rehabilitation costs, incorporating both technical rehabilitation and reporting costs. Non-technical costs such as retrenchment, retraining or grants on closure to local communities for off-setting social impacts have not been included but should be considered. These indicative costs have been calculated based on the preparation of engineering, design and construction plans as part of closure and rehabilitation planning. Related costs for management and administration are also included. The preliminary estimated closure and rehabilitation cost is shown in Table 3.

Other costs that are not included in this estimate include work-force training in transferable skills, community development, revegetation research and active restoration activities, which will be financed as operational costs during the mine life, although they will act to reduce the final closure cost. Similarly the costs of carrying out detailed studies of AMD and the impacts of closure on the community, are not included as it is anticipated these will be more appropriately borne in the

operational phase. The estimated closure costs do not include income derived from the selling of old equipment, recyclables, etc., which will be used to offset the final costs of closure.

At this stage of the Project there remain many unknowns, which make the calculation of closure costs particularly difficult. The preliminary estimate provided here should be refined during subsequent revision of this MCRP, during the LoM.

Post-closure monitoring and maintenance costs are highly indicative at this stage as the full period of post-closure monitoring and aftercare activities will not be known until much nearer the end of the life of mine, based on research and review carried out during the construction and operational phases.

The overall preliminary cost of closure and rehabilitation is broadly estimated as US$12,483,944. This figure is indicative and will be refined during the on-going closure planning process.

| Table 3: Preliminary Closure Costs | | | | |
|---|---|---|---|---|
| **№** | **Name** | **Name of works** | **Total cost $US** | **Cost of all works $US** |
| 1 | Open Pit | Earthworks, land profiling, topsoil, seeding and vegetation, equipment disposal, installation of warning signs. | | 101,669.00 |
| 2 | Underground Mine | Dismantling of pit head buildings and facilities. | 418,700.00 | |
| | | Mine shafts closure | 150,838.00 | |
| | | Dismantling of ventilation shafts, collar houses, fan systems. | 209,562.00 | |
| | | Closure of rising ventilation shafts. | 20,950.00 | |
| | | Dismantling of foundations of all buildings and collar houses. | 520,875.00 | |
| | | Dismantling of equipment. | 41,200.00 | |
| | | Removal of underground equipment. | 20,950.00 | |
| | | Removal of hazard materials from underground workings. | 20,950.00 | 1,404,025.00 |
| 3 | Waste dump | Slope reprofiling, placement of topsoil and storage of arsenic containing waste (planning only). | | 1,208,888.00 |
| 4 | Topsoil storage | Earthworks. | | 69,388.13 |
| 5 | Carbon product storage | Land profiling, placement of clay layer, removal of pipelines. | | 76,245.39 |
| 6 | TSF | Earthworks, slope profiling, drainage ditch, placement of crushed stone, equipment dismantling, removal of pipelines, removal of contamination, equipment disposal, perimeter drainage, water level monitoring (5 years). | | 3,123,845.00 |
| 7 | Ore processing facilities | Dismantling of buildings. | 198,360.17 | |
| | | Land profiling. | 30,168.75 | |
| | | Application of topsoil of 0,2m thickness. | 8,026.00 | 236,554.92 |
| 8 | Mine Site infrastructure | Filling with debris and crushed stone soil (0,6m). | 179,725.33 | |
| | Intermediate ore stockpile | Application of topsoil of 0,2m thickness. | 17,657.20 | |
| | | Equipment disposal. | 4,128.00 | |
| | | Dismantling of pipeline. | 4,626.35 | |
| | Motor service site | Dismantling of buildings. | 11,793.71 | |
| | | Land profiling. | 6,033.75 | |
| | | Application of topsoil of 0,2m thickness. | 1,605.20 | |
| | Plant site | Equipment disposal. | 206,400.00 | |
| | | Dismantling of buildings. | 1,638,698.37 | |
| | | Land profiling. | 119,468.25 | |
| | | Application of topsoil of 0,2m thickness. | 31,782.96 | 2,221,919.00 |
| 9 | Utilities | | 10,320.00 | |
| | Boiler-house | Dismantling of buildings. | 48,178.56 | |
| | | Land profiling. | 16,894.50 | |
| | | Application of topsoil of 0,2m thickness. | 4,494.56 | |
| | Motor roads | Roads reclamation. | 18,830.90 | |

| Table 3: Preliminary Closure Costs | | | | |
|---|---|---|---|---|
| **№** | **Name** | **Name of works** | **Total cost $US** | **Cost of all works $US** |
| | Power lines | Removal of power lines. | 106,833.88 | 205,552.30 |
| 10 | Raw Materials | Remediation of fuel tanks areas. | 12,576.00 | |
| | Fuel storage site | Dismantling and removal of fuel tanks. | 15,372.00 | |
| | | Dismantling of fuel pipes. | 5,280.00 | |
| | | Removal of contaminated soil. | 481,286.00 | |
| | | Buildings and foundation removal. | 45,625.00 | |
| | Explosives site | Dismantling of buildings. | 74,275.28 | |
| | | Land profiling. | 14,481.00 | |
| | | Application of topsoil of 0,2m thickness. | 3,852.48 | 652,747.70 |
| 11 | Water Management | Equipment disposal, dismantling of buildings, land profiling, application of topsoil, removal of surface pipelines. | | 89,768.80 |
| 12 | Contractors | | | 761,286.00 |
| 13 | Engineering and management | Reporting, supervision, administration and security. | | 1,202,000.00 |
| 14 | Ecological estimation of mine shutdown | Remediation. | | 227,865.00 |
| 15 | Post Closure monitoring and maintenance | Sampling, monitoring, maintenance, equipment and reporting. | | 902,190.00 |
| | | | Total cost $US | 12,483,944.23 |

# 3 CONCLUSIONS AND COMMITMENTS

This framework MCRP developed for the Project is in accordance with the laws and regulations of Kazakhstan and its mine closure standards. The plan also meets the expectations of good international industry practice.

The final estimated closure figure of US$12,483,944 should be regarded as indicative at this stage as there are several significant unknowns relating to the Project. Means of addressing these are outlined in the recommendations below, with the knowledge thus gained being used to refine this framework MCRP and provide greater certainty as to the financial estimate.

## 3.1 Management Plan Commitments

There remain a number of commitments that will require further studies and reporting during the implementation of the management plan, these include the following

- A detailed assessment of the AMD characteristics of the current and future waste rock materials and in-situ rocks in the walls of mine workings. This will assist in developing mineral waste and mine water management strategies that are more focused and have fewer impacts, including ensuring that any back-filling is carried out with the most appropriate materials. To be

commissioned, evaluated and reported on a programme to contribute to the design of the TMF and WRD.

- To investigate and model the groundwater rebound characteristics following the cessation of pumping and identify areas at the surface at potential risk of flooding and model the subsurface movement of potentially contaminated groundwater. To be commissioned and findings reported to contribute to the detailed design of underground workings
- To assess the degree, extent and dynamics of pre-project contaminated land, surface and ground waters at and around the old mine workings and infrastructure. Develop a remediation strategy as necessary and according to best practice. To be commissioned and the findings available to develop appropriate strategies for remediating contaminated land during construction of the mine infrastructure.
- To develop a formal ecological restoration research programme to be developed throughout the mine life that will consider species mixes, germination and establishment characteristics, target vegetation communities, soil-forming materials and amendments, different substrate and surface types, and will inform the active restoration of the site. In particular, the programme should research the ecological and horticultural specifics of the rare, endemic plants found on site and develop restoration protocols to enable their re-establishment. Integral to the rehabilitation plan and to commence active revegetation during the life of the mine. Proposal for this programme to be in place prior to the completion of the construction phase.
- To maintain ongoing studies in order to assess the closure impacts on the local community and workforce, including consultation with the parties to be affected, to begin the development of appropriate mitigation and management strategies well before closure actually happens. The details of these studies to be incorporated into the SEP and published prior to completion of the construction phase.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**AIR QUALITY MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **KZ10061** |
| **VERSION:** | **V2.0** |
| **REPORT NUMBER:** | **MM6** |
| **STATUS:** | **Final** |

**POLYMETAL**

**KYZYL PROJECT**

# AIR QUALITY MANAGEMENT PLAN

**September 2016**

**PREPARED BY:**
Ishita Shah Senior Environmental Scientist

**APPROVED BY:**
David Brignall Technical Director





ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**GLOSSARY OF ACRONYMS** ..... **1**
**1 AIR QUALITY** ..... **2**
1.1 Introduction ..... 2
1.2 Dust ..... 2
1.3 Plant and Equipment ..... 3
1.4 Arsenic in Dust ..... 3
1.5 Combustion and Point Source Emissions ..... 4
1.6 Greenhouse Gas Emissions ..... 4
1.7 Nuisance Odours ..... 5
**2 COMPLIANCE AND STANDARDS** ..... **5**
2.1 National Legislation ..... 5
2.2 International Best Practice ..... 5
2.3 Compliance Standards for the Kyzyl Project ..... 6
2.4 Action Trigger Levels ..... 9
**3 EMISSION CONTROLS** ..... **9**
3.1 Dust Emission Controls ..... 9
3.2 Combustion Emission Controls ..... 10
3.3 Greenhouse Gas Emission Controls ..... 11
**4 MONITORING AND PERFORMANCE** ..... **11**
4.1 Reporting Template ..... 11
4.2 Visual Assessment ..... 11
4.3 Dust Monitoring ..... 11
4.4 Air Quality Monitoring ..... 13
4.5 Stack Emission Monitoring ..... 13
4.6 Meteorological Influences ..... 14
4.7 Reporting ..... 14
**5 ROLES AND RESPONSIBILITIES** ..... **14**
5.1 Visual Inspections of Dust Monitors ..... 14
5.2 Stack Emissions Testing ..... 14
5.3 Record Keeping and Reporting ..... 14
**6 CORRECTIVE ACTIONS** ..... **15**
6.1 Action Levels ..... 15
6.2 Visual Inspections ..... 15

**TABLES**

Table 1: Ambient Air Quality Standards ..... 7
Table 2: Emission Limit Values ..... 8
Table 3: Project Emission Limit Values ..... 8
Table 4:Action Trigger Levels ..... 9

Table 5: Dust Control Measures and Approximate Control Efficiency Ranges ..... 10
Table 6: Air Quality Monitoring Locations ..... 13

**FIGURES**

Figure 1: DS100 Directional Dust Gauge ..... 12
Figure 2: Turnkey Osiris Monitor ..... 12

**GLOSSARY OF ACRONYMS**

| | |
|---|---|
| CO | Carbon Monoxide |
| DMP | Dust Management Plan |
| EAC | Effective Area Covered |
| ESIA | Environmental and Social Impact Assessment |
| GHG | Greenhouse Gas |
| g/t | grams per ton |
| $mg/m^2/d$ | milligrams per square meter per day |
| NOx | Oxides of nitrogen |
| PM | Particulate Matter |
| $PM_{2.5}$ | Very fine particles with a diameter of less than 2.5 microns |
| $PM_{10}$ | Small particles with a diameter of 10 microns or less |
| RC drilling | Reverse Circulation drilling – a particular type of drilling technology |
| SO2 | Sulphur dioxide |
| SOP | Standard Operating Procedure |
| SPZ | Sanitary Protection Zone |
| TSP | Total Suspended Particles |
| VOC | Volatile Organic Compounds |
| WAI | Wardell Armstrong International Ltd |
| WHO | World Health Organisation |
| µm | micron, micrometers, one millionth of a metre |

# 1 AIR QUALITY

## 1.1 Introduction

In order to ensure that emissions to atmosphere are controlled as effectively as possible, this air quality management plan has been developed and will form part of the comprehensive environmental management plan for the Kyzyl Project. It is principally applicable to the operational stage of mine life, but will commence during the construction stage, to develop the network on monitoring stations and relevant procedures and will be further adapted at the end of the operational stage to take account of mine closure requirements.

Potential air quality emissions for the project are categorised as:

- Fugitive dust; particulate matter generated from earthmoving, material transport and handling, and unpaved road traffic;
- Combustion emissions; gas and particulate matter generated by internal combustion engines (heavy and light vehicles, equipment motors, generators) and from coal-fired boilerhouses and heating units used for mine and plant heating;
- Greenhouse Gas (GHG) emissions; gas emissions with the potential to affect global atmospheric GHC concentrations and contribute to climate change; and
- Nuisance odours; non-health-related (aesthetic) gas emissions affecting nearby receptors.

Potential impacts and mitigation measures for each of these emission types are addressed in this Air Quality Management Plan.

## 1.2 Dust

The predominant emission to air from the operation of the mine will be dust. Dust can be divided into 2 general categories; deposited dust, which may lead to nuisance, and suspended particulate matter. Dust contains particles in the size range 1µm to 75µm in diameter; however, only particles in the range of 10µm to 30µm are generally referred to as nuisance dust. Nuisance dust is accepted as not being harmful to long term health as it is likely to be too large to be respirable dust; however, this dust tends to be the subject of most complaints from communities. Suspended particulate matter is the smaller size fractions of dust, generally measured as $PM_{10}$ and $PM_{2.5}$, and persistent or repeated exposure to high levels of this dust can cause long-term health problems.

The purpose of the air quality management plan is to prevent the release of particulates into the environment surrounding a site and where these releases cannot be prevented entirely, to minimise them as far as possible. Mitigation measures should also be in place in case of accidental release of particulates into the environment.

A variety of dust control methods will be utilised to minimise the release of dust into the atmosphere, these have been identified in the following sections:

## 1.3 Plant and Equipment

- Plant and methods will be selected to minimise dust emission. Wet processes produce less dust than dry;
- Dust generating activities, such as crushing and conveying will be provided with enclosures;
- Non-venting dust extraction systems (scrubbers, electrostatic dust scrubbers, dust bags, etc) will be used in enclosed spaces, where possible. Details of dust extraction systems will be confirmed once mine/plant design is finalised but will meet all regulatory limits;
- Dust suppression measures (shrouds, water sprays) during drilling and haulage will be used;
- Drops onto stockpiles and waste rock dumps from trucks and conveyors will be minimised;
- Speed of mobile plant, including light vehicles will be controlled to reduce emission of duts from haul roads; and
- Spillage of ore onto haul roads (prevent overloading of trucks) will be reduced.

### *1.3.1 Other Operations*

- Dust-generating activities will be located to avoid locations where sensitive receptors are downwind of the prevailing winds;
- Mist sprays on static sources will be used, where appropriate;
- Sealing and/or watering (summer) or salting (winter) of haul roads will be maintained to reduce the potential for dust emissions from haulage by dump trucks;
- Dust control chemicals/water sprays will be applied on stockpiles and bare ground;
- Site activities will be curtailed when wind blows towards receptors (last resort); and
- Construction footprints and areas of ground disturbance will be minimised where possible.

## 1.4 Arsenic in Dust

### *1.4.1 Environmental monitoring and management*

Air quality monitoring indicates that there are elevated levels of arsenic present in the dust at the site, however, this is based on a limited dataset. Further monitoring will be undertaken to obtain one-week representative sampling during each month when mean temperatures are above 0°C, using the methodology identified in Section 4.3.3, of this management plan.

A main source of the Arsenic in dust is considered to be the windblown dust from the tailings facility constructed during the operation of Bakyrchik mine as well as legacy windblown arsenic dust from previous processing activities on site. Since the tailings dam is a state asset and is not owned by Polymetal, it cannot be closed, reclaimed and surface vegetated. Therefore, temporary dust barriers such as the use of an HDPE, geotextile or other appropriate surface sealant will be laid on the exposed surface to reduce wind blow of particulates from this source.

The tailings generated from the operation of the Kyzyl Project will be pumped to the newly constructed tailings facility, which will be manged to maximise settlements of tailings during the

operational phase. The closure of the tailing facility has been included in the MCRP (MM8), to ensure that the surface of the lagoon is closed and reclaimed to avoid drying of the surface and potential for the wind blow of dust. During the deep mine phase of operations, tailing will be mixed with a cementing agent to backfill into mine workings no longer required.

Therefore, the future management of tailing at the Kyzyl will prevent additional sources dust containing arsenic, being subject to fugitive windblown emission.

### *1.4.2 Occupational monitoring*

To monitor potential health effects, workers biomonitoring will be carried out as part of routine worker health testing to monitor the Arsenic concentrations in urine using an internationally recognised arsenic in urine limit of 35-50ug/l (ACGIH). If exceedances are observed, additional measures for minimising arsenic (in dust) exposure will be identified and implemented and worker hygiene monitoring will be continued on a regular basis. Polymetal will maintain a dialogue with local medical facilities and professionals to monitor potential arsenic and cadmium exposure amongst members of local community as a result of historic mining operations. No health risks to workers or the local community as a result of previous mining activities, including potential arsenic in dust risks, have been identified to date (following consultation with local medical providers).

The occupational monitoring programme will be supplemented with monitoring within the SPZ in work areas to confirm that arsenic in air concentrations do not exceed an occupational workplace exposure limit of 0.01mg/$m^3$ (typical European standard).

## 1.5 Combustion and Point Source Emissions

Gas and particulate matter will be emitted from blasting, mobile equipment, and the coal-fired boiler houses and heating units. The coal-fired boiler houses will be equipped with cyclones with a dust removal efficiency of 85%.

## 1.6 Greenhouse Gas Emissions

Fuel and electrical power use for the heavy equipment, light vehicles, building heating, underground ventilation, and ancillary support buildings will produce greenhouse gas emissions during construction and operation. These emissions will be minimised by the use of energy efficient measures incorporated into the engineering design, the use of modern, energy-efficient mobile plant and regular maintenance of mobile plant. A greenhouse gas inventory will be maintained to minimise the direct and indirect GHG emissions associated with the Project and will be reported on an annual basis.

### 1.7 Nuisance Odours

Nuisance odours during construction and operations could be generated from improperly managed domestic waste handling and wastewater treatment and disposal. Odour generation will be minimised by use of appropriate waste reduction and recycling procedures, by effective waste disposal practices and sewage treatment facilities. Solid waste management measures are described in the Waste Management Plan. Sewage waste management measures are described in the Water and Waste Water Management Plan.

## 2 COMPLIANCE AND STANDARDS

As per EBRD guidance, when selecting impact assessment thresholds and criteria, consideration must be given to both International Standards and local standards, with preference given to the most stringent criteria. For the Kyzyl Project ambient air quality standards, a combination of World Health Organisation Guidelines, EU EC Directives, and Kazakh Maximum Permission Concentrations (MPC) have been reviewed and selected (Refer to Table 4.4.1 of the ESIA).

### 2.1 National Legislation

The Environmental Code of Kazakhstan requires the establishment of an air quality Sanitary Protection Zone (SPZ) around industrial objects. Article 130 of the RoK EC "Rights and Obligations of the User of Natural Resources in respect of Environmental Monitoring" reads:

1. The User of Natural Resources has the right:
1) to undertake minimum environmental monitoring sufficient to monitor compliance with the RoK environmental legislation"

### 2.2 International Best Practice

The EBRD's Performance Requirement 3 states:

*'Projects involving new facilities and operations are expected to meet EU substantive environmental standards or other agreed environmental standards, and national regulatory requirements from the outset.'*

The EU's Industrial Emissions Directive is one of the main EU instrument regulating pollutant emissions from industrial installations. The Industrial Emissions Directive (IED) was adopted on 24 November, 2010. The IED applies to all combustion plants with a total rated thermal input of or greater than 50 MW.

While smaller and bigger plants were covered by respective EU directives, the emissions from medium combustion plants were not regulated at EU level at the time of preparation of the ESIA report. On November 10, 2015, the European Council adopted the Medium Combustion Plant Directive, to limit

the emissions from combustion plants of medium size.

The EU's Medium Combustion Plant Directive, regulates emissions of $SO_2$, NOx and dust into the air with the aim of reducing those emissions and the risks to human health and the environment they may cause. The Directive regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth. The emission limits prescribed in the Directive are presented in Table 2.1.

**Table 2.1: Emission Limit Values**

| Parameter | EU Medium Combustion Plants Directive ($mg/Nm^3$)[1] | EU Industrial Emissions Directive ($mg/Nm^3$)[2] | IFC's Emission Guidelines for Small Combustion Facilities Emissions (3MWth – 50MWth)[3] |
|---|---|---|---|
| Sulphur Oxides | 400 | 400 | 0.5 percent Sulphur or lower percent Sulphur if commercially available without significant excess fuel cost |
| Nitrogen Oxides | 300 | 300 | N/A |
| Total suspended particulates | 20 | 30 | 96 ppm (Electric generation)<br>150 ppm (Mechanical drive) |

The European Council has agreed the following timeframes for the adoption of the emission limits prescribed in the Directive:

- for bigger existing plants (5-50 MW): from 2025
- for smaller existing ones (1-5 MW): from 2030
- for new plants: after a transposition period of two years following entry into force (20 December, 2018 onwards)

The Directive will be applicable to new plants after a transposition period of two years of coming into force and therefore any plant installed before 20 December, 2018 will be exempt. In this instance, the project boilers will comply with IFC's emission guidelines for small combustion facilities if installed before 20th December, 2018. In case the boilers are installed after this date, they will comply with the EU Medium Combustion Plant Directive. Further, since each proposed boiler is below the 5MW threshold, the 2030 timeframe for adoption would apply.

## 2.3 Compliance Standards for the Kyzyl Project

The compliance standards for the Kyzyl Project are tabulated in Table **1** and will be used define reporting for all environmental air quality monitoring.

[1] Directive (EU) 2015/2193 of the European Parliament and the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants
[2] Directive 2010/75/EU of the European Parliament and the Council on industrial emissions
[3] IFC's General EHS Guidelines: Environmental - Air emissions and ambient air quality

| **Table 2: Ambient Air Quality Standards** | | | |
|---|---|---|---|
| **Parameter** | | **Averaging Period** | |
| Particulate Matter - $PM_{10}$ | 50 | 24hr | $\mu g/m^3$ |
| | 40 | Annual | $\mu g/m^3$ |
| Arsenic | 30 (TSP) | One time | $\mu g/m^3$ |
| | 3 (TSP) | 24hr | $\mu g/m^3$ |
| | 0.006 ($PM_{10}$) | Annual | $\mu g/m^3$ |
| Nitrogen dioxide ($NO_2$) | 200 | 1hr | $\mu g/m^3$ |
| | 40 | Annual | $\mu g/m^3$ |
| Sulphur dioxide ($SO_2$) | 125 | 24hr | $\mu g/m^3$ |
| Carbon Monoxide | 30,000 | 1hr | $\mu g/m^3$ |
| | 10,000 | 24hr | $\mu g/m^3$ |
| **Note:**<br>*EU Directive 2008/50/EC* ($PM_{10}$ – including arsenic, $NO_2$, $SO_2$ & CO)<br>*Based on new Kazakh Sanitary Norms and Rules #168, 25, January, 2012 (Arsenic containing TSP)* | | | |
| Emission limit values (Coal fired boilers) | | | |
| **Parameter** | **Current – Project Standard** | Future (EU medium sized combustion plant directive) – Project Standard | |
| Sulphur oxides | **0.5% sulphur or less in coal** | 400 | $mg/Nm^3$ |
| Nitrogen Oxides | **n/a** | 300 | $mg/Nm^3$ |
| Total suspended particulates | **150** | 20 | $mg/Nm^3$ |

### *2.3.1 Emission Limits*

The EBRD refers to the EU emission standards for the projects it finances. The EU's Industrial Emissions Directive is one of the main EU instrument regulating pollutant emissions from industrial installations. The IED was adopted on 24 November, 2010. The IED applies to all combustion plants with a total rated thermal input of or greater than 50 MW.

While smaller and bigger plants were covered by respective EU directives, the emissions from medium combustion plants were not regulated at EU level at the time of preparation of the ESIA report. On November 10, 2015, the European Council adopted the Medium Combustion Plant Directive, to limit the emissions from combustion plants of medium size.

The EU's Medium Combustion Plant Directive, regulates emissions of $SO_2$, NOx and dust into the air with the aim of reducing those emissions and the risks to human health and the environment they may cause. The Directive regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth. The emission limits defined in the Directive are shown in Table 2.

The European Council has agreed the following timeframes for the adoption of the emission limits prescribed in the Directive:

- For bigger existing plants (5-50 MW): from 2025
- For smaller existing ones (1-5 MW): from 2030
- For new plants: after a transposition period of two years following entry into force (20 December, 2018 onwards)

| **Table 3: Emission Limit Values** | | | |
|---|---|---|---|
| **Parameter** | **Medium Combustion Plants Directive ($mg/Nm^3$)[4]** | **Industrial Emissions Directive ($mg/Nm^3$)[5]** | **IFC's Emission Guidelines for Small Combustion Facilities Emissions (3MWth – 50MWth)[6]** |
| Sulphur dioxide | 400 | 400 | 0.5 percent Sulphur or lower percent Sulphur if commercially available without significant excess fuel cost |
| Nitrogen Oxides | 300 | 300 | N/A |
| Total suspended particulates | 20 | 30 | 96 ppm (Electric generation)<br>150 ppm (Mechanical drive) |

The Directive will be applicable to new plants after a transposition period of two years of coming into force and therefore any plant installed before 20 December, 2018 will be exempt. In this instance, the project boilers will comply with IFC's emission guidelines for small combustion facilities if installed before 20th December, 2018. In case the boilers are installed after this date, they will comply with the EU Medium Combustion Plant Directive. Further, since each proposed boiler is below the 5MW threshold, the 2030 timeframe for adoption would apply.

| **Table 4: Project Emission Limit Values** | | |
|---|---|---|
| **Parameter** | **For installation before December 20, 2018** | **For installation after December 20, 2018** ($mg/Nm^3$) |
| Sulphur dioxide | 0.5 percent Sulphur or lower percent Sulphur if commercially available without significant excess fuel cost | 400 |
| Nitrogen Oxides | N/A | 300 |
| Total suspended particulates | 96 ppm (Electric generation)<br>150 ppm (Mechanical drive) | 20 |

The proposed boilers will comply with the standards specified in Table 3 The following mitigation measures will be implemented to ensure compliance with the IFC's emission guidelines for small combustion plants:

[4] Directive (EU) 2015/2193 of the European Parliament and the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants
[5] Directive 2010/75/EU of the European Parliament and the Council on industrial emissions
[6] IFC's General EHS Guidelines: Environmental - Air emissions and ambient air quality

- Use of low sulphur fuel (less than 0.5%) and/or use of a flue gas desulphurisation unit
- Use of higher efficiency dust removal equipment such as high efficiency cyclones or Electro-static Precipitators.

### 2.4 Action Trigger Levels

For each of the components that are monitored, action trigger levels will be defined at a level of 75% of the defined air quality standard and would provide an early warning system for managing emissions to air. The use of trigger levels will be adopted as the air quality monitoring stations are established and a consistent dataset is developed.

Action triggers are concentrations of pollutants, measured at monitoring locations that are more stringent than the compliance target. When concentrations exceed the action trigger level, appropriate action should be taken to prevent pollutant levels from exceeding the compliance target. For the proposed project, the action trigger levels would relate to75% of the adopted ambient air quality standards and have been provided in Table 4.

**Table 5:Action Trigger Levels**

| Parameter | Averaging Period | Action Trigger Levels (concentrations in µg/m³) | Compliance standard (concentrations in µg/m³) |
|---|---|---|---|
| Sulphur dioxide ($SO_2$) | 24 hour | 94 | 125 |
| Nitrogen dioxide ($NO_2$) | 1 hour | 150 | 200 |
| | Annual | 30 | 40 |
| Particulate Matter (PM10) | 24 hour | 37.5 | 50 |
| | Annual | 30 | 40 |

Recommendations for potential action to take is discussed in Section 6.

## 3 EMISSION CONTROLS

### 3.1 Dust Emission Controls

In terms of Good International Practice, the following measures will be used for managing particulate emissions:

- Use of dust control methods such as covers, water suppression, or increased moisture content for open materials storage piles, or controls, including air extraction and treatment through a baghouse or cyclone for material handling sources such as conveyors and bins;
- Use of water suppression for control of loose materials on paved or unpaved road surfaces. Oil and oil by-products is not a recommended method to control road dust.

Other dust control measures that will also be considered are presented in Table 5:

| Table 6: Dust Control Measures and Approximate Control Efficiency Ranges | |
|---|---|
| ***Control Types*** | ***Control Efficiency*** |
| *Chemical Stabilisation* | *0% - 98%* |
| *Hygroscopic salts, Bitumens/adhesives* | *60% - 96%* |
| *Surfactants* | *0% - 68%* |
| *Wet suppression – watering* | *12% - 98%* |
| *Speed reduction* | *0% - 80%* |
| *Traffic reduction* | *Not quantified* |
| *Paving (Asphalt/Concrete)* | *85% - 99%* |
| *Covering with Gravel, Slag or "Road Carpet"* | *30% - 50%* |
| *Vacuum Sweeping* | *0% - 58%* |
| *Water Flushing/Broom Sweeping* | *0% - 96%* |

## 3.2 Combustion Emission Controls

### *3.2.1 Mobile Fleet*

The guidelines refer to land-based mobile sources as emission sources for CO, $NO_x$, $SO_2$, PM and VOCs, among other emissions. The following measures will be adopted to control of excessive emissions;

- Regardless of the size or type of vehicle, fleet owners/operators will implement the manufacturer recommended engine maintenance programs;
- Drivers will be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measures addressing acceleration and driving within safe speed limits;
- Where practical, the mobile fleet stock will be managed to:
  - Replace older vehicles with newer, more fuel efficient alternatives;
  - Installing and maintaining emissions control devices, such as catalytic converters; and
  - Implementation a regular vehicle maintenance and repair program.

### *3.2.2 Boilerhouses and Heating Units*

The project boilers will comply with IFC's emission guidelines for small combustion facilities if installed before 20th December, 2018. In case the boilers are installed after this date, they will comply with the EU Medium Combustion Plant Directive. Further, since each proposed boiler is below the 5MW threshold, the 2030 timeframe for adoption would apply.
in The following mitigation measures will be implemented to ensure compliance with the IFC emission limits/Medium Combustion Plant Directive:

- Use of low sulphur fuel and/or use of a flue gas desulphurisation unit
- Use of higher efficiency dust removal equipment such as high efficiency cyclones or Electro-static Precipitators.

### 3.3 Greenhouse Gas Emission Controls

The following measures will be adopted for reduction and control of greenhouse gases, will be considered:

- Adopting energy efficiency programmes where practical;
- Promotion, development and increased use of renewable forms of energy; and
- Limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy (coal, oil, and gas).

## 4 MONITORING AND PERFORMANCE

### 4.1 Reporting Template

A reporting template will be developed to record all visual assessments, dust monitoring results, air quality monitoring results, meteorological conditions, and stack emission results.

### 4.2 Visual Assessment

Visual inspections will be undertaken daily, and preferably more often if wind direction or windspeed changes during the working day. In order for visual inspections made by different staff members to be comparable, environmental staff, shift supervisors and mine management, a grading system should be developed for inspecting and determining whether dust suppression techniques are sufficient or require further action. Staff undertaking inspections will undergo appropriate training in order to consistently apply the method.

### 4.3 Dust Monitoring

Particulate monitoring will be carried out at a number of locations on site, determined by current operations and prevailing wind direction. As operations move and develop, the location of the monitoring points should be reviewed to ensure adequate coverage is maintained.

Dust monitoring will monitor for nuisance dust, suspended particulates (TSP, PM10, and PM2.5), and for arsenic contained in dust. Appropriate equipment that can carry out continuous 24 hour, 7 day per week, monitoring will be used.

Examples of possible equipment selections follow. These equipment selections are suggestions, and should not be considered as proscribed.

#### *4.3.1 Nuisance Dust Monitoring: DustScan DS100*

The DS100 directional gauge is a static monitoring point which can be situated at suitable locations around the site to monitor nuisance dust levels. The DS100 measures "dust flow" from different directions and gives an indication of the relative contribution; it does not give an actual measurement of dust deposition.

**Figure 1: DS100 Directional Dust Gauge**

### *4.3.2 Suspended Particulates Monitoring: Osiris Turnkey Monitor*

The Osiris monitor measures suspended particulates and can be used either as a portable instrument or can be deployed as a semi-permanent installation. Osiris can provide a continuous indication of TSP, $PM_{10}$, $PM_{2.5}$ and $PM_1$ particles. In the "workplace" mode it can indicate inhalable, thoracic and respirable concentrations.


**Figure 2: Turnkey Osiris Monitor**

### *4.3.3 Arsenic Content in Dust*

One-week representative sampling will be carried out for each month, excluding the five months per year when mean temperatures are below 0°C. The sampling will comprise of a two stage process, first being collection of particulates for a duration of one week with no distinction between particle sizes; and then preparing the samples for analysis by dissolution of PM10 fraction using wet or dry procedures and final analysis using standard techniques for detection of Arsenic.

This will be supplemented with monitoring within the SPZ in work areas to confirm that arsenic in air concentrations do not exceed an occupational workplace exposure limit of 0.01mg/$m^3$ (typical European standard)

## 4.4 Air Quality Monitoring

In addition to dust, the gaseous pollutants $NO_2$ and $SO_2$ should be monitored at the following locations on site and in Auezov and Solnyechni village (see Table 6 ).

**Table 7: Air Quality Monitoring Locations**

| Location | Description | Latitude | Longitude |
|---|---|---|---|
| AQ-1 | Northern corner of Auzeov settlement (residential) | 49°42'50.62"N | 81°34'31.03"E |
| AQ-2 | Southern corner of Auzeov settlement (residential) | 49°42'23.07"N | 81°34'50.55"E |
| AQ-3 | Auzeov school | 49°42'21.90"N | 81°34'9.36"E |
| AQ-4 | Eastern corner of Auzeov settlement along access road (residential) | 49°42'52.57"N | 81°35'17.55"E |
| AQ-5 | Solnyechni village along Bursak bypass road (residential) | 49°42'4.50"N | 81°35'52.44"E |

As operations move and develop, the location of the monitoring points will be reviewed to ensure adequate coverage is maintained. Examples of possible equipment selections follow.

### *4.4.1 Gradko Tubes: $SO_2$ and $NO_2$ monitoring*

Gradko monitoring tubes are acrylic tubes designed for passive sampling of airborne gases. The tube contains an adsorbent material which can then be analysed by UV/Visible Spectrophotometry with reference to a UKAS (United Kingdom Accreditation Service) calibration curve, appropriate to this methodology.

If logistical problems in importing and exporting the Gradko tubes present difficulties, alternative monitoring equipment should be selected that will provide continuous averaged results over an extended period of time, and such equipment should be capable of operating 24 hours per day, 7 days per week.

## 4.5 Stack Emission Monitoring

The boilerhouses and heating units will incorporate stacks to remove the gaseous products associated with the burning coal and heating air for ventilation and other purposes.

The stacks will be equipped with a monitoring port for isokinetic monitoring of the flue gases within the stack. The determinands to be monitored and the frequency of monitoring will be agreed with the regulatory authorities.

### 4.6 Meteorological Influences

An onsite weather station will be installed to provide a detailed daily record of wind speed, wind direction, and precipitation.

The air quality monitoring and dust results received from analytical contractors, will be compared with the on-site weather information in order to assess how air quality parameters correlate with weather conditions. These insights could be used to better mitigate and manage dust and combustion emissions from the Project.

### 4.7 Reporting

Dust and air quality analysis will be submitted to local, regional and national authorities as required by legislation.
Periodic revisions to Air Quality Management Plan will be carried out to ensure the plan reflects current practice, and that practice adheres to the current plan.

## 5 ROLES AND RESPONSIBILITIES

### 5.1 Visual Inspections of Dust Monitors

Visual inspections will be carried out on a regular basis (possibly once a week or another reasonable frequency) by the environmental manager, site manager or other nominated person. If the specified person is unable to carry out the inspection, then an alternative suitably trained staff member will be directed to undertake the monitoring.

### 5.2 Stack Emissions Testing

Monitoring of flue gases, and reporting of results will take place in accordance with a schedule agreed with the relevant regulatory authority.

### 5.3 Record Keeping and Reporting

A reporting template will be used to record all inspections. Templates will be filled and kept on site as part of the environmental monitoring data records. The environmental manager at the site will be responsible for maintaining these records in an appropriate way and ensuring that daily inspections are undertaken.

# 6 CORRECTIVE ACTIONS

## 6.1 Action Levels

When analysis received, or real-time monitoring results indicate that there has been a breach of action levels, then appropriate investigative action and remediation measures will be undertaken. These actions would include, but will not be limited to:

- Analysing the weather conditions during the period in which the breach occurred;
- Increased regularity of watering haul roads during dry weather;
- Inspecting vegetation in the vicinity of the detected breach to ascertain if major deposition occurred;
- Checking dust extraction equipment is working correctly; and
- Checking stack emissions filtering equipment is working correctly.

## 6.2 Visual Inspections

Visual inspections and assessment of dust analysis results will inform changes in the mitigation measures in use on site. The introduction of these processes will be documented in order to demonstrate that on-going reviews are taking place. Once implemented these changes will be monitored daily to ensure their effectiveness, and further changes made as required until they are proven successful.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**FRAMEWORK SOIL MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER:** | **MM7** |
| **STATUS:** | **Final** |

**POLYMETAL**

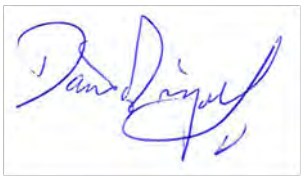
**KYZYL PROJECT**

# FRAMEWORK SOIL MANAGEMENT PLAN

**OCTOBER 2016**

**PREPARED BY:**
Jakub Olewski

**APPROVED BY:**
David Brignall Technical Director







ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Aims and Objectives ..... 1
1.2 Scope of the Management Plan ..... 1
1.3 Roles and Responsibilities ..... 1
**2 SOIL REMOVAL ..... 2**
2.1 Weather Conditions ..... 2
2.2 Topsoil (Organic Rich, Fertile Layer) Stripping ..... 2
2.3 Subsoil Stripping ..... 2
**3 SOIL STORAGE ..... 3**
3.1 Topsoil Storage ..... 3
3.2 Subsoil Storage ..... 3
3.3 Storage Mound Erosion Control ..... 3
**4 MINE CLOSURE, RESTORATION AND AFTERCARE ..... 4**

# 1 INTRODUCTION

## 1.1 Aims and Objectives

The purpose of this document is to provide framework soil management plan for the Kyzyl Project. The aim of it is to protect the soil and its important functions during the Project activities, especially topsoil removal from large areas required for the WRD, TSF, and CPS areas. This will be achieved through the use of best industry practice during soil stripping and storage which will minimise damage to soil's important properties such as organic matter (carbon), nutrient content and biological activity. This in turn will enable for the soil to be effectively restored upon mine closure and create conditions conducive to natural recreation of original habitats.

## 1.2 Scope of the Management Plan

The plan provides general guidelines for good practice mitigation of the potentially adverse effects of mining and associated Project activities on soil resources. The plan considers the effects on soil resources itself, there are other elements of the environment, such as water environment and biodiversity, which will require additional measures. They are addressed in other chapters of the ESIA and they have to be considered with the measures proposed here to ensure that any potential conflicts are resolved before the works commence. The plan is an addition to soil protection measures already included in the Project design and layout, and the mine closure and rehabilitation plan.

## 1.3 Roles and Responsibilities

The plan is prepared for the client who will be responsible for implementation of the proposed measures into the site working strategy (or equivalent document) and ensuring that they are followed during day-to-day work.

# 2 SOIL REMOVAL

## 2.1 Weather Conditions

All soil handling to be carried out in summer months, after snow melt when soil is dry and friable.

## 2.2 Topsoil (Organic Rich, Fertile Layer) Stripping

Vegetation (turf, shrubs) to be removed before topsoil stripping. The stripping to be carried out using soil scrapers or excavators and dump trucks. The stripping to be done systematically from one end so as not to travel over soil to be stripped. Precisely control the depth of operations not to mix topsoil with subsoil. Topsoil depth in the Project area is typically 30cm, but it may be deeper in places.

## 2.3 Subsoil Stripping

Subsoil is a distinctive soil horizon immediately below the topsoil, typically >30cm. Subsoil depth varies and it is not present in many locations to be stripped where depth to bedrock is shallow.

When subsoil is present it should be removed separately to topsoil. Due to large variability between soil profiles, the depth of subsoil will need to be determined during the excavation. Subsoil will typically comprise weathered rock material: sand, clay, rock fragments.

# 3 SOIL STORAGE

## 3.1 Topsoil Storage

Topsoil and subsoil will be stockpiled for the duration of the operational phase of the mine, additional soil stripping will also take place in this phase as the area needed for WRD and other facilities increases due to further rock extraction. It is therefore important to create conditions that maximise the soil ability to support vegetation when restored after mine closure.

The storage area to be stable (undisturbed), protected from wind and water erosion, compaction (no machinery traffic), and contaminants.

To minimise the anaerobic zone at the bottom of the stockpile, international best practice is to keep stockpiles less than 7m high. It is recommended that the gradient of the slopes do not exceed 18.5° to horizontal (1:3).

## 3.2 Subsoil Storage

Subsoil (if substantial surplus present) to be stored separately from topsoil, stockpiles to be up to 10m in height and up to 26.5° to horizontal 1:2 slope gradient.

## 3.3 Storage Mound Erosion Control

### *3.3.1 Seeding of Soil Storage Mounds*

Mounds to be seeded with a mixture of plants typical for the area. The mix should include grasses and legumes, including pioneer species to give immediate cover. Initial irrigation may be needed to help with plant emergence.

### *3.3.2 Mulching*

Vegetation removed from clearing areas such as TSF to be used as a mulch for the topsoil storage mounds. The mulch to be spread evenly and cover 70–75% of the surface (to protect the soil sufficiently at the same time not delaying plant emergence and growth).

### *3.3.3 Sediment Control Measures*

Construct cut-off ditches around the soil mounds to prevent soil loss and pollution of watercourses with sediment.

# 4 MINE CLOSURE, RESTORATION AND AFTERCARE

A restoration and aftercare plan will be implemented as a key element of mine closure (Appendix 5), which will include the reinstatement of the land surface and management of disturbed soils as a resource for the restoration of decommissioned areas, including the WRD, CSF, TSF, processing plant, roads, and other site infrastructure.

Land to be re-graded to the target landform shaped so as to minimise risk of soil erosion. The slopes should not exceed 18.5 degrees to horizontal, they should be terraced. Topsoil chemical analysis to be carried out to ensure optimal plant growth conditions, fertilisers and other soil amendments to be applied according to the needs. For the waste rock dump areas mix of perennial fodder plants should be used. Surfaces of TSF and CSF should be sown with non-fodder species. Initial irrigation may be needed to support the germination and establishment of vegetation.

The aftercare to include temporary restriction of access to the area until the vegetation cover is established and controlled intensity of grazing until the condition of the land can withstand typical stocking rates and grazing frequency used in the region.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**BIODIVERSITY MANAGEMENT PLAN**

**October 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

**DATE ISSUED:** **October 2016**
**JOB NUMBER:** **KZ10061**
**VERSION:** **V2.0**
**REPORT NUMBER:** **MM8**
**STATUS:** **Final**

**POLYMETAL**

**KYZYL PROJECT**

# BIODIVERSITY MANAGEMENT PLAN

**September 2016**

**PREPARED BY:**
Helen Simpson Associate Director

**APPROVED BY:**
David Brignall Technical Director





ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 INTRODUCTION ..... 1**
1.1 Objectives ..... 1
1.2 Scope ..... 1
**2 LEGISLATIVE, REGULATORY AND POLICY FRAMEWORK ..... 2**
2.1 Republic of Kazakhstan Law ..... 2
2.2 Lender Policies, Requirements and Standards ..... 2
2.3 Polymetal Policy ..... 2
**3 ROLES AND RESPONSIBILITIES ..... 2**
**4 BIODIVERSITY MANAGEMENT PLAN ..... 3**
4.1 Management for Vegetation ..... 4
4.2 Management for Raptors, such as Golden Eagle and Steppe Eagle ..... 5
4.3 Restoration ..... 5
4.4 Management for Brook Akbastaubulak ..... 6
**5 REPORTING AND DOCUMENTATION ..... 6**
5.1 Government/ Kazakh Authority Reporting ..... 6
Polymetal will comply with any Kazakh requirements and government reporting requirements relation to biodiversity management. ..... 6
5.2 Internal Reporting ..... 6
**6 BIODIVERSITY ACTION PLAN ..... 6**

**TABLES**

Table 1: General Approach to Biodiversity Mitigation Measures ..... 3

# 1 INTRODUCTION

This Biodiversity Management Plan (BMP) is an outcome of the Environmental and Social Impact Assessment (ESIA) for Polymetal's Kyzyl Project in Kazakhstan (hereafter referred to as "the Project"). It is a stand-alone document that details the practical, biodiversity-related actions to be undertaken during the implementation of the Project, along with responsibilities, timeframes and monitoring requirements and associated procedures. Although largely site-focused, the BMP also includes actions that need to be taken during the detailed Project design phase (i.e. pre-construction).

The BMP provides an instructional working document for management of biodiversity and ecosystem impacts during Project design and implementation, and will be used by Polymetal to ensure that necessary measures are implemented to comply with national laws and lender policies, and to address stakeholder concerns relating to biodiversity and ecosystem services, as identified in the ESIA. The BMP describes mitigation and management measures, identifies the parties responsible for their implementation (e.g., company, contractor, government) and specifies the required monitoring and monitoring schedule.

This BMP is a "live" document, and is expected to evolve and to be enhanced as necessary throughout the Project detailed design, construction, operation and decommissioning phases.

This document may be used by Polymetal, to provide instruction to one or more sub-contractors expected to undertake the bulk of the Project. However, Polymetal retains ultimate responsibility for ensuring that the measures outlined in this BMP are implemented.

## 1.1 Objectives

Responsible mining is a commitment of Polymetal, in order to reduce risks and minimise negative impacts resulting from development.

The Project is also committed to comply with the EBRD's Performance Requirements (PRs), specifically PR6 entitled 'Biodiversity Conservation and Sustainable Management of Living Natural Resources'. PR6 recognises that the conservation of biodiversity and sustainable management of living natural resources are fundamental to environmental and social sustainability.

## 1.2 Scope

This BMP applies to management of biodiversity and ecosystem issues during Project implementation. The document is based on the ESIA's baseline and impact assessment chapters on biodiversity as well as Chapters 4 and 5 of the SESR, where complementary data are presented. There is overlap between the BMP and other management plans, since some mitigation measures

developed for other disciplines (e.g. soil erosion control; surface water management) will also assist with protection of biodiversity.

# 2 LEGISLATIVE, REGULATORY AND POLICY FRAMEWORK

The Project must comply with several laws, regulations, and policies and standards relating to biodiversity. These include the national Laws of the Republic of Kazakhstan (RoK); the requirements and policies of potential financial lenders to the Project, such as the EBRD; and Polymetal's own internal policies.

## 2.1 Republic of Kazakhstan Law

The main legislation relating to biodiversity and ecosystems in Kazakhstan is set out in Chapter 2 of the ESIA.

## 2.2 Lender Policies, Requirements and Standards

Potential financial lenders to the Project have policies relating to environmental and social management. Specifically, the EBRD's PR6 relates to the conservation and protection of living natural resources, which recognises the importance of maintaining core ecological functions of ecosystems and the biodiversity they support. All ecosystems support a complexity of living organisms and vary in terms richness, abundance and importance of species.

## 2.3 Polymetal Policy

Polymetal aims to achieve 'no net loss' (NNL) of biodiversity and to ensure that biodiversity and ecosystem functions are not systematically degraded or lost from the landscape as a result of the Project. This means that species occurring in the Project's area of influence should have the same chances of long-term survival with the Project in place as without it and have access to similar amounts of suitable habitat as in the baseline situation.

# 3 ROLES AND RESPONSIBILITIES

Polymetal has final responsibility for ensuring that the ESIA's commitments are met, and therefore that the BMP is implemented correctly. However, much of the day-to-day responsibility for ensuring the implementation of the management and mitigation measures outlined in this BMP will fall to the contractor or contractors engaged in the on-site works. The detail of the responsibilities assigned to the contractor(s), and of the environmental and social staff that the contractor(s) will employ, depends in part on the project contracting strategy.

# 4 BIODIVERSITY MANAGEMENT PLAN

The BMP is an instructional document that sets out the mitigation and management requirements and responsibilities to be implemented on site to fulfill the Project's biodiversity objective. The protocols, procedures, forms and documentation required to implement the BMP (many of which are specifically identified in the BMP tables) will need to be developed as part of development of the Project ESMP, during the pre-construction phase of the Project.

Ultimate responsibility for the successful implementation of the BMP lies with Polymetal, although it is expected that the BMP will be provided to site contractors to inform them of Polymetal's expectations as to how their work is conducted.

The BMP is a "live" document, to be adapted and enhanced as the Project progresses. In the event that impacts not anticipated by the ESIA arise during the Project, and require mitigation, then they should be added to the BMP. Mitigation should always be devised in line with the mitigation hierarchy: avoid, reduce/minimise, restore, offset. More detail on this general approach is shown in Table 1:

**Table 1: General Approach to Biodiversity Mitigation Measures**

| Step in mitigation hierarchy | Typical Measures and Commitments |
|---|---|
| Avoid | Impacts on highly irreplaceable biodiversity should be avoided unless it can be proved that effective mitigation or an effective offset is possible without compromising viability.<br><br>Impacts should be avoided (e.g. by relocating infrastructure or carrying out activities at a more suitable time) if:<br>• There is a risk of losing biodiversity with very high irreplaceability.<br>• Biodiversity affected is threatened and declining throughout its remaining area of occupancy.<br>• Impact will result in remaining portion of the resource becoming non-viable because critical viability thresholds have been exceeded (remaining habitat too small or fragmented, population unable to recover).<br>• Recovery from impact is uncertain and no proven mitigation measures are known. |
| Minimise | Improve measures/design to minimize ecological impacts e.g. by reducing proportion affected, reducing magnitude or intensity of impact. Other measures include covering leachate ponds to prevent mortality of small mammals, amphibians, reptiles and birds. |
| Restore or repair | Post-impact measures to restore the condition of biodiversity in its current location, e.g. diversification of vegetation that has become disturbed during construction and restoring its pre-impact species composition. This is necessary for all areas where vegetation has been cleared, e.g. for haul roads or for temporary storage of materials or components. It will also be necessary for the temporary camp. |
| Offset | Possible offset opportunities |

It is a fundamental assumption of the BMP is that suitably qualified and trained staff will be present on site and constantly engaged in checking and verifying that the various mitigation measures are being implemented correctly.

## 4.1 Management for Vegetation

### *4.1.1 Avoid*

Although no rare species have been identified on site, in the event that these were to be found they should be avoided by:

- clearly marking the location of the species;
- educating employees/contractors regarding occurrence of important species in the area and the importance of their protection;
- erect temporary fencing around the species to exclude workers and construction equipment and vehicles; and
- maintaining a protective buffer around the species to exclude unintentional disturbance.

### *4.1.2 Minimise*

Minimise disturbance of habitats and flora by:

- use of construction methods to minimise excavation works;
- restricting site and private vehicles (mine personnel) to designated access roads, haul routes and working areas to prevent disturbance;
- restricting foot traffic in areas to prevent disturbance; and
- Suppressing pollution which could degrade vegetation and habitats in adjacent zones. The pollution prevention measures identified in the environmental design criteria should be effective in reducing localised deposition and pollution affecting vegetation; as well as reducing the potential for contamination of surface and ground water which may be taken up by these species

### *4.1.3 Restoration*

Carry out research work in partnership with the RoK botanical specialists to establish effective techniques for restoring the vegetation types affected by the Project.

Develop an aftercare programme to include activities such as:

- Re-seeding and re-planting of the swards where there have been failures to establish or grow;
- Addition of fertiliser or other ameliorants to re-build soil fertility;
- Maintenance of wind and water erosion control measures; and
- Management of grazing on agricultural pasture areas.

### *4.1.4 Offset*

Not Required

## 4.2 Management for Raptors, such as Golden Eagle and Steppe Eagle

### *4.2.1 Avoid and Minimise*

Only one individual golden eagle and also, in a survey from August 2016, one individual steppe eagle (IUCN Red Listed as 'endangered'), were spotted circling at high altitude above the Project area. It was determined that the Project area does not include any critical habitat for these raptors, specifically that no nests were deemed to be present on the Project site. In order to verify the longer-term status of these populations, as well as to confirm whether nesting occurs on site, it is required that Polymetal support:

- For ascertaining the possible nesting of steppe eagle, a spring survey of the terrain within the Project area is needed;
- Additional surveys every 2 or 3 years to monitor the condition of populations of bird species and to add corrections to the environmental protection measures, as needed

Large raptors, such a golden or steppe eagles, are also at risk of electrocution when power transmission lines are difficult to navigate or and cross-migrating and feeding bird flight paths; and where there is insufficient separation between energised phase conductors (also called 'phases') and between phases and grounded hardware.

Mitigation measures should include:

- use of construction methods to minimise excavation works;
- restricting site and private vehicles (mine personnel) to designated access roads, haul routes and working areas to prevent disturbance to prey species or degradation of prey species habitat;
- restricting foot traffic in areas to prevent disturbance to prey species or degradation of prey species habitat;
- Suppressing pollution which could degrade vegetation and habitats in adjacent zones (making them less attractive to prey species) or which could accumulate through the food chain. The pollution prevention measures identified in the environmental design criteria should be effective in reducing localised deposition and pollution affecting vegetation; as well as reducing the potential for contamination of surface and ground water which may be taken up by vegetation and / or prey; and
- Installation "avian-safe" power transmission lines (see below).

## 4.3 Restoration

Soil and habitat restoration, as dealt with in Mine Closure Plan (MP5) and soil erosion plan (MP7) will reinstate potential area of lost hunting habitat

### *4.3.1 Offset*

Not required

## 4.4 Management for Brook Akbastaubulak

### *4.4.1 Avoid*

The diversion of the Akbastaubulak brook cannot be avoided as it is essential for ensuring that potential contamination from the Waste Dump does not enter the surface water environment and at present the brook goes through the pit and mine site locations. A baseline ecological study around Akbastaubulak Brook was carried out by "The Wild Life Laboratory" ecological surveyors in 2013 and has now been made available to WAI (see Appendix E). The study shows that no endangered or rare species are present at and around Akbastaubulak Brook.

### *4.4.2 Restoration*

The Waste Dump would remain in situ post-operation / upon mine closure. Restoring pre-project flows to Akbastaubulak are not currently considered possible.

### *4.4.3 Offset*

Not Required

# 5 REPORTING AND DOCUMENTATION

## 5.1 Government/ Kazakh Authority Reporting

Polymetal will comply with any Kazakh requirements and government reporting requirements relation to biodiversity management.

## 5.2 Internal Reporting

Additional surveying for raptors should be undertaken every 2 to 3 years. This monitoring should be reported to the Polymetal board of Directors as part of PMs Environmental and Social Monitoring. Annual aquatic ecological surveys will also be undertaken to monitor the health of the water courses that are affected by the site.

# 6 BIODIVERSITY ACTION PLAN

A Biodiversity Action Plan is not necessary for the Project because the surveys conducted suggest the site does not house any critical habitat or priority biodiversity features for species listed as endangered by the IUCN Red List.

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

POLYMETAL

**KYZYL PROJECT**

**TRAFFIC MANAGEMENT PLAN**

**OCTOBER 2016**

*your earth our world*

wardell armstrong

**Wardell Armstrong International**
Baldhu House, Wheal Jane Earth Science Park, Baldhu, Truro, Cornwall, TR3 6EH, United Kingdom
Telephone: +44 (0)1872 560738 Fax: +44 (0)1872 561079 www.wardell-armstrong.com

your earth our world

| | |
|---|---|
| **DATE ISSUED:** | **October 2016** |
| **JOB NUMBER:** | **ZT52-0156** |
| **VERSION:** | **V1.0** |
| **REPORT NUMBER:** | **MM9** |
| **STATUS:** | **Final** |

**POLYMETAL**

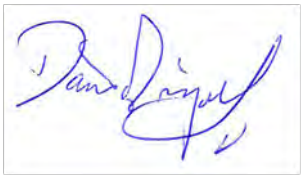
**KYZYL PROJECT**

# TRAFFIC MANAGEMENT PLAN

**OCTOBER 2016**

**PREPARED BY:**
Amer Waheed

**APPROVED BY:**
David Brignall Technical Director







ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

**CONTENTS**

**1 TRAFFIC MANAGEMENT PLAN ..... 1**
1.1 Introduction ..... 1
1.2 Abnormal Loads ..... 1
1.3 Standard Load Trucks ..... 3
1.4 Notifications ..... 5
1.5 Contingency Plan ..... 7

**APPENDICES**

APPENDIX 1: Site Traffic Map
APPENDIX 2: Example Driver Code of Conduct

# 1 TRAFFIC MANAGEMENT PLAN

## 1.1 Introduction

Appointed contractors must agree temporary traffic management measures then adopt and monitor an appropriate way of working in consultation with the local municipality and police.

This Traffic Management Plan (TMP) proposes measures to enhance the efficient transport of plant components and the materials to / from site, whilst minimising congestion and disruption which might affect general traffic and in particular the emergency services. Wear and tear on the public roads which will constitute the operational vehicle routes to site is also considered. This document represents a commitment to satisfy roads and transport commitments and will be finalised as agreed between the contractor and the relevant stakeholders prior to commencement on-site.

## 1.2 General Traffic Management Measures

The following measures will be implemented for the project:

- Chartered buses will be used to transport workers between the mine site and their accommodation;
- Chartered buses or car sharing to be used to transport Senior Management between the mine site and their accommodation;
- Bus occupancy will be monitored in order to ensure that most efficient service level will be provided;
- Strict control of access to the mine site to authorised vehicles only, through the use of security gates. This will be in conjunction with advising workers that the use of personal vehicles to travel to site is not allowed except for a limited number of staff who will have to apply for a specific permit which will be reviewed on a regular basis. Permit allocation will be controlled by the site manager;
- Where private vehicle use is required (for example contractors with equipment to bring to site), workers and supervisors will be encouraged to car pool.
- Construction works will be staged to minimise traffic congestion effects. Working hour arrangements will be modified and haulage tasks avoided during any peak traffic periods.
- Only approved truck routes will be used for the haulage of materials and equipment. All deliveries will be managed and coordinated by the project management team to minimise impacts to local highways and nearby communities;
- A detailed phasing programme for deliveries will be developed to avoid overloading public highways throughout the construction and operational periods and ensure deliveries are spread evenly throughout the day;
- Traffic conditions during the construction and operational periods will be monitored in order to identify and address any negative impacts;
- Speed restrictions will apply in areas subject to road works and construction;
- A standard journey management plan will be prepared for the mine. The journey plan will address trip routes, health and safety requirements, hazards, driving and road conditions, fatigue management, communications, control measures, emergency procedures and security requirements;
- Vehicle and driver safety education and training courses will be developed and reviewed by the mine ‘s Environmental Safety and health representative;
- Action plans and procedures will be prepared to manage staff and traffic movements in adverse weather conditions and winter months;
- Site Managers will ensure implementation of the project vehicle inspection and maintenance;

- A wheel washing facility will be provided at the site entrance and other appropriate locations to minimise the level of dust and earth transported off-site;
- Appropriate signage and traffic controls are to be provided at all site junctions with the public highways;
- Adequate on-site parking and turning areas will be provided to accommodate all anticipated vehicles movements;
- Polymetal will ensure adequate consultation is undertaken with the appropriate regulatory authorities;
- Where practicable, the local community will be notified about proposed changes to local traffic conditions due to construction and mine activities, including the provision of advanced notice, clear signage of changed traffic conditions and as required, traffic control personnel; and
- Any construction near or encroaching on inter-state highways will be agreed with the relevant authority and conform to statutory requirements. If the road is State-controlled, an application for ancillary works permits should be made to the relevant authorities.

## 1.3 Abnormal Loads

***Introduction***

Pre-defined access routes will be used by long, wide and/or heavy load vehicles transporting power plant components. These routes will be agreed with the relevant authorities in advance and the police will be notified. The abnormal loads associated with the project will be identified prior to commencing construction activities.

***Delivery Plan***

Plant components shall be delivered to site in sufficient time to meet the agreed programme, and in accordance with the requirements of the local municipality and police.

Components will be delivered to site by road and stored at the work compound or other suitable location adjacent to the defined delivery route. It will be the contractor's responsibility to identify a suitable storage location and obtain any necessary authorisations.

It is recommended that pilot escort vehicles be used to provide an escort for all abnormal load vehicles travelling to the site. The general preference in these situations is to employ a convoy system, with a vehicle at the front and rear to warn oncoming vehicles of the approaching load. The escort would also help to ensure minimised disruption of flow for other road users by pulling the convoy over at pre-identified locations to allow [if any] build-up of following traffic to pass. Drivers responsible for operating the convoy should be fully briefed on the route, where and when to make the pre-defined stops, and be aware of all contingency measures in place in the event of an incident occurring. All vehicles and lead traffic management staff shall be in contact with the use of two-way radios.
Pedestrian safety is a high priority; additional traffic management staff (requirement to be agreed with Police prior to transportation) will be made available for any locations where pedestrians are most likely to be in evidence.

Clear roadways are needed to allow transporters passage through geometrically constrained sections of the route. At strategic locations parking will require to be restricted at times of delivery.

A driver's induction for abnormal load vehicles will include;

- safety briefing including detail of all contingency measures;
- the need for appropriate care and speed control;
- identification of specific sensitive areas; and
- clarification of identified route, the requirement not to deviate from this route, the requirement to adhere to convoy system and pull over at pre-defined points to allow build up of traffic to pass.

As an integral part of the TMP a contingency plan will need to be developed, in consultation with the local authorities to cover an event where an abnormal load becomes immovable on the public road, for any particular reason.

### 1.4 Standard Load Trucks

***Delivery Plan***

General site traffic and general construction / operational traffic will not require the presence of an escort when travelling to and from site. Drivers should however be aware of route and contingency measures as pre-defined at induction stage. Drivers of HGV are to be briefed in good road practice and will be instructed to pull over on narrow sections of road to allow build-up of traffic to pass. As with the abnormal load movements this will be detailed in the driver induction and should be made clear to all relevant personnel prior to any vehicle movements.

All general site traffic and construction / operational vehicles will run to coincide with site working hours, or as required per specific planning conditions. Normal load vehicles will generally use a defined route, which will need to be agreed for each phase as works proceed.

To avoid unnecessary clutter signage will be kept to a minimum, however temporary direction signs indicating local routes to site and site entrances (statutory and site identification boards) will be required at strategic locations on local roads. The detailed signing arrangement will be agreed between the appointed contractor in close liaison with the local municipality and the police service.

As discussed in the Transport Chapter, arrangements will be made for site workers to be transported to site via shared transport [i.e. bus] to minimise unnecessary traffic movements locally. The Applicant will be required to implement induction procedures and regular up-dates for all drivers to establish and promote an overall culture of safety and awareness of other road users.

*Environmental Protection*

During the construction and operational phases the contractor / Applicant will be required to undertake regular inspections to ensure roads are clear of mud and other debris, together with dust suppression during periods of dry weather, at locations where access tracks meet the public roads.

Adequate on-site parking facilities will be provided within the curtilage of the site to accommodate plant, delivery vehicles, site operatives and visitors vehicles.

A wheel and chassis wash facility which operates on a closed cycle shall be installed at a location(s) approved by the local municipality and shall be operated throughout the construction and operational periods. The public roads adjacent to site accesses shall be regularly cleaned (utilising mechanical brushers where appropriate) so that the presence of mud, dirt, stones and other deleterious material arising from construction activities is minimised.

Where fuels are taken to site, this will be restricted to the minimum amount required for the plant and equipment on site.

All waste materials will be removed from site in accordance with relevant waste and environmental regulations. Wherever possible, waste will be minimised and materials reused and recycled.

Access routes will be monitored by the contractor and Applicant to ensure that damage to walkways, driveways, accesses, bridges, walls, verges and property does not occur. Where accidental damage occurs, the contractor will promptly make good any damage to public and private property and land.

Where road improvement works involve unavoidable impacts to walls, hedges, verges, banks and drainage channels, these features would be either realigned as part of the design of the works or (such as in the case of walls which need to be temporarily removed) re-instated.

Road improvement works would use materials sympathetic to the landscape character of the area in which they are proposed.

Any requirement for works to culverts and bridges over watercourses will be agreed with the local municipality and relevant national environmental authority and the contractor will be required to adhere to any special requirements which may be specified.

In all locations, works will be kept to the minimum area necessary and disturbance to areas outside the mine(s) infrastructure and designated access roads by, vehicles and personnel would be avoided.

*Car and Medium Goods Vehicle Journeys*

It is probable that cars and small vans used by site operatives and visitors will use similar routes to that proposed for trucks, dependent upon their point of origin. It is not proposed to designate or restrict routes for these types of vehicles.

Wherever possible, arrangements will be made for site operatives to be transferred to/from site via bus from local settlements.

Adequate on-site parking facilities will be provided within the curtilage of the site to accommodate site operatives and visitors vehicles.

## 1.5 Road Design

The road design must take into account:

- Type of equipment that will use the road;
- The amount of traffic expected;
- Traffic flow and potential peak periods;
- The skill level and competence of expected road users (i.e.: trained personnel, general public etc.);
- The topography of the land;
- Soil types and available road construction materials;
- Rainfall and abnormal weather events;
- Road sign requirements;
- Intersection layout;
- Berm construction;
- Water management; and
- Dust control.

## 1.6 Parking and Vehicle Security Requirements

When a vehicle is left unattended:

- The engine must be switched off;
- The vehicle must be left in first or reverse gear (automatic park);
- The park brake must be fully applied;
- If on a slope the wheels must be chocked and turned so that the vehicle will roll into the kerb or embankment,
- Must not be within 50 metres of any a heavy vehicle or equipment such as a Bulldozer or Grader.

## 1.7 Road Condition Reports and Maintenance

Drivers using the roads will notify the Site Manager of the roads conditions who would in turn produce a report for the Management meetings. All roads that are the responsibility of the company will be inspected at least weekly. Information on off project area roads will be provided by drivers on those roads. Road maintenance will be conducted to maintain roads in a safe condition based on the reports. Where maintenance is not able to be performed in a timely manner then other controls will be implemented including;

- Regulating access;
- Utilising alternate routes;
- Regulating traffic/speed;
- Closing sections of roads and using signage.

## 1.8 Interaction with Heavy Vehicles or Equipment

Light vehicles and Pedestrians will not permitted within 50 metres of any operating heavy equipment. To approach heavy equipment a person must either:

- Contact the operator via two way radio or phone; or
- Make visual contact with the operator.

The operator must confirm the contact by replying over the radio/phone or visually acknowledge they have seen the Light Vehicle/ person. The operator will then stop his machine and apply the park brake before giving permission for the person to enter the work area. Any interaction of heavy equipment and a person on the ground (i.e. spotter) must be controlled by an established procedure approved by the Project Lead.

## 1.9 Notifications

***Emergency Services***

Consistent with the procedures defined through prior consultation; the local municipality, Police and other relevant authorities will be given written notice of abnormal load deliveries associated with the project works. Weekly and daily communication will be necessary in advance of the vehicles leaving their origin by road.

The Applicant is committed to working with the Police and other emergency services to ensure that essential deliveries associated with the development do not cause any significant detriment to emergency service response locally.

***Local Municipality***

The local municipality will be given four weeks written notice of the abnormal load deliveries, weekly updates will be provided as the delivery timetable is finalised with the supplier during the delivery period.

The Applicant will work with the local municipality to develop media awareness of the project.

The Applicant will work with the highway authorities to identify planned engineering works which might conflict with the delivery route times. Discussion will then be made to minimise the potential for associated disruption to local communities.

***Local Communities***

The Applicant and contractors will maintain close liaison with local community representatives, landowners and statutory consultees throughout the construction period. This would include circulation of information about ongoing activities and in particular those which could have potential to cause disturbance. A telephone number will be made available during operational hours and persons with appropriate authority to respond to calls and resolve any problems that occur would be made available.

The Applicant and contractors will liaise with the relevant local authority and community to identify major events in the area and to programme the works to ensure that these did not disrupt the local road network on those days.

Information on proposed construction deliveries and in particular abnormal load deliveries will be communicated through local notice boards as appropriate. Additionally regular public notices will be given out through the project website, local newspapers and local radio as the project progresses.

## 1.10 Contingency Plan

The emergency/contingency plan is designed to provide a safety net which details how unplanned circumstances that may arise would be dealt with.

A meeting will be held with key stakeholders and information and comment provided at that meeting will be utilised in developing a contingency plan.

The contingency plan is particularly focused on the potential concerns regarding blockage of the public road network for a significant period as a consequence of, for instance mechanical breakdown to one of the abnormal load vehicles.

A trial run of transporter vehicle simulating the maximum length load predicted will be carried out, the trial run will be escorted by experienced traffic management specialists and the Police. The trial run will assist the project in determining likely timings and also that there are suitable locations to stop large vehicles to allow general traffic to pass. It will also allow the Police to consider locations where additional road safety (pedestrian and traffic) management would be beneficial.

***Assumptions***

The haulage contractor will be a specialist within the field of moving abnormal loads. The vehicles and trailers used by the hauliers will use state of the art hydraulic trailer technology and come from a modern in house fleet.

The drivers that are employed in the operation of moving the abnormal loads will be experienced at performing movements of this nature and are fully experienced in the vehicles operating capabilities and restrictions.

Pilot escort vehicles will accompany each abnormal load journey, and on certain sections of the road that are particularly narrow or single track the convoy will effectively create a temporary 'rolling road closure'. The presence of pilot escort vehicles will help to ensure the greatest possible safety when transporting abnormal loads and provide forewarning for other road users. This should result in less impedance occurring along the route and hence reduce the likelihood of a major incident occurring.

***Proposed Contingency Measures***

Along with planning for the foreseeable causes of impedance that could cause the abnormal load transport delay or obstruction it still remains a possibility that a vehicle may break down along the

route. Should such a situation occur it is important that appropriate contingency measures are in place to cope with any such problem and essentially minimise the disruption to normal traffic flows.

## 1.11 Information to Contractors and Suppliers for Deliveries

Prior to start of Phase 1 operations, a detailed traffic management plan will be developed by the Site Manager and will be circulated to all contractors and suppliers for deliveries. The traffic management plan will be reviewed every quarter and updated if required.

The following sections describe the various aspects to be covered in the traffic management plan.

### *1.11.1 Site Traffic Map*

The site traffic map will include information on the following:

- Recommended safe route to access the project and alternative routes where available;
- Traffic flow direction;
- Speed limits;
- Hazardous areas;
- Parking areas;
- Areas to segregate pedestrians and vehicles;
- Areas to segregate light and heavy vehicle areas,;
- No go areas such as sensitive community, environmental or heritage areas;
- Gates to be left open/closed.

### *1.11.2 Hazardous Areas and Specific Controls*

Information on site specific project hazards such as :

- Steep slopes requiring low gear selection ;
- Creek crossings;
- High risk pedestrian areas;
- Heavy vehicle operation areas;
- High risk security areas;
- High risk wildlife areas;
- Dust areas and actions to take to avoid;
- Road damage areas;
- Adverse weather procedures, i.e. “go/no go” criteria for abnormal road conditions (e.g. rain, snow, high winds, creek and river crossings).

wardell-armstrong.com


STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

**International offices:**

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel : +7(727) 334 1310

MOSCOW
Office 4014
Entrance 2
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: (495)626-07-67

**Wardell Armstrong Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820


*your earth our world*

wardell armstrong