Komi Aluminium

Komi Aluminium Programme

Executive Summary of Environmental and Social Impact Assessment (ESIA)

PROPOSED EXPANSION OF THE MIDDLE TIMAN BAUXITE MINE FROM 2.5 MTPA TO 6 MTPA AND EARLY WORKS AT THE SOSNOGORSK REFINERY SITE

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1. INTRODUCTION AND OVERVIEW

SUAL Group, the Russian-based integrated aluminium producer is currently contemplating a large-scale aluminium development in Komi Republic, Russian Federation. The development, which is known as the 'Komi Aluminium Programme', is made up of three separate projects namely:

- **Phase 1** – Expansion of the Middle Timan Bauxite Mine (MTBM)
  - 1a – continued expansion to 2.5 million tons per annum. The appropriate project documentation has been developed and a positive conclusion issued by the State Environmental Review (SER). All other necessary approvals have been obtained and the expansion started in 2003.
  - 1b – further expansion to 6,0 million tons per annum. The project documentation is currently being developed. It is anticipated that the expanded capacity will be achieved in 2007, with work starting in mid 2005.
- **Phase 2** – Potential establishment of an Alumina Refinery in the Ukhta/Sosnogorsk area with a capacity of 1,400,000 tonnes per year.
- **Phase 3** – Potential establishment of an Aluminium Smelter with a capacity of 300-500,000 tonnes per year.

SUAL is currently assessing the technical, economic, environmental and social feasibility of the three projects and preparing a Bankable Feasibility Study for each. This will culminate in a Russian State Environmental Review (SER) for each of the three projects including Environmental Impact Assessment (or OVOS) documents. At the same time the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) have been approached for loan financing for the programme. IFC's safeguard policy on environmental assessment and similar EBRD policy, states that all projects proposed for IFC and EBRD financing require an environmental due diligence to ensure that they are environmentally and socially acceptable.

This document presents a summary of the various deliverables included in the environmental assessment requirements of Phase 1b of the proposed Komi Aluminium Programme. These deliverables include an Environmental and Social Impact Assessment (ESIA) for the proposed mine expansion, a Public Consultation and Disclosure (PCD) strategy for the entire programme and the PCD P for the mine expansion, an Environmental Analysis of the so-called 'early works' requirements for the refinery and a socio-economic baseline of the area that will be affected by the two proposed projects. The executive summary is structured to include the operational context, proposed projects, mine expansion alternatives, environmental and social baseline in the Timan (mine) and Sosnogorsk (refinery) areas, potential environmental impacts and the significance of those impacts, and finally the Environmental and Social Action Plan (ESAP) for the proposed mine expansion.

2. OPERATIONAL CONTEXT

2.1 Proposed expansion of the Middle Timan Bauxite Mine (MTBM)

The Middle Timan Bauxite Mine (MTBM) was established in 1996 in the northern part of the Knyazhpogost District (Fig. 1), near the boundaries of the Ust-Tsilemski and Udorski Regions in the Republic of Komi. Bauxite Timana (BT), the company that owns the mine, is situated in Ukhta, which is the closest large city to the mine (a distance of some 230 km by road). The nearest formal settlement is the village of China'voryk, which is some 157 km from the mine. In the initial years of the mine's operations, bauxite was transported by truck using a haul road that extends for some 160 km from the mine, to the village of China'voryk. In 2002 a railway line was completed and the bauxite is now transported by rail directly from the mine to China'voryk and from there on to the Uralsk

Aluminium Refinery (1755 km) and the Bogoslovsky Alumina Refinery (1815 km). The mine has been operating since 1998 at a rate of up to 1.0 million tonnes per year (mtpa) but has recently obtained all necessary approvals to expand the capacity to 2.5 mtpa. As part of the proposed Komi Aluminium Programme, the feasibility of expanding the mine's capacity to 6 mtpa is currently being investigated, with a possible alternative of increasing capacity to only 4 mtpa.

2.2 Proposed Sosnogorsk Alumina Refinery

At the same time, work is progressing on the feasibility study for the alumina refinery, which is being proposed near the City of Sosnogorsk. As part of that feasibility study Komi Aluminum will commence all geotechnical studies and other fieldwork required under Russian guidelines during the summer of 2004. This will be principally geotechnical work in the refinery and proposed tailings areas (preferred and alternative), and railway spur areas, and will include drilling and clearing of the areas to ensure access. All land disturbances will be protected with diversion ditches and all material will be stockpiled for reclamation purposes. A single temporary access road to be used by all persons visiting the site will be constructed.

2.3 Next steps of the Komi Aluminium Programme

The establishment of the refinery (and smelter) is contingent on the feasibility of expanding the mine. The location of the refinery is currently being evaluated as a component of the feasibility study. A key condition of the IFC and EBRD approving funding for the project is that an Environmental and Social Assessment is undertaken for all phases of the project and that each phase receives positive approval from the Russian environmental authorities. A Declaration of Intent (DoI) for the refinery was submitted to the Russian Authorities in March, 2004 as per Russian requirements. In addition, an Environmental and Social Impact Assessment (ESIA) is being completed for the proposed mine expansion as per the requirements of EBRD and IFC, and an 'OVOS' is under preparation as per the Russian Regulations. Both of these processes will be completed by the end of 2004 and will include full public consultation and disclosure of all final reports for the ESIA, ESAP and OVOS.

2.4 Project investment

The project companies are OAO Bauxite Timana (an existing company) and ZAO Komi Aluminium (a new company) established to operate the planned integrated bauxite/alumina/aluminium project. OAO Bauxite Timana was established to run MTBM and holds the current mine license. The project sponsor is the SUAL Group, Russia's second largest aluminium producer and a major exporter. SUAL Group owns approximately 80% of OAO Bauxite Timana, with the remainder held by the Government of the Republic of Komi. ZAO Komi Aluminium is owned 100% by the SUAL Group. The total cost of Phase 1 is approximately US$300 million. Sual is seeking IFC and EBRD financing of US$150 million, of which US$100 million will be disbursed for the mine expansion, and US$50 million on the feasibility study and refinery early works.

2.5 Russian legal and institutional framework

2.5.1 Environmental assessment requirements

The proposed mine expansion and refinery will be implemented under Russian Federation and Republic of Komi environmental, social, health, and safety requirements. The Environmental Assessment requirements are:

- Preliminary Assessment that includes the Act of Site Selection and Declaration of Intent;
- Preparation of a Scope of Work for an Environmental Assessment;

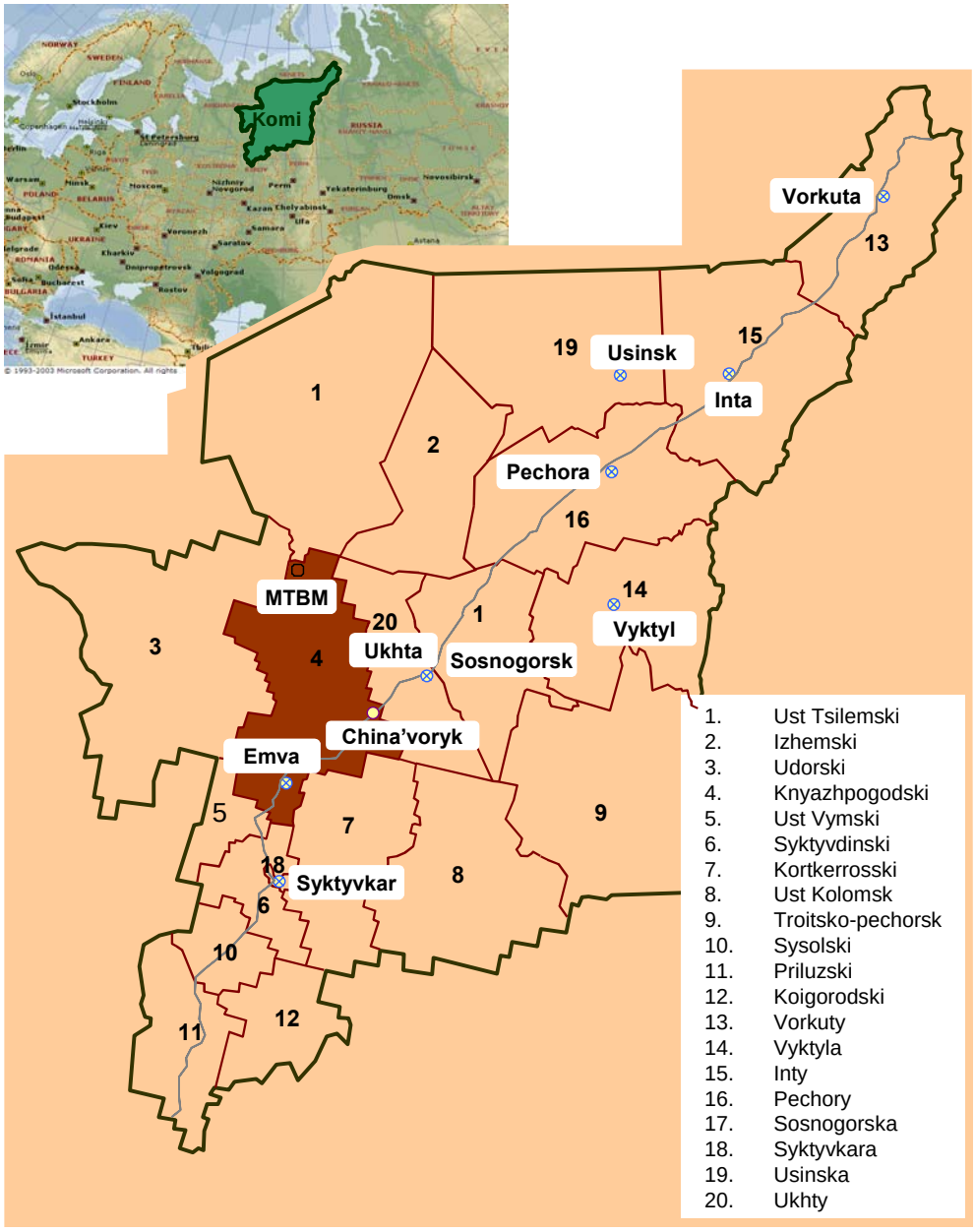

Figure 1: Map of Komi Republic, showing the position of the mine, the various districts (Knyazhpogost highlighted) and major cities/towns.

- The Environmental Impact Assessment itself which consists of two parts namely:
  - Investment-level Feasibility (TEO-I) – the EIA (called an OVOS in Russian) is submitted as a separate volume. This OVOS is still preliminary but is more detailed than the Preliminary Assessment described above.
  - Construction-level Feasibility (TEO-C) – a separate volume on Environmental Protection is submitted. The section on environmental protection is very detailed and includes specific actions regarding effective resource use, waste and pollution minimization and reclamation.

All TEO documents (including the OVOS and environmental protection documents) are submitted for State Environmental Review (SER), which issues a positive or negative conclusion. A positive conclusion indicates that the project is acceptable and that it can proceed to construction. Public consultation is a recognized and important part of the EA process and public meeting protocols and minutes must be attached to the documents that are submitted.

2.5.2 Detailed engineering/operational permitting

As part of detailed engineering, the company is required to develop the following documents:

- Maximum Allowable Emission Limits;
- Water Use and Discharge Limits;
- Solid Waste Disposal Limits; and
- Reclamation and Closure Feasibility.

2.5.3 Authority involvement

Various authorities at local, district, regional and federal level will be involved in the environmental assessment and permitting process for the Komi Aluminium Programme.

2.6 EBRD and IFC/WBG Environmental Assessment Requirements

The full range of WBG/IFC environmental and social policies are applicable to the proposed projects as a result of the involvement of the IFC and the EBRD. It includes OP 4.01 on Environmental Assessment. In addition, guidelines for different industry sectors as well as general environmental guidelines, will be applied as included in the World Bank's Pollution Abatement and Prevention Handbook (1998) and IFC's industry specific guidelines. EBRD use European Union (EU) standards and directives, most notably the Integrated Pollution Prevention and Control (IPPC) Directive of 1996. Best Available Techniques (BAT) are presented within the IPPC, for different industry sectors.

2.7 Public consultation and disclosure

The primary objective of public consultation and disclosure is to improve the quality of the information on which decisions are made and to ensure that potentially affected stakeholders have had the opportunity to comment. In addition, public consultation ensures that people's environmental and societal rights and responsibilities are upheld. To ensure that these principles are maintained during the proposed Komi Aluminium Programme the following has been developed:

- An overarching public consultation and disclosure (PCD) strategy for the entire programme; and
- An individual public consultation and disclosure plan for the proposed mine expansion[1].

The Programme PCD strategy outlines an approach that will implement best practice principles within the EA processes, prevent potential conflicts and build social trust and partnerships within the proposed Komi Aluminium Programme. The mine expansion PCDP has been prepared within the framework of the strategy[2]. The consultation and disclosure requirements of the Russian Federation, the IFC and EBRD as well as international best practice are included in these documents.

2.7.1 Public consultation and disclosure framework

The PCD Strategy defines the following mechanisms for consultation and disclosure:

- Public meetings
- Open houses
- Focus group discussions

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[1] Individual PCDPs will be developed for each of the proposed alumina refinery and aluminum smelter projects, within the framework of the overarching strategy.

[2] The PCD Strategy was presented for review and comment during a capacity building workshop held in Syktyvkar, on 29 January 2004. The mine PCDP was presented in Emva and Chin'avoryk during public meetings held in the first week of March 2004.

- Newspaper articles and publications in popular media
- Radio and television interviews and announcements
- Internet
- Brochures and information sheets
- Reading rooms and information centres
- Technical support to schoolteachers
- Appropriate local language
- Hotline

An important element of the PCD Strategy is the capacity building program which aims to increase the capacity of all stakeholders in EA, community building, conflict resolution and other issues relevant to the Komi Aluminium Programme. The mechanisms for PCD described earlier will all have an element of capacity building, but it is also intended to have a "school's programme" aimed at building environmental capacity in students to participate in environmental assessment processes.

2.8 Stakeholders consultation

There are a number of stakeholders that will be affected by or may be interested in the proposed Komi Aluminium Programme. These stakeholders include:

- Local communities
- Non-governmental (public) organizations (NGOs)
- Self-governance structures (local authorities)
- Other authorities
- Research, educational and cultural institutions
- Religious groupings
- Small and medium enterprises (SME) and SME-supporting structures
- Indigenous people
- Other civil society structures
- Mass media

2.8.1 Grievance Mechanism

Despite best practice in the public consultation and community relations programme, it is likely that there will be times that the developer and stakeholders disagree. For this reason a formal grievance mechanism will be implemented as part of the PCD process.

3. PROJECT SUMMARY

3.1 The mining process

The bauxite mining process is essentially an open-cast operation that is made up of the following key activities. These activities are

- Development drilling - in which the area to be mined is demarcated by drilling cores and then defining the position of the ore body;
- Overburden[3] stripping – in which blasting is used to break up the overburden before it is

[3] Overburden is the material that must be removed to access the bauxite.

excavated and loaded mechanically for removal to temporary overburden stockpiles.

- Blasting – in which the ore mass is broken up;
- Bauxite mining – in which broken or mass excavated by mechanical excavators and loaded onto trucks for transport;
- Transport – in which the bauxite is transported from the mine pit to the central blending yard;
- Blending – in which oversize bauxite is separated and crushed, and different grades of bauxite blended;
- Bauxite loading - in which the bauxite is loaded into rail cars for transport to the refineries; and
- Rail Transport in which the mined material is transported to the refineries to be processed to produce alumina.

The proposed mine layout of the expanded operation is illustrated in Figure 4. A series of new pits will be established to mine the major ore bodies that exist in the area.

3.2 Land and deposit allocation

The current deposits and those that will be mined for 2.5 mtpa are the Vezhayu-Vorykvinskoye deposits. The area currently being mined will be expanded in small increments in liaison with Knyazhpogost and Komi authorities until it reaches the limits of the permitted area. The deposits required to mine 6.0 mtpa have been granted to Bauxite Timana in the form of a subsoil lease for completion of geological exploration under the license issued by the Federal Ministry of Natural Resources. The permit required for the mining of the 6.0 mtpa will be issued when geological exploration under the license is completed together with the necessary environmental approvals.

3.3 The expanded mine operation

The major differences between the existing process, Phase 1a, and Phase 1b is the introduction of new equipment and the number of units in operation other changes are presented in the following sections.

3.3.1 Developmental drilling

Development drilling plays a key role in the mining process as the quality of the extracted bauxite is direct function of the area delineated for extraction. A maximum of ten drill rigs could potentially operate simultaneously under the expansion scenario implying a maximum of 600,000 meters of drilling per year. Related fuel consumption will increase to 3,600 tonnes per year. All drilling is assumed to be dry with a dust suppression system that has an efficiency of 90%.

3.3.2 Blasting

In excess of 80% of all material will require drilling and blasting during the life of the project. Assuming average annual production of 80Mt (total material including overburden), will entail approximately 33 tonnes of explosives annually. At 6.0 mtpa, the mine will be blasting at least once a day (on average.).

3.3.3 Overburden stripping

Prior to overburden stripping, trees are felled and stored on-site prior to removal. In the mining area, trees will be progressively removed as needed and no more than one year prior to mining operations. There will be opportunities for SME's to remove the trees for beneficial downstream use at no charge. Soil will be separated from the overburden and stored on site for later use in reclamation. The overburden will also be removed and placed on an overburden pile close to the pits.

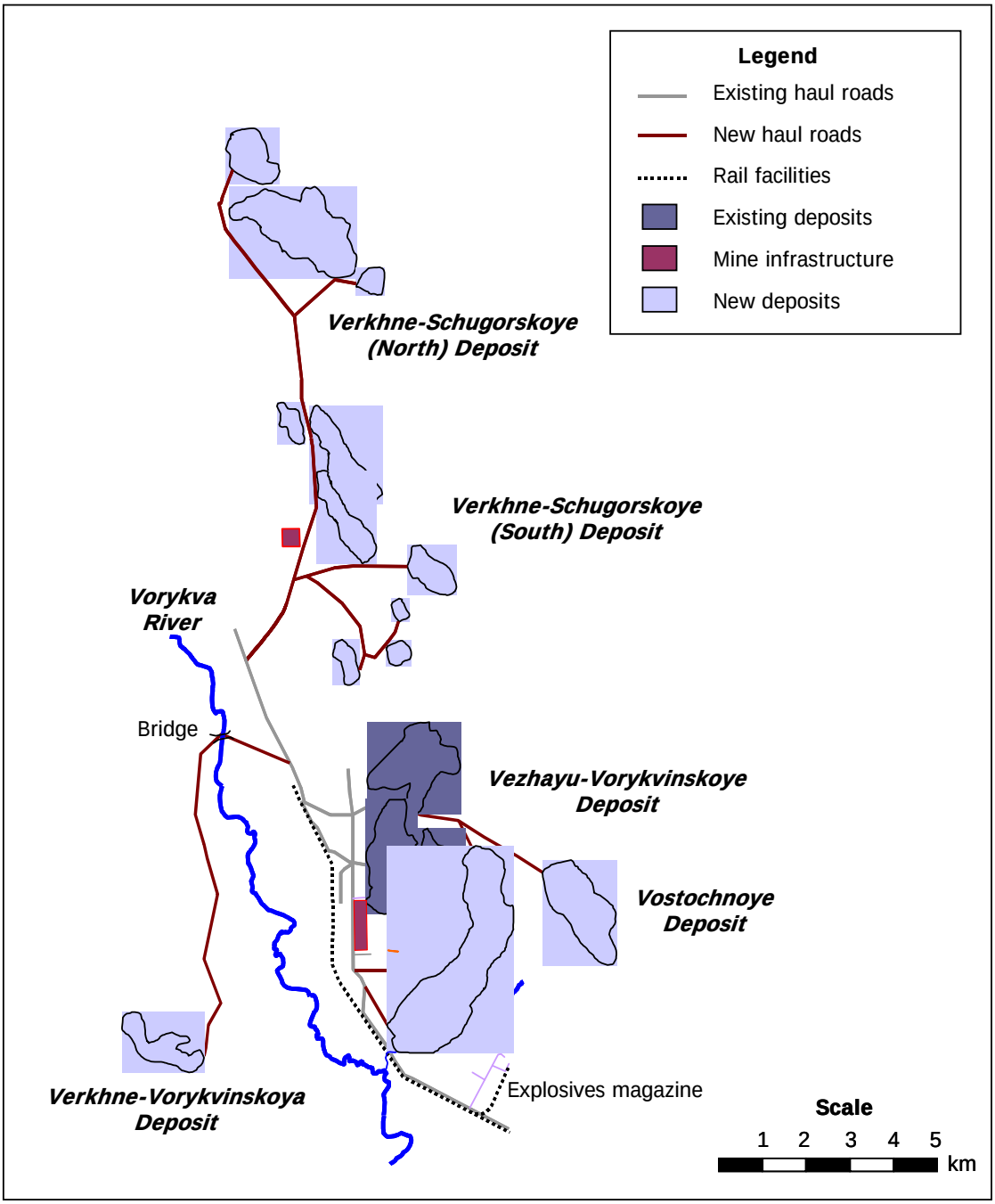

Figure 2: Propose layout of the expanded Middle Timan Bauxite Mine.

3.3.4 Bauxite mining

Following drilling and blasting to break up the ore mass, the bauxite is excavated and loaded onto trucks. The bauxite is then transported to the Central Blending Yard (CBY). During the expanded operation, the number of excavators will simply increase as will the number of haul trucks (up to a total of 49 during peak operations.)

3.3.5 Central Blending Yard

Dumping of the bauxite at the CBY takes place at pre-defined sections on the unloading dolly way (there are a 100 such sections each 15m in length). During Phase 1b, the size of the CBY will approximately double.

3.3.6 Crushing circuit

A new crushing circuit will be implemented to expedite crushing and blending of ore. This crushing circuit will be located within the existing mine area and will be equipped with dust control facilities. The performance of the dust control facilities will meet apposite Russian Regulatory, EBRD and IFC requirements.

3.3.7 Haul roads

New haul roads will be constructed to access the new pit areas, adding some 49 kilometres of additional haul road. These new roads will result in a land disturbance of more than 122 ha. The routing of the haul roads will be optimized to reduce the land disturbance footprint and waste bauxite will be used as fill material for the haul roads. The haul road to the Verkhne-Vorykvinskoya deposit will require a bridge to be built across the Vorykva River.

3.3.8 Ancillary facilities

Because the mine is not located near any existing town or facilities, the project is completely independent of all utilities. The following facilities will be constructed/expanded during the expansion project:

- Explosives storage;
- Mancamp – this will increase to approximately 760 persons;
- Fuel and lubricant storage;
- Power – supplied by diesel-fired generators;
- Administrative complex;
- Water supply- daily water consumption will increase to approximately 125 m^3/day; and
- Wastewater treatment facilities - a total maximum sewage effluent of 50 m^3/day will be processed through an aerobic tank, anaerobic tank, rotary biological contactor, settling tank, and finally a polishing tank (where chlorine is added). This water is then pumped to the Vorykva for discharge. The design of the facility will be such as to ensure that applicable Russian, IFC and EU discharge standards are met.

3.3.9 Landfill

A comprehensive Waste Management Plan will be developed for the project detailing the waste generated, its classification and quantities, how it will be disposed and waste tracking and monitoring. This will include the establishment of a formalised municipal waste disposal landfill at the mine.

3.3.10 Fuel storage

Above-ground fuel storage facilities will be installed to maintain a minimum of 4 weeks fuel supply – equivalent to 3Ml of dieseline. The storage facilities will be equipped with spill prevention and capture facilities.

3.3.11 Transportation

The existing rail facility (from the mine to Chin'avoryk) will be upgraded to provide for the increase in rail traffic from the current 1 train per day to 3,76 trains per day.

3.3.12 Manpower

The estimated manpower requirements (management and operating staff) are summarized in Figure 3. The manpower estimates are based on 2x12 hour operating shifts per day for 7 days per week, with 2 crews remaining on site for 2 weeks before being replaced.

3.3.13 Reclamation

Although reclamation has not yet been initiated, it will be started once enough of the mine has been excavated to allow for the material to be returned to the pit without affecting mining operations. The current practice is not satisfactory, but MTBM has agreed to develop and implement a Mine Reclamation and Rehabilitation Plan (MRRP) as part of the proposed mine expansion. Significant additional planning and capacity building will be required at MTBM to ensure that reclamation at the mine is advanced to match the good practice norms of bauxite mines operating elsewhere in the world.

3.4 Mine dewatering requirements

For current mine operations and for the pits that will be developed as part of the 2.5 mtpa expansion, there is no need to pump excess water from the pit. This is because the various pit bases are (and will be) above the water table and rainwater entering the pit simply soaks through the base. This will not hold true for the proposed new pits, which with the exception of pit no 7, require dewatering (pumping water out of the mine to prevent the mine flooding and protect the pit sides from collapsing).

Mine dewatering will be effected in two ways. Towards the west the pits will only be partially below the water table and here a pump will be placed in the base of the pit (sump). Towards the east the pits will go deeper below the water table and these pits will have to be dewatered by establishing a series of boreholes around the new pits. Groundwater will then pumped out of the aquifers in advance of the excavations of the pit. The estimated quantities of water that will need to be pumped from the pits are significant but these are 'worst case' estimates and it is likely that actual dewatering volumes will be less than predicted here.

3.4.1 Storm water

Storm water entering the pits that are below the water table will need to be pumped out of the base of these pits. It is estimated that these volumes could be 1036 m^3/hr and 1018 m^3/hr for the northern and southern pits respectively following rainfall of 39 mm in 24 hours (the maximum amount of rain likely to occur).

3.4.2 Disposal of the water

The water pumped out of the pits in the manner described above is planned[4] to be discharged into the Vorykva River or adjacent rivers. The groundwater quality is good with low concentrations of dissolved solids, but there will need to be conditioning of the water to adjust the water temperature and oxygen content to that of the river.

Water that is pumped from the pit sumps will have a high suspended solids content (clay in particular). Settlement facilities will have to be established for this water and may include flocculation (the addition of chemicals to encourage the settlement of the suspended solids) before being discharged to the river. Some of the water could also potentially be used during the summer for the dust suppression.

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[4] Note that this is the initial planning only – no water will be allowed to be discharged if it will result in a significant environmental impact. See later section on mitigation that outlines the further investigative work and evaluation of mitigation options that will be concluded before a decision is made on the dewatering.

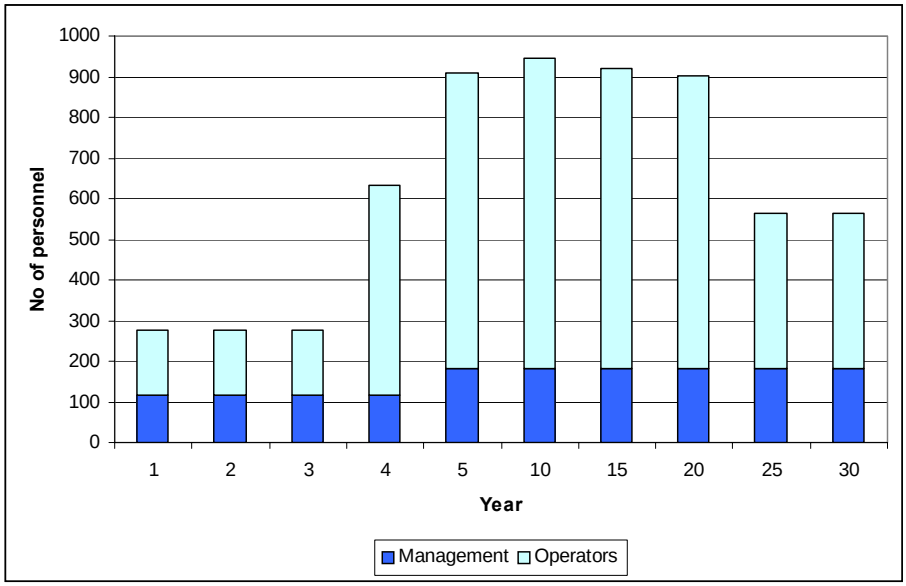

Figure 3: Summary of the manpower estimates required for the proposed mine expansion. Note that as the pits get deeper there is progressively less overburden. This means a reduction in the equipment required and fewer personnel to operate the equipment.

3.5 The proposed refinery site

Initially, two locations were proposed for the construction of the refinery namely Ukhta and Sosnogorsk. At a regional scale, there is little difference between the two sites, as they occur in similar biophysical and socio-economic environments. However, at the local scale, there are important differences between the two proposed sites, which influenced the selection of Sosnogorsk as the most suitable location for the refinery. The Sosnogorsk alumina refinery will be constructed on a 2.5 km by 1.5 km plot with 350 hectares (ha) and 370 ha being allocated for the refinery and red mud pond respectively. The key components of the refinery are a Crushing and Milling unit, a Calcination unit, maintenance facilities, a Digestion unit, a Precipitation and Filtration unit and a red mud pond. The site will be located in a marshy area between an existing railway line and a 35 kilo volt (kV) power line. A high pressure gas pipeline as well as the Komi republic road is also in close proximity (5-7km) to the site together with a bulk potable water reservoir.

Komi Aluminium will apply for a temporary land allotment (for two years), while they progress the feasibility study for the refinery. In the event of the decision being made to proceed with the refinery, the land allotment application will be extended to a permanent application that may last between 19 and 49 years. The land will be leased by the government to Komi Aluminum.

3.5.1 Description of the early works

To prepare the site for the proposed construction activities, the area of the refinery and construction camp will need to be cleared of all vegetation. The total footprint of the area will be approximately 720 hectares. This will involve felling trees and storing them on-site prior to removal. Opportunities will be presented for SME's to remove the trees for beneficial downstream use at no charge or for the local community to utilize the trees for heating purposes. Should this not occur Komi Aluminium will remove the trees for transfer to local distribution centres. The site will also be grubbed which consists of excavation and disposal of stumps, roots and organic surface material. The organic surface material (top soil) will be stored, for future use, in a designated area within the plant area.

Thereafter, a platform (on which the refinery will be constructed) will be prepared on site. This will require the excavation of materials on site and filling of certain areas. Perimeter drainage ditches, to prevent any spilled materials or contaminated water from flowing into the Aiuva River, will be constructed around the refinery and person-camp areas. Excavated earth will be discarded within the plant area as this material

can not be reused. All excavated areas will be covered with a layer of 500 mm well graded sand and gravel imported from outside the plant area. Imported granular material is also required as fill. Perimeter drainage ditches and fencing will be constructed around the refinery and person-camp areas.

All trees and vegetation will be cleared for an access road, however, no platform or fill material will be imported and no actual road construction activities will be undertaken. The area will also need to be prepared for the construction of rail facilities, and will entail clearance activities similar to the road. Therefore, detailed geo-technical investigations will need to be conducted including:

- Refinery site: Investigation will require boreholes at 100 m intervals and Cone Penetrometer Testing (CPT) at 50 m intervals;
- Access road to the refinery: Investigation will require bore holes for the bridge supports and a number of test pits and bore holes;
- Railway spur line: Test pits and bore holes to be defined along the railroad spur alignment; and
- A detailed topographic survey will also be required to create maps at 1:2500 and ground contours at 0.5 m intervals.

To accommodate refinery construction and operation, the existing powerline will be relocated directly north (from a point approximately 500m from the south-west corner of the site). It is envisaged that this will not involve any disturbance of vegetation and will be undertaken to prevent electrical supply disturbances. A non-permanent person-camp will be established on site during the early works operation which will house approximately 100 workers in temporary, “caravan-type” accommodation. On site sanitation facilities will be provided for workers which will be drained regularly by tanker for disposal in a domestic sewage treatment facility. Note that no engineered facilities including bridges and/or other structures will be allowed during the 2004 season.

4. MINE EXPANSION ALTERNATIVES

4.1 ‘Do nothing’ alternative

The first alternative to consider is the so-called ‘do-nothing’ alternative, where the mine would not be expanded beyond the currently permitted 2.5 mtpa. This would imply that any potential impacts associated with the expanded mine would not occur. However, several benefits would also be lost including:

- Loss of basalt aggregate – a sought after by-product of the mine expansion
- Loss of employment opportunities
- Additional spending associated with increased employment would not manifest.
- Poor reclamation activities will take place at mine closure
- Loss of opportunity to extend the supply chain to SME service providers.

4.2 Alternative sources of bauxite within the region

A second alternative is to find alternative sources of bauxite for the refinery given the extensive reserves known to occur in the region. There are two reasons why this is not a viable alternative:

4.2.1 Information

The single most important reason why the expansion of the mine is feasible is the extensive exploration and investigative work previously completed for the Timan deposits. The same level of information simply does not exist for other deposits implying a three to five year period of information gathering before such deposits could be mined.

4.2.2 Mine footprint

One of the benefits of expanding an existing mine is the availability of existing infrastructure – especially rail and road access infrastructure. Although the footprint of the mine will be expanded it will not cause the same land disturbance that would be required for a new mine.

4.3 Alternative pit excavation schedule

A third alternative is to reschedule the order in, and the rate at which, the various pits will be excavated i.e. excavating one pit more rapidly and not several in parallel. The greatest potential advantage of this alternative is reducing the amount of dewatering that would be happening at any one time, reducing the groundwater extraction rate and the quantity of water discharged to the surface water environment. Vorykva. Given the significant need for the mine to be able to blend material (maintaining the required grade of bauxite) it is not yet clear as to whether alternative scheduling is technically and economically feasible. Neither is it immediately evident whether this alternative would materially reduce impacts.

4.4 Alternative mine layout and schedule

While it is recognized that the mine layout is related to the positions of the deposits, some alternatives may exist for changing the siting of the various mine facilities, most notably the bridge that could cross the Vorykva River. Judicious siting of the bridge can be used to reduce the risk of increased turbidity and suspension of solids in the river during bridge construction as well as streambank degeneration.

Overburden stockpiles, and haul roads can be positioned so as to reduce the risk of erosion and sediment loading in stormwater, and minimize possible impedance of drainage. Potential impacts can also be reduced by alternative scheduling of, for example, the bridge over the Vorykva during the low flow condition of the river. Also grubbing and clearing should take place during the early winter when the risk of rainfall and erosion is reduced. The greatest potential benefits of this alternative arereducing the overall mine footprint and the risk of impact on the Vorykva River.

4.5 Expansion using Russian technology

The new mine plan relies heavily on Western equipment and technologies. This is due to the reliability and maintainability of the equipment. In the short term, the mine will have to undergo extensive training of new operators (as opposed to manning Russian equipment). The overall benefit of the implementation of Western technology is that the operators will be trained on best equipment available. This will allow for transfer (if necessary) between operations and an overall better trained workforce.

Additionally Russian equipment (or similar equipment sourced from former Soviet Union countries) used for mining does not typically meet EU and/or WBG requirements in terms of worker health and safety, effluent treatment and/or disposal and air emissions. The use of Russian equipment may thus imply relatively higher pollution and waste loadings and a higher lost time injury (LTI) frequency.

4.6 Alternative capacity (4.0 mtpa)

The ongoing feasibility study may indicate that mine operations are only increased to 4 mtpa. A lesser increase in capacity will result in a reduction of key impacts including:

- Loss of biological resources resulting from clearing and general land disturbance;
- The quantity of water than will need to be discharged into the Vorykva River;
- Erosion and drainage impedance risk as a result of a lesser haul road distance
- Dust resulting from stockpiles, mining pits and waste rock dumps; and
- Voids (from disturbed areas).

The need to ensure adequate bauxite quality could imply that the overall mine footprint will not necessarily be reduced in proportion to the reduction in the capacity.

4.7 Concluding comment

The greatest potential benefits of these alternatives are reducing the overall mine footprint and the risk of impact on the Vorykva River. In finalising the mine plan all viable alternatives will be investigated to realize these potential benefits.

5. ENVIRONMENTAL BASELINE

5.1 Climate

The high latitude at which Middle Timan Bauxite Mine is located (64º20') results in a continental climate with moderately severe winters and cool summers. Prevailing winds are southerly/southwesterly (20%-22% frequency) and the average annual temperature of the region is -2.0 ºC. Average daily temperature is below zero is for 190-192 days per year with winter beginning during the middle of October and lasting until the end of April. Stable frozen ground conditions at the mine are observed from end October to end May with the maximum depth of ground freeze (an average of 1.5 meters) occurring during the last 10 days of March. Snow cover in the region lasts some 204 days with snowstorms occurring from October through to April. Summer is cool and lasts some 74 days during which the average daily temperature holds above +10 ºC. The total number of days with average daily temperatures above zero is, on the average, 173 to 175 days per year. Average annual precipitation for the region is 541 mm.

5.2 Ambient air quality

There have not been any direct baseline ambient air quality measurements. In accordance with a recommendation made by the Head of the Geophysical Observatory background concentrations were used based on regulatory requirements for small towns and villages with populations of less than 10,000 persons. The values used for previous impact assessments are provided in Table 1.

Table 1: Calculated background air pollution concentrations for MTBM.

Pollutant	Concentration in µg/m^3
Sulphur dioxide (SO_2)	16.0
Carbon monoxide (CO)	1.8
Total suspended particulate (TSP)	220.0
Nitrogen dioxide (NO_2)	39.0

5.3 Geology

The area around MTBM has been explored since 1969 and consists of the Vorykvinskaya group of bauxites that developed along the axis of the northwest-southeast trending Timan topographic ridge. The deposits have formed on the north eastern flank of an anticline - an arching of the rock layers. Other groups of bauxites, the Svetlinskaye, Valodinskaye and Zaostrovskoye groups are situated to the north west of the Zaostrovskaye group, also located on the northeast flank of the anticline.

The bauxites have formed by very intensive, lateritic weathering of Pre-Cambrian basement rocks aged between 1300 and 1600 million years old. The basement rocks are made up of dolomites and dolomoitised limestones, with about 30% clay. At the time of weathering, these rocks had already been eroded into a platform with a typical Karstic topography. Dolomites are carbonates and therefore soluble, and their erosion results in a topography with sharply defined platforms, ridges and hollows which, in the Vorykvinskoya region, result in sharp topographic cliffs and a variation in elevation of the buried basement surface of up to three hundred meters.

The bauxite is not a continuous layer but a series of lenses up to ten, but generally around one to three kilometres long, and from a few hundred meters to a kilometre wide. The long axis tends to have formed parallel with the anticlinal axis, (i.e. trending northwest). Ridges in the topography in the Devonian times seem to be responsible for the gaps between the lenses. This is not because they actually protrude above the bauxite layer, but is probably because they produced ridges in the water table at the time and bauxite will only form above the water table.

The thickness of the bauxite layer varies up to fifty meters but averages from four to eleven meters for individual lenses. The very thick formations have formed over depressions in the basement dolomite and are up to three hundred meters long and two hundred wide. Elsewhere the thickness tends to vary considerably with the thicker parts also formed over valleys in the basement surface. In cross section the bauxite appears as an undulating layer of widely varying thickness. In addition to bauxite, the deposit contains a range of other minerals including iron, titanium and manganese oxides.

5.4 Soils

Soil cover is formed primarily on morainic glacial, sandy-loam sedimentation. Additionally, there are other parts that are even sandier. These sedimentations are represented as sandy loams and loams, including detritus and splinters of bedrock. The thickness of the soil layer is 30 centimeters and greater. On the morainal surface sandy loams are developed as combinations of gleyey podsols and peatey podsols. Peatey soils are present in the upper and lower reaches of the valley with alluvial-turf and alluvial-peatey soils underlying the riverbeds.

5.5 Terrain

The terrain in the vicinity of the mine is largely flat with some slightly elevated areas to the north and northwest. Given the generally flat topography, drainage is relatively poor and there are numerous swampy/marshy areas. There are few incised river channels other than for the larger rivers such as the Vym and Vorykva. The area is forested and is classified as ‘northern taiga’ with the middle taiga lying south of the mine and the arctic taiga to the north. It contains peat bogs, spruce forests and, in some places, fir forests, birch and mixed forests

5.6 Surface water hydrology

The surface water bodies near the mine consist of the upper reaches of the Vorykva River, a tributary of the Vym River and its tributary, the Cherney. The source of the Vorykva River is the Chetlassky Range and it has an overall length of 174 kilometres and total catchment of some 256.4 km^2. The river has an average slope of 0.002 km/km and can reach widths of up to 10-15 meters (on the average the width is 5-8 meters). The height of the banks does not exceed 1 meter. The depth of the river during low flow does not exceed 0.7 meters however there are pools that are as deep as 1.5-2.0 meters.

Spring runoff typically begins in late April and lasts for approximately 2 months during which time flows are highly variable as they are during the summer when low-flow can be between 0.3 and 0.74 meters per second (m/s). The river has total ice cover from November when temperatures drop below -15 °C. The minimal average monthly flow (95^{th} percentile) for the winter is 0.43 m^3/s. The Cherney intersects the left flank of the bauxite deposit and confluences with the Vorykva River 33.3 kilometres from the Vorykva headwaters. The entire length of the stream is 13.7 kilometres with a total catchment area of 53.4 km^2.

5.7 Surface water quality

The water quality of the streams near the mine is dominated by magnesium or calcium but in general the total mineralization of the streams does not exceed 0.1-0.3 grams per liter (g/l). The mineralization in the Vorykva River exhibits seasonal fluctuations, but remains largely consistent along the length of the river. Mineralisation peaks in the middle reaches of the river at some 452.95 mg/l during the summer months. The lower reaches of the Vorykva River indicate similar conditions with total mineralization between 177 mg/l (spring) and 328 mg/l (summer) and a pH between 7.8 and 8.48.

Water quality for the Cherney is similar to the water quality in the Vorykva River. The total mineralization ranges from 0.03-0.5 g/ml. The water is very soft and has a pH ranging from 6.9-8.3. There have been some exceedances of the Maximum Allowable Concentrations for iron (as high as 0.9 mg/l) in the upper reaches of the creek and petroleum products (up to 1.34 mg/l) during summer low-flow periods.

5.8 Vegetation

5.8.1 Protected areas

In addition to the Vymski State Iethyological Reserve (VSIR), there are also other protected areas (important landscapes) to the west and east of the mine respectively, namely "Udorski" (in Udorski district) and "Belaya Kedva" (Ukhta municipality). The mine has no direct impact on these other protected areas.

5.8.2 Forests

The area is dominated by pine forests and marshland, with almost the entire area being characterized as pine forests (more than 94% of the forested area). Groundcover in the pine forests contains cowberries, bog bilberries and cloudberries, which are typical for marsh shrubbery. The northern taiga spruce forests are naturally mosaic (with patches of shrubs, mosses, and different distributions of flowering vegetation and mosses) and extremely non-uniform. The landscape is dotted with varying combinations of mosses, lichens, shrubs, grasses, and groves of trees. Birch and pine dominate each terrain.

5.8.3 Marshlands

Marshlands make up slightly more than 10% of the territory around the site with the number increasing slightly to the northeast. Marshy vegetation is often characterized by an abundance of shrubbery with underlying berry bushes and the lichens and mosses of the northern taiga.

5.8.4 Meadows

Meadows are not abundant around the minesite. The most prominent areas are found along the thin, level belts of the catchment of the Vorykva River. Additionally, meadows can be found as 1st level revegetation after an area has been denuded for production. This means that some areas around the wasterock piles can be classified as meadows[5].

5.9 Rare or endangered floral species

Most rare or endangered species within the Komi Republic are located south of the project area. Nonetheless, it is possible for several species to grow within the ecosystem of the Vym and Vorykva River basins.

5.10 Ichthyofauna (fish)

The ichthyofauna (excluding Agnathas) of the Vym River basin consists of 20 different species from 9 different families (Table 2).

Table 2: Icthyofauna in the Vym River Basin

• Sterlet	• Common Dace	• Bream
• Atlantic Salmon	• Ide	• Bearded Loach
• Nelma	• Urasian Minnow	• Burbot

[5] It is anticipated that it will take in excess of 20 years for a representative distribution of species of vegetation return to these areas.

• Siberian Whitefish	• Chub	• Perch
• European Grayling	• Gudgeon	• Ruffe
• Pike	• Bleak	• River Bullhead
• Roach	• Crucian Carp	

Carp and perch dominate the lower regions of the Vym River while the Atlantic salmon (considered to have the greatest economic value to the waterway) forms the core of the middle and upper sections. Numbers of European graylings and Siberian whitefish in the upper reaches of the Vym River vary greatly as a function of the feeding habitat.

5.10.1 Fish migration

The Atlantic salmon and Siberian whitefish migrate as does the Nelma, but this later species ascends the Vym River for reproduction via the Vychegda and the deltas of the Severnaya Dvina, where it feeds. The Atlantic salmon spawn at nesting sites in the main branch of the river. The newly hatched salmon (alevins) emerge in May or June of the next year and remain in the rapid water sections of the river until they move to the sea.

The indigenous species of the river also migrate (to a very small degree) during the course of the year for foraging, spawning, and wintering. These species tend to spawn in October and live nearby the nesting area until the eggs hatch. The exception is the non-migratory Whitefish that nests in spring, right after ice break-up, in the upper reaches of the river and returns in the fall to the lower reaches for wintering and foraging.

5.10.2 Spawning Habits

There are two types of fish spawning habits in the Vym and its tributaries. The first type spawns in the spring during ice break-up (until mid-June) and includes the European grayling, Sterlet and the Bream. The second type spawn in October and includes the Atlantic salmon, the Nelma, and the Siberian whitefish. The spawning areas for the middle and upper reaches of the Vym River are located 244-406 kilometers from the mouth whereas the migratory Siberian Whitefish nests approximately 162-172 kilometers from the mouth, spawning in areas with a sandy bottom and slow moving currents. The Nelma nests anywhere up to the Koin confluence while the European grayling nests within the main river as well as its tributaries on rocky/gravelly ground.

5.10.3 Fisheries Classification

The presence of Atlantic salmon, Nelma, Siberian whitefish, and the European grayling has resulted in the Vym watershed being classified as a Category I Fishery. Part of the Vym is also an ichthyological sanctuary where fishing is forbidden. In these terms, it can be stated that all the fish are protected within this watershed. The River bullhead is also listed in the Komi Red Book and the Russian Red Book.

5.11 Avifauna (birds)

Birds use the area as a habitat (nesting), hunting ground, migratory route, and wintering area. Some 112 species have been identified in the area including 13 species that are protected under the Komi Republic Red Book (Table 3).

Table 3: Birds that could potentially be impacted that are listed in the Komi Republic Red Book.

• Lesser White-fronted Goose	• Common Crane
• Whooper Swan	• Great Snipe
• White-tailed Sea Eagle	• Snowy Owl

• Golden Eagle	• Northern Eagle Owl
• Peregrine Falcon	• Great Gray Owl
• Osprey	• Ural Owl
• Willow Ptarmigan	

5.11.1 Bird Densities

The primary habitat near the site, for birds is the spruce forests and the forests of mixed spruce and birch. Approximately 40 species are found in the area with an average density of 250-300 per square kilometer. In the region near the mine there are some 5 to 6 times the number of commercially valuable birds, found elsewhere in the Komi Republic.

5.11.2 Bird migration routes

The spring migration of birds along the valleys of the Vym and Vorykva Rivers begins in the middle of April through May. Fall migration begins during the middle days of August and lasts until the end of September. There are several species that migrate as late as October. Most of the migrating birds use the large marshlands and river catchments that connect with the Vycherogosky and Pechorsky basins for rest and eating during their migration route.

5.12 Amphibians and reptiles

The area around the mine site is habitable to three species of amphibians (the Siberian salamander, the moor frog and the European common frog) and one species of reptile (the Common lizard). Of these the Siberian salamander is listed as a Komi Republic Red Book species (but not endangered by IUCN designation).

5.13 Mammals

Mammals typically avoid population centers and noisy areas (e.g. away from the existing operations). A large number of mammals (35 species) can be found within the region (Table 4). Of these species, the European mink is listed as both a Komi Republic Red Book species and protected under IUCN designation.

Table 4: Mammals that could potentially be found within the impact area.

• European Mole	• N. Birch Mouse	• Marten
• Eurasian Common Shrew	• Field Mouse	• Wolverine
• Masked Shrew	• Muskrat	• Ermine
• Pygmy Shrew	• Bank Vole	• Least Weasel
• Eurasian Least Shrew	• Red-backed Vole	• European Mink
• Equal-toothed Shrew	• Wood Lemming	• Otter
• N. Water Shrew	• Water Vole	• Northern Lynx
• Northern Bat	• Tundra Vole	• Moose
• Arctic Hare	• E. European Vole	• Wild N. Reindeer
• Eurasian Flying Squirrel	• Wolf	• N. Marten
• Red Squirrel	• Red Fox	• Squirrel
• Siberian Chipmunk	• Grizzly Bear	

5.13.1 Mammal densities

The presence of many of the species listed above at the proposed site expansion is unlikely due to the existing mine operation and availability of other more suitable habitat within the region but is still regarded as "potential habitat". A field survey was completed for the smaller mammals and a head count of 415 per km^2 calculated. For the larger mammals, data was collected for the entire region and extrapolated across the site.).

5.14 Endangered and threatened species

Endangered and threatened species that could occur in the area are summarized in Table 5. It is important to recognize that these species are known to occur across the region in which the mine expansion will take place. Given the relatively small size of the expansion, to the region, it is unlikely that the proposed expansion would impact in any significant way or endangered or threatened species.

5.15 Aesthetics, visual resources, noise and vibration

The region around the deposit is void of any population centers and is not a tourist destination for nationals or foreigners. Areas beyond the existing mining operations remain in relatively pristine condition with ample opportunity to enjoy natural conditions. Baseline levels of noise and vibration should be considered near natural levels due to the fact that there are no other industries within the area of impact for the mine.

6. SOCIO-ECONOMIC BASELINE

6.1 The Komi People

The Komi people are descended from the inhabitants of the Volga, Kama, Pechora and Vychegda River basins and were renowned as skilled traders on the routes between Arkhangelsk and Siberia. The area forming the Komi Republic was originally inhabited mainly by ethnic Komis, and Russians to a lesser extent. It is now a melting pot of people originating from different areas of the former Soviet Union including the Ukraine, Belarus, and some of the Caucasus or Central Asia Soviet Socialist Republics. The harsh climate and sparse rural population made Komi an ideal location for the Soviet government to establish labour camps for criminals and political prisoners, in the early 1930s.

Ethnic Russians currently make up almost 60 per cent of the population of the Komi Republic, with Komi (about 23 per cent) and Ukrainians (8 per cent) being the other major groups. The Komi, who call themselves Komi Mort (Komi person) or Komi Voityr (Komi people), speak Komi or Zyrian, a language with several dialects that belongs to the Permian group of the Finnic division of the Ural-Altaic languages. The Komi Republic is currently governed by the Head of the Komi Republic, Vladimir Torlopov, and the Government of the Komi Republic. The official languages of the Komi Republic are Komi and Russian.

6.2 The Knyazhpogost District

6.2.1 Overview and demographic profile

MTBM is situated in the Knyazhpogost district which occupies an area of 24,600 km^2 and has a population of 33,100 spread throughout 53 settlements. The district capital is the city of Emva. The District is principally rural with no cities – the main settlements are the villages of Sindor, Tract, Meschura, Vet'yu, China'voryk, Seregovo, Shoshka and Knyazhpogost. Chin'avoryk is the closest formal settlement to the mine (about 157 km). It has a population of 1,272 people. There are, however, two other small penitentiary settlements that are closer to the mine Shomvukovo (population: about 210) and Kas'en Kedva (population: about 210)

The main demographic characteristics of the district are the following:

- The population is decreasing at a rate of 1.4% per year (over the last three years).

Table 5: Summary listing of rare and threatened species that could occur in the vicinity of the mine expansion, together with habitat and geographical occurrence.

Species	Habitat	Geographical Occurrence
Siberian Salamander	Wet conifer, mixed, deciduous forests in the taiga zone and riparian groves in tundra and forest steppe	Russia, the north of Kazakstan, Mongolia, China, Korea, and Japan
European Mink	Densely shaded banks of fresh water creeks, rivers and lakes	Throughout Europe
Lesser White-fronted Goose	Wet tundra lowlands and forest tundra; sea-shores and inland bodies of water during migration	European and Asian regions of Russia. Winters in Western Europe, West Asia, China and Japan
Whooper Swan	Lakes of forest tundra and taiga	Northern regions of European Russia, Western and Eastern Siberia (except tundra zones).
White-tailed Sea Eagle	River valleys, sea-and lakeshores with trees or rocks	Most of Russia except for the tundra and deserts. Winters in southern Europe, Egypt, India, China, Korea, Japan, and the southern parts of Russia
Golden Eagle	Mountains, forests, and deserts	Greater part of Russia excluding the northern regions
Perigrine Falcon	Tundra to mountain to deserts	Throughout Russia, winters in Southern Russia
Osprey	Variety of habitats except tundra, steppe and alpine zones	Most of Russia and Kazakhstan
Willow Ptarmigan	Tundra, forest-tundra, taiga, forest steppe and mountains	Northern half of European Russia, the northern part of Kazakstan, and Siberia.

Species	Habitat	Geographical Occurrence
Common Crane:	Forest-tundra to desert and mountains	Greater part of European Russia (except the tundra and southern regions), Kazakhstan, and parts of Siberia. Winters in Africa, West Asia, Iran, India, and Southeast Asia.
Snowy Owl	Tundra and arctic prairies	Kanin Peninsula to the Chukotski Peninsula
Northern Eagle Owl	Taiga to deserts and mountains	Anywhere in Russia except for tundra, the basin of the Anadyr River, and the Kamchatka Peninsula.
Great Gray Owl	Remote sections of mature forests (particularly coniferous).	Taiga zone of Russia
Ural Owl	Mature coniferous or mixed forests	North and central Russia from BeloRussia to the Kiril Islands

- The natural balance of population is negative, with natality at 8.5 for one thousand and mortality at 18.1.
- In addition, the migratory balance is also negative with more people leaving than settling. The life expectancy at birth is 57.9 years for males and 67.7 years for females

6.2.2 Economy

Key industries in the district are forestry and timber production, which make up some 85% of total production. Other industries include food production (4.5%), light industry (6.5%), machinery and metal-working (3.1%). There are 75 businesses registered with the Knyazhpogost Administration including MTBM and five departments of M-222, with 20 SMEs and 634 individual businessmen registered. The official level of unemployment is 3.5% (630 persons).

6.2.3 Main sectors of activity

Industry and Government institutions in the field of health, education and administration are by far the main providers of employment. As in other districts of the area, SMEs are weak.

6.2.4 Small and medium businesses

There are some 22 registered small businesses in the district (January 2003 figures). About half of these are engaged in industry (36% of the total number) or trade (about 14%). Small businesses provide employment to about 324 individuals. In addition, about 626 individuals are engaged in independent work (2002 figures).

6.2.5 Incomes

The average salary in the district was 4,460 Rubles per month in 2002 (about 159 USD), 29% higher than that of 2001. There are about 7,182 pensioners in District of Knyazhpogost (about 24% of the total population) and the average pension is 1,579 Rubles per month (56 USD).

6.2.6 Health Services

The District has 4 hospitals with a total of about 225 patient beds, and 6 other health centers of different types (polyclinic, *medpunkt*). Some 63 doctors and 260 medical staff man these facilities. The total number of registered cases was 19,400 in 2002.

6.2.7 Education Services

Public education services in the District of Knyazhpogost are summarised in Table 6.

Table 6: Summary of public education services in the District of Kynazhpogost.

Type of Facility	Number of Facilities	Number of Pupils/ Students	Number of Education Staff
Kindergartens	20	1064	158
Primary Schools	23	3892	380

6.2.8 “Posiolok” China’voryk

China’voryk is located at the junction of the federal railway and highway, with the mine railway and access road. The population of Chin’avokyk is about 1,416 people (banished population excluded), with 1,272 in the main settlement, and 144 in three small settlements. The population has been decreasing in the recent

years, although a few newcomers (12 in 2003) have reportedly settled.

The village has one primary and secondary school (1st to 11th class), with 219 students, with another smaller primary school in the settlement of Kasyian Kedva. There is a first-aid post in Chin'avoryk with one doctor. One of the main issues stressed by the local population is that they cannot go to Ukhta (about 60 km) to receive medical care and have to travel to Emva (about 130 km), to which they are administratively attached.

The main employer is by far State Enterprise M-222, followed by the railway and the mine (a workforce of 65 from China'voryk). China'voryk has a few small businesses (9 shops and 4 coffee shops). The unemployed population is officially 24, but according to the local administration the real number would be closer to 50. There is some social housing in the village (apartment blocks), which is reportedly in poor condition.

6.3 State Enterprise M-222

State Enterprise M-222 is a State commercial enterprise under the Ministry of Justice of the Russian Federation that provides labor for convicts ("banished"). These banished workers are employed in logging and timber ventures run by the enterprise. The total number of banished individuals is about 600.

M-222 runs three "colonies", one in Chin'avoryk (capacity: 240), the other two further North on the mine access road namely:

- Shomvukovo (unfenced colony, capacity: 240 banished, currently about 210 banished persons plus about 40 M-222 personnel and about 30 other inhabitants),
- Kasyian Kedva (unfenced colony, capacity: 240: banished, currently about 210 banished person plus about 40 M-222 personnel and 25 other inhabitants).

Under Russian law, banished persons can only be employed by State Enterprise M-222 and employment by any other enterprise is illegal[6]. This means that no such labour can be used in any way on the mine, or for any related construction requirements. In addition, it is necessary to emphasize that the employment of such labour, even were it to be allowed by Russian law, is expressly prohibited by the SUAL Group.

6.4 The Sosnogorsk District

6.4.1 Overview and demographic profile

The Sosnogorsk District was created in 1955 and has a population of about 58,000 in an area of 16,500 km^2. The distance between Syktyvkar and Sosnogorsk is about 345 km. Sosnogorsk town is easily accessible by road from Ukhta (and Syktyvkar) and has a railway station on the main line from Vologda (and Moscow) to Vorkuta.

The main demographic characteristics of the district are the following:

- Slow, steady decrease in population which is mainly caused by a natural decrease (14.5 deaths per thousand against 9.0 births per thousand).
- Slightly more people tend to settle in the area than those who leave, although this is far from offsetting the natural decrease.

6.5 Economy

The District of Sosnogorsk is mainly industrial, with forest and agriculture having became increasingly marginal in the last years. The total industrial production of the district for 2003 was worth 5,450 M Rubles (about 195 M USD), while in 2003 investment in the productive sector was 3,930 M Rubles (about 140 M

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[6] Running a small business in the settlement is tolerated

USD) - a notable increase compared with past years (2.3 times that of 2002[7]). Oil is being exploited in several areas by 5 companies that deliver the crude oil to a refinery located in Ukhta. There has been a lack of investment in the oil industry, with potential exhaustion of the reserves in 10-15 years as a result. However, several new fields are reported to be currently under investigation. Sosnogorsk town also has a large gas transformation plant. Oil and gas represent 94% of the total industrial production of the district.

The forest industry is reported to be literally devastated in the district, and most timber operations have dramatically reduced their workforce or simply closed down. Timber production (in terms of cubic meters) was in 2003 only 15% of the production of 2000, Formal agriculture produces mainly milk and meat. In addition to oil, gas and forest, the operation of the railway is also a significant sector in the District of Sosnogorsk, as well as administration and social, educational and cultural services. Sosnogorsk is described as Ukhta's "dormitory town". Because housing is cheaper in Sosnogorsk many people live there and work in Ukhta.

6.5.1 Employment

The actually working population is 62%[8] of the population of working age[9]. However, only 5% of this working age population is officially registered as unemployed.

6.6 Small and medium businesses

There are 84 registered private, small and medium enterprises in the district providing employment to about 700 persons, and another 1,300 independent workers without juridical denomination.

6.7 Incomes

The average salary in the District was 8,180 Rubles per month in 2003 (about USD 290), 36% higher than that of 2002. There are about 15,000 pensioners earning on average 1,707 Rubles per month (61 USD).

6.7.1 Health services

The District has 5 hospitals with a total of about 400 patient beds, and 8 other health centers of different types (clinic, *medpunkt*). These medical facilities are manned by 131 medical doctors and 560 medical staff. The total number of registered medical cases was 43,400 in 2002.

6.7.2 Education Services

The district has 23 kindergartens, 21 primary/high schools, 1 general high school and 3 professional training schools.

6.7.3 "Posiolok" Kerke

The village of Kerke is located at about 6 km to the North-East of the proposed refinery site, and is the inhabited settlement closest to the site. Its current population is about 740, with pensioners forming about 40% of the total population. Out-migration is continuing to reduce the population as a result of the crisis in forestry. The village has one primary school, designed for 500 pupils (presently attended by 80). It also

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[7] This sharp increase was mainly generated by the upgrades undertaken at Severgasprom gas plant in Sosnogorsk town.

[8] This does not mean that 38% of the population in working age is unemployed, as this population includes students, housewives, and others, who do not qualify as unemployed although they are not active.

[9] According to the official categorization, the working age population includes females from 16 to 54 and males from 16 to 59.

has a medical center with an assistant doctor, a nurse, a dentist and a laboratory, but the facilities are described as outdated. The main community development issue described by the local population is the fact that the village is accessible by road only in winter when the river next to Kerke is frozen. Otherwise, Kerke is accessible only by rail through a pedestrian bridge from the railway station.

6.8 The Ukhta District

6.8.1 Overview and demographic profile

Created in 1939, the District[10] of Ukhta has a population of 125,000 individuals over an area of 13,200 km^2. In addition to the Town of Ukhta, the district includes 4 workers' villages, 3 administrative villages and 19 other inhabited settlements. The population is decreasing at a rate of 0.6% per year (over the last three years).

6.8.2 Economy

The District of Ukhta is one of the most economically developed districts in Komi, having been a significant oil and gas production centre for the last 50 years (Ukhta town has an oil refinery for example). Other significant sectors are construction materials (bricks, cement), mechanical industry (agriculture and forestry equipment) and forestry and sawmills. The total yearly industrial production of the District (2002) is worth about 6,312 million Rubles (USD 225 million).

6.8.3 Employment

The actually working population is 64%[11] of the population in working age. The distribution of the employed population in the various economic sectors (year 2002) is shown in Figure 4.

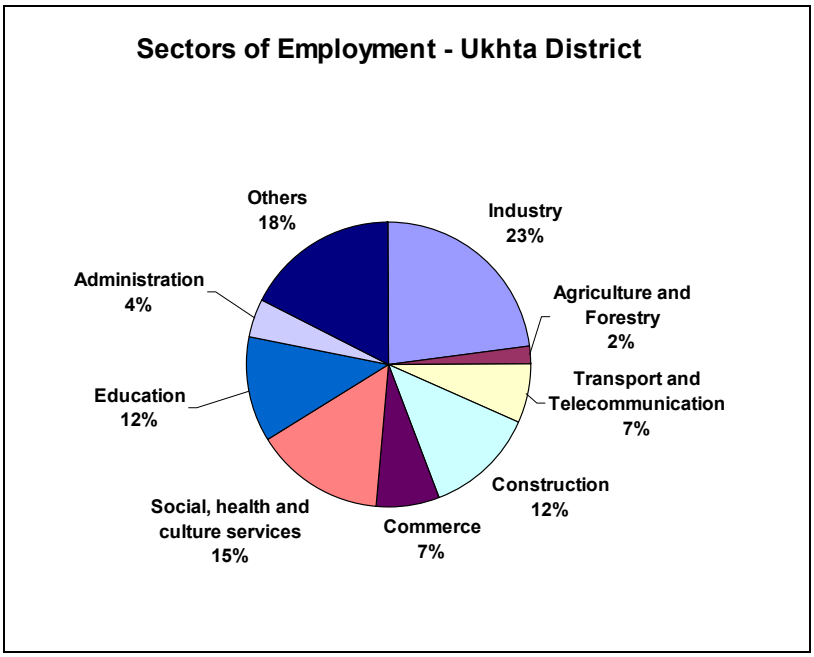

Figure 4: Distribution of the employed population in the various economic sectors of Ukhta (year 2002).

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[10] Official Russian Name: "*Municipalnoye Obrazovanye Gorod Ukhta"*

[11] See footnotes 8 and 9.

6.8.4 Small and medium businesses

There are 674 registered small businesses, of which more than half are engaged in construction (30% of the total number) or trade (23%). These small businesses provide employment to about 5,700 individuals.

6.8.5 Incomes

The average salary in the district was 5,220 Rubles per month in 2002 (about USD 190), 25% higher than that of 2001. There are about 33,560 pensioners (about 27% of the total population) earning 1,719 Rubles per month (61 USD) on average.

6.8.6 Health services

The district has 8 hospitals with a total of about 1,300 patient beds, and 16 other health centers of different types (clinic, *medpunkt*). These medical facilities are manned by 580 medical doctors and 1,790 medical staff.

6.8.7 Education Services

The district has 43 kindergartens, 34 primary/high schools, 2 general high schools and 4 professional training schools. Ukhta has a State Technical University with about 5,700 students, and two private higher education colleges.

6.8.8 Indigenous populations

The proposed mine expansion will not affect any group of Komi nomadic reindeer herders, as no community uses the area for grazing, even temporarily (confirmed by various representatives of the Komi community, including Komi NGOs). However, Komi (and other) people consulted in China'voryk village expressed their close affinity to the natural environment including rivers, which are used for fishing, and areas in the forest where they collect mushrooms and berries. Komis do not meet the criteria established by the World Bank Group OD 4.20 for Indigenous People in the project area[12]. Komis are fully part of the mainstream economy and suffer no economic or cultural discrimination but strongly maintain their cultural traditions through cultural societies, folkloric groups and the preservation of their language. For these reasons they will be recognized in the environatal assessment process as a distinct cultural group.

7. IMPACTS AND MITIGATION OUTLINE

7.1 Air quality impacts

Ongoing mine and proposed expansion activities will result in a variety of atmospheric emissions. These include gaseous and particulate emissions from various fuel burning devices including diesel generators and plant and vehicles. Such emissions include sulphur and nitrogen oxides, carbon monoxide, carbon dioxide and particulate matter. Given the baseline air quality described earlier it is unlikely that these emissions will result in a significant impact.

Dust will also be generated during blasting, stripping of overburden, drilling, excavations and general materials handling including transport, crushing and blending. Windblown dust will also be generated in areas that have been cleared of vegetation especially the mine haul roads and the overburden stockpiles. Although dust only gets generated under certain weather conditions it poses a potentially significant risk if not properly managed.

[12] The same Komi ethnic group could meet these criteria in other areas of the Russian Federation

7.2 Surface water impacts

7.2.1 Risks to surface water

There are several activities associated with the mine expansion, which will present a possible threat to the ecological function of the Vorykva River watershed. These include:

- The discharge of water from mine operations into the Vorykva River and other surface water bodies including:
  - Water pumped from the aquifers ahead of pit excavations in order to dewater the aquifer and reduce the potential inflow into the pit
  - Water pumped from within the mine pits (from sumps within the pits)
  - Effluent from the sewage treatment plant
  - Surface water runoff from the mine area, especially the CBY
- Mine pits dewatering influence on the local (or regional) hydrology and aquifers
- Mining of pits nearby the river for the Verkhne-Vorykvinskoya deposit
- The construction of a bridge over the river to provide access between the main mine area and the Verkhne-Vorykvinskoya deposit.

7.2.2 Potential impacts on the Vorykva River

There is widespread concern regarding possible impacts of the mine expansion on the Vorykva River. The closest point of mining will be more than 1 km from the river and as such there will be no *direct* physical transformation of the river as a result of pit excavation, Indeed the portion of the deposit that underlies the Vorykva, has been removed from the mine's reserve balance so it is simply not available to be mined. The *Vymski State Icthyological Reserve (VSIR)*, serves to protect the spawning area of salmon and a range of other fish species that occur in the Vorykva. Certain activities within the river such as commercial fishing are banned and a water protection zone that extends for 1 km on either side of the river (Fig 5). Although effluent discharge into the rivers is not expressly prohibited, it is clear that the spirit of the provisions is to protect the ecological integrity of the reserve and maintain an aquatic environment that supports the fish populations that are found in the river.

To this end any impacts arising from expanded mine operations that threaten fish diversity and/or populations in the reserve should be considered significant and potential fatal flaws. This is especially true of the proposed discharge of pumped groundwater (Table 7) and effluent into the river and surface water runoff containing high suspended solids. These discharges may result in:

- Changes in river system hydrology (flows)
- Changes in river hydraulics (altered energy loading and changes in sediment transport and channel dynamics)
- Changes in the physical (especially temperature and sediment loading), chemical (mineralization and other possible pollutants) and nutrient properties of the river.

The discharge of pumped ground water to the surface water environment is not required currently and will only become a requirement in later years. An intensive investigation will be conducted on the proposed mine dewatering (to be completed by the end of 2004) to ensure that such an activity does not result in any significant impact to the VSIR. Discharges to the river will only be allowed if proven to be acceptable from an environmental point of view.

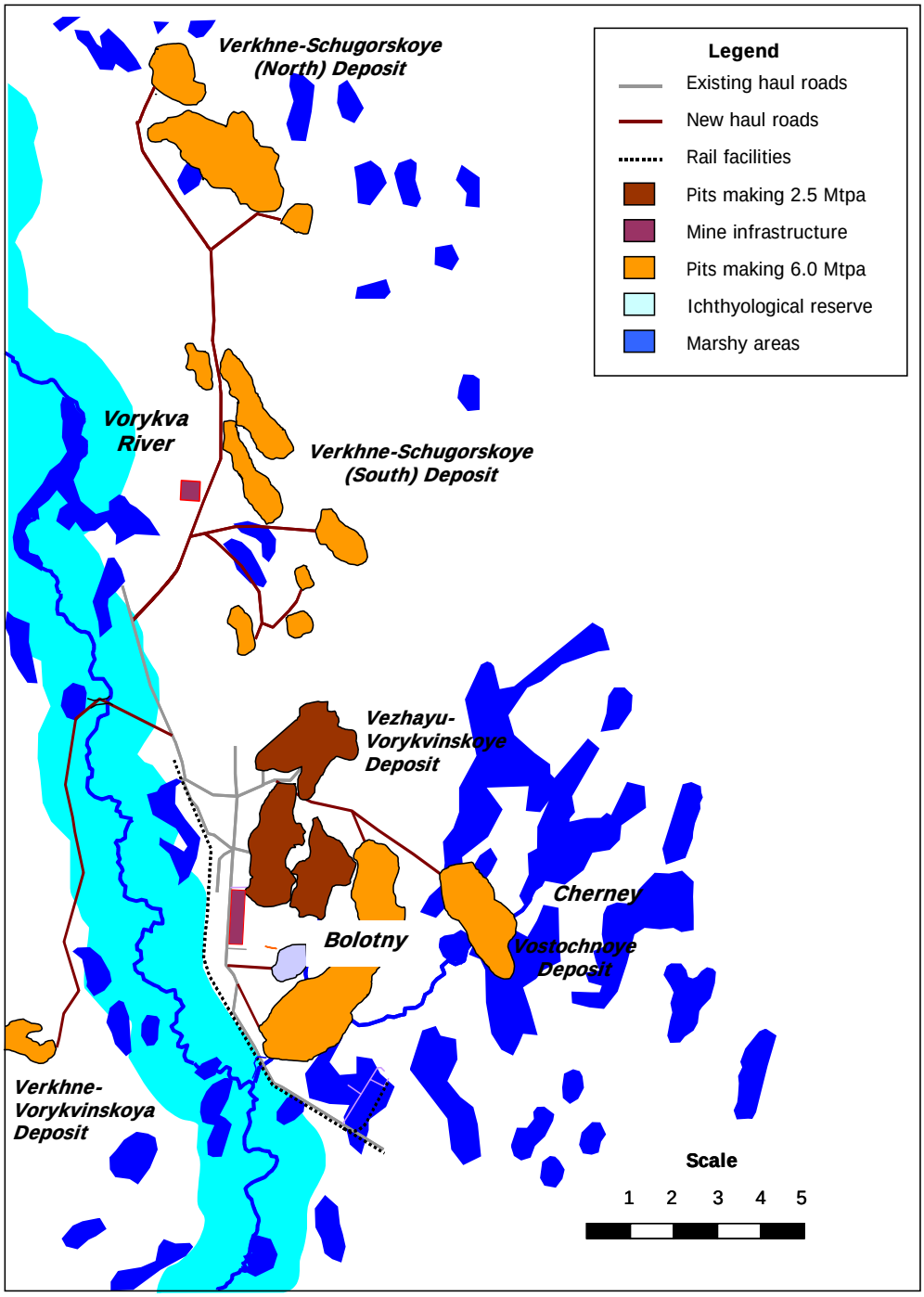

Figure 5: **Relative positions of the ichthyological reserve, the Vorykva, Cherney and the Bolotny, and marshy areas, to the existing and proposed new mining areas. Note that the scale of the figure is approximate.**

Table 7: **Estimated total discharge for the duration of the proposed expanded mine operation.**

Year	Total discharge m^3 /day
5 to 8	50,000
9 to 11	100,000
12 to 15	150,000
16 to 18	200,000
19 to 23	250,000

Year	Total discharge m^3 /day
24 to 27	350,000
28 to 32	200,000

7.2.2.1 Changes in river system hydrology

The projected water volumes that will be discharged into the Vorykva and other surface water bodies will result in substantial changes in the flow regime of the rivers. Peak flows occur in May following the spring thaw (some 2,900,000 to 3,300,000 m^3 a day), low late summer flow in August/September (some 138,000 to 968,000 m^3 a day) with low winter flows in January of (some 40,000 to 458,000 m^3 a day). As would be expected, there is significant seasonal variation in the flows, as well as potentially from year to year. The discharge volumes may be as much as nine times the low flow condition and between 10 and 12% of the high flow condition (in years 24 to 27) and prevail for about half the life of the mine (16 years). The effects of these increased flow volumes in the Vorykva are several and varied and include:

- Possible changes in the morphology of the river and changes in the scouring (erosion), transport and sedimentation (deposition) processes;
- Changes in the pattern of flooding of the river; and
- Changes in the freezing and thawing cycle of the river.

7.2.2.2 Changes in habitat

These changes in turn may result in changes in habitat including changes in the light and temperature conditions (changes in river depth and sediment loading) with important potential ramifications for invertebrates, nutrient presence and oxygen content. Salmon are especially sensitive to changes in the streambed condition and small changes in water chemistry and dissolved oxygen content. The Cherney and Bolotny drain a marshy area and as such are an important nutrient source for the Vorykva. The streams will have to be diverted or lined which may reduce this function.

7.2.2.3 Changes in the chemical properties of the river

The risk also exists of discharges of water containing various pollutants, most notably fuel, oil and grease as well as high suspended solids (SS) loadings entering the river. Unconsolidated areas across the mine site are potential sources of such material. The rivers and streams in the area carry very low suspended sediment loads and increased water turbidity could result in the degradation of habitat conditions for fish. The later deposition of this sediment may also result in a variety of impacts further downstream.

7.2.2.4 Potential impacts on river biota

The effects described above will have an impact on river biota, including changes to spawning areas, reduced nutrients, changes in forages and feeding areas and several others. It is not possible at this early stage to define the direct impact on fish populations. However, it can be stated with some certainty that there may be a severe disruption to the ecology of the Vorykva. The ability of the river to assimilate the projected pumped ground water quantities is limited as a result of the sensitive ecosystems that support diverse fish populations. It is not possible at this stage to define an acceptable discharge volume that will not affect the hydraulics of the river and associated aquatic habitat and additional work will be needed to properly assess these potential impacts.

7.2.3 Proposed mitigation strategy

The mitigation strategy will be required to ensure that the impact significance is lessened to the point of not impairing the ecological function of the Vorykva.

7.2.4 Mitigation

A limitation in the impact assessment is the current lack of adequate information upon which to properly quantify the full extent of the impact. As the mine expansion will be competed in 2007 and the pit dewatering issue will become relevant in year 5 (i.e. 2011 at the earliest), such mitigation must take the form of detailed, further investigation of the possible impacts so that they can be properly quantified. Thereafter mitigation options can be properly assessed, developed and implemented to ensure that the proposed mine expansion has no significant impact on the function of the Vorykva or the VSIR. The mitigation required is reducing the quantity of discharge water to a volume that will not impact on the river. This requires defining the maximum quantity of discharge water that can be assimilated (tolerated) by the river while minimizing the quantity of discharge water. Where these two objectives meet is the point at which no significant impact will occur, (Fig. 6). The project can only proceed if this condition can be realized during mine operations.

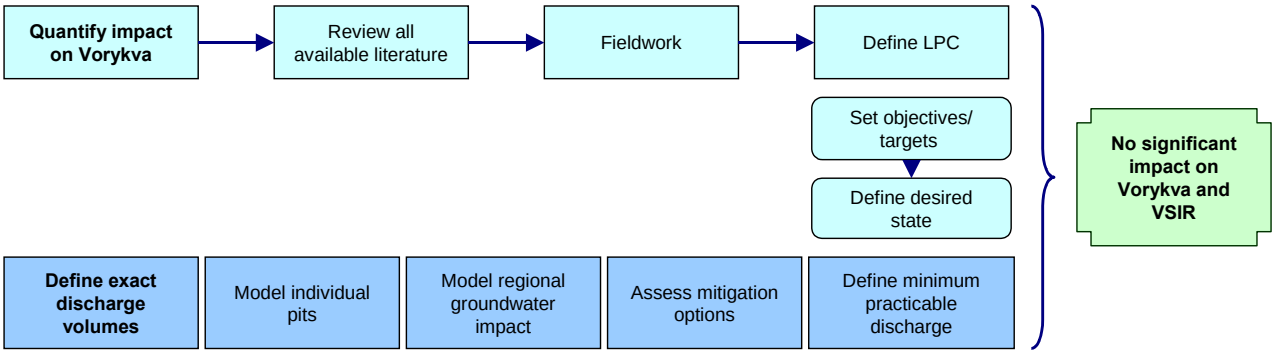

Figure 6: Conceptual illustration of the process for identifying the mitigation required to achieve 'zero impact discharge' from the proposed mine expansion.

The proposed options being reviewed in the detailed assessment, to reduce the quantity of discharge water include:

- Discharge into another catchment to the north or the east;
- Splitting the discharges to 2 or 3 river catchments;
- Discharging into the swamp/wetlands areas to ensure stabilisation with ambient conditions including chemistry and nutrient load, before the water reaches the river;
- Investigating the principle of 'no net loss' – the full impact on the Cherney and the Bolotny has not been quantified but theses streams may be lost as a result of excavations of Vezhayu-Vorykvinskoye. In this comes to pass a similar 'replacement' marshy environment could be created and water discharged in amounts equivalent to the typical flow volumes of the two streams;
- Developing groundwater cutoffs and grouting to reduce inflows but this would be extremely expensive and would also impact significantly on side slope stability and slope angles;
- Using earlier pits as recharge cells but this could only work if permeability of the discharge pit is at least as high as the pumped pit;
- Artificial recharge into recharge wells specially drilled between the abstraction wells and the rivers. This would remove the water while also maintaining the groundwater levels outside the dewatering wells in the surrounding aquifer; this will be especially important in reducing potential impacts on the regional groundwater condition; and
- Concurrent use of some of the above options to maximize the possible reduction in discharge volumes, whilst maintaining cost effectiveness in the mining operation.

It must be strongly emphasized that without adequate mitigation being identified to reduce the significance of the potential threats to the VSIR, anticipated impacts will not be acceptable. For this reason it is essential that a revised dewatering strategy, based on the above process, be developed,

reviewed and included in the mine plan, before a firm decision gets taken on the proposed mine expansion. This will take the form of a detailed and comprehensive Mine Dewatering Plan.

7.3 Ground water impacts

7.3.1 Potential impacts

Potential impacts of the dewatering on regional groundwater include:

- Changes in topography as a result of settling or deformation –formation of depressions;
- Lowering of the water table and changes to the ecological character of marshy areas and/or peat bogs;
- Reduced availability of ground water for other possible land uses (unlikely to be significant given that there are no communities living in close proximity to the mine);
- Long term effects on the regional groundwater; and
- Reduced water supply to rivers in the area, most notably the Vorykva – through the possible loss of tributaries and direct decant of water from underlying aquifers

7.3.2 Extent of cone of drawdown and lowering of the water table

The 'cone of drawdown' refers to the extent of water loss that will be manifest underground. It appears that this will be constrained by the underlying geology but may still extend for several kilometers from the point of abstraction. This will be predicted for the different mining scenarios using a detailed numerical model described earlier.

As the water table is lowered, the peat bogs in the area may start to drain and this will impact on the habitat created by the peat bogs. The peat bogs that exist on the downstream side of the Cherney and Bolotny may thus be impacted upon, by disruptions to the Cherney and the Bolotny, physical transformation as the pit is excavated and finally a drying out as a result of the lowering of the water table. As described previously the peat bogs have ecological significance as a roosting area for migratory birds and changes in the character of these bogs will reduce the attraction of the area to migratory birds. Potential impacts will thus be highly significant .

7.3.3 Proposed mitigation

The mitigation required to reduce the significance is closely related to the mitigation options for the surface water impacts described earlier. Some of the options to reduce the quantities of discharge water are based on the principal of recharging the aquifer and wherever this gets done the extent of the dewatering cone and associated impacts will be reduced. As mentioned earlier further detailed groundwater and hydrological modeling will take place based on the extensive work to date done by the Komi Biological Institute and other organizations. Without a properly developed dewatering plan that addresses and mitigates potential regional impacts as a result of the proposed dewatering, impacts are likely to be unacceptable. Detailed hydro-geological investigations to characterize such impacts, and define the required mitigation will be completed by end 2004.

7.4 Solid Waste Production Impacts

The most significant waste type that is generated by mine operations is overburden which will be temporarily stockpiled before being returned to the pits as part of the reclamation process. Also, The current absence of a formalised domestic waste landfill presents a potential threat to the environment. A new landfill will be developed as part of the proposed expansion, so the risk of impacts associated with the disposal of domestic waste is likely to be low.

The dominant hazardous waste type (quantity) is used oil and oil contaminated materials. These wastes will either be recycled (in the case of the used oil) or used as a fuel in the boiler. Fused mercury lamps constitute the most hazardous waste type but these are generated only in relatively small quantities and

there is provision for the recycling of the lamps. A safe, effective disposal option for tyres will be implemented as part of the expansion of the mine. Note that a waste management strategy will be developed for the mine that upholds Russian regulatory, IFC and EBRD (notably the EC Directive on Waste). The waste management strategy will encompass all aspects of waste generation and disposal at the mine.

7.4.1 Mitigation

Mitigation must take the form of implementing the components of the waste management strategy. More specifically these include:

- Establishing a formal municipal waste landfill at the mine;
- Establishing a dedicated waste transition area that can be used as a central collection for waste and from where the waste, once segregated, can be sent for recycling, recovery or disposal; and
- Preparation of a detailed Waste Management Plan.

7.5 Hazardous materials

Materials spillages especially oils and petroleum products pose a risk to surface and ground water quality. The planned establishment of proper refueling facilities at the mine with the necessary hard surfaces, bund walling, spill drains and capture sumps will significantly reduce the threat of such spillages.

The implementation of a comprehensive spill control plan, that serves to prevent spills, ensure that when spills do occur they are rapidly and effectively ameliorated and reduce the potential for spilled material to enter the environment will reduce the potential for spills to result in an impact on ground and/or surface water quality.

Mitigation to reduce impacts on the environment as a result of hazardous materials is contingent on the full implementation of the various spill control measures defined in the mine plan and supported by the implementation of the Oil Spill Prevention, Control and Countermeasures Plan.

7.5.1 Mitigation

Full implementation of the Oil Spill Prevention, Control and Countermeasures Plan will occur early on during the proposed expansion project. This includes:

- Maintaining a hazardous materials register;
- Hard (impermeable) surfaces and bunding for storage tanks, filler connections and loading/unloading areas; and
- Consolidation of outdoor maintenance areas and prohibition of *ad hoc* vehicle maintenance, lubrication and refueling across the mine site; and
- Implementation of oily water separators at all points of water discharge to the external environment.

7.6 Impacts on ecology

The most obvious and direct impact on ecology will be the physical transformation of the landscape as vegetation is cleared ahead of the mine expansion. This will have the effect of destroying habitat that may be home currently to the various faunal species described in the baseline. That said it is important to recognize that the existing mine activities have probably resulted in the clearing of these areas of fauna anyway due to noise and other disturbance from the mine. At the same time the surrounding vegetation is largely homogenous implying that faunal species could relocate with relative ease to other areas where there will be no clearing of vegetation and resultant habitat destruction.

A less direct impact on ecology, but potentially more significant impact, would be the access provided by the land clearing to new parts of the forest, and poaching as a result. TB has specific policies prohibiting

all kinds of hunting and fishing by employees of the mine. Poaching can also be effectively prevented through combined efforts of the competent authorities, the mine and the public, finally, potential changes in water quality and the flow regimes of the Vorykva as described above could have a detrimental effect on the aquatic life in the river. This would impact in turn on fish populations and undermine the purpose of the icthylogical reserve (Vymski). This implies ensuring that there are no uncontrolled discharges of effluent of any sort into the Vorykva or other rivers, either from dewatering or other effluent, and control of hazardous materials and hazardous materials spillages across the mine site.

That notwithstanding, the size of the area that will be cleared of vegetation is significant in its own right. For this reason Komi Aluminum will investigate the feasibility of an off-set project as a function of the larger Komi Aluminum Programme. The aim of the off-set project will be to create a similar sized area elsewhere that would serve to replace or 'off-set' the area taken up by the various proposed projects.

7.6.1 Mitigation

An Erosion and Sediment Control Management plan will be developed and implemented together with of a stormwater management strategy that includes:

- Diverting stormwater runoff from entering areas where it could become contaminated
- Provide settling areas to allow sediment contained in the stormwater to settle out
- Shape and contour undeveloped areas to ensure that they are not prone to erosion
- Stabilise road and rail embankments

Should the mine expansion be approved the mine layout must be subjected to a detailed review to ensure that the footprint of the mine is minimized. Most importantly, reclamation is the single most effective mitigation strategy for reducing ecological and other impacts. The reclamation programme must be implemented as soon it is logistically viable to begin the process of reclaiming disturbed areas.

This ecological impact on fauna and flora will be effectively prevented through developing and strictly enforcing anti-poaching policies amongst the directly-employed workforce and contractors alike. In addition ongoing monitoring will take place to ensure that there is not an adverse impact on faunal populations in the area.

7.7 Human health effects

Given the remoteness of the mine from inhabited settlements the risk of adverse health effects in communities neighboring the mine is considered negligible. However, there are a variety of atmospheric emissions sources that may have the potential to adversely effect the health of personnel working at the mine. The mine will develop and implement an occupational health and safety strategy to reduce/prevent the risk of such effects.

7.8 Impacts on heritage resources

Information on cultural and heritage resources within the area of the proposed expansion is limited. it is considered however, given the history of development in the area, that there will be cultural or archeological artifacts uncovered within the mine footprint. It will be important to ensure that the area is examined prior to the start of the clearing for cultural heritage artifacts and an operational procedure developed which can be used if any heritage or archeological artifacts are uncovered during pit excavations (in accordance with WBG Management of Cultural Property OP 11.03 and similar EBRD requirements).

7.9 Social impacts

7.9.1 Local employment

There are a variety of potentially positive impacts that will be brought about the mine expansion. The first

and most obvious of these is job creation where the labour force at the mine will increase significantly as the new pits are opened and excavated. Ensuring that labour is sourced locally, especially from China'voryk, can easily enhance these positive effects. Given the time before the mine is brought to full capacity, a skills development programme will also be developed and implemented to increase the 'employability' of locals. The development, publication and widespread dissemination of a recruitment policy for the mine would serve to encourage local employment, as well as reducing the potential influx of work seekers into the area. The recruitment strategy must also make an unequivocal statement on forced or prison labour to ensure that there is no perception that this may happen at the mine.

7.9.2 In-migration

Employment opportunities created by the mine expansion will generate expectations, which if unmanaged, may cause an in-flux of job-seekers to the project area. Potential effects of in-migration could include price inflation, housing problems and additional pressure on municipal and community infrastructure and services. However, in the context of the project area, in-migration is not likely to be of a great extent but mitigation will still be implemented to ensure that it does not become a problem.

7.9.3 Local procurement

Although the mine has specific equipment requirements that cannot easily be met by local suppliers, there are still many goods and services that can be purchased locally. To enhance these positive impacts, the mine will develop a procurement policy that maximizes whatever opportunities exist.

7.9.4 Traditional livelihoods of the original Komi population

The impact of the mine expansion on natural resources will not affect any group of Komi nomadic reindeer herders. However, Komi (and other) people consulted in China'voryk village have expressed their attachment to natural resources, including rivers (fishing) and areas in the forest where they collect mushrooms and berries. These areas will be identified in detail and mapped for further protection. Komis also highlighted the importance of their cultural traditions through cultural societies, folkloric groups and the preservation of their language. As such they will be recognised by the project as a distinct cultural group, particularly in terms of consultation and information disclosure.

7.9.5 Increased local spending

Increased local employment would lead to increased local spending and the further economic growth potential of that spending. This could also be supplemented by a focused programme aimed at building SME links to the mine. It is recognized that these links are currently limited due to the specific equipment requirements of the mine, but this will not prevent the continual pursuit of creating and maximizing local business opportunities.

7.9.6 Social development programme

It has also been made clear in the public consultation and disclosure process that there is an expectation of municipal services being upgraded and enhanced by the mine. This is the *quid pro quo* expectation in return for the 'giving up' of the district's resources. A social development programme that unambiguously details where the mine will invest and where it will not, will be developed and implemented. A critical element of the social development programme is ensuring that the investments are sustainable.

7.9.7 Mitigation

The mitigation to reduce or prevent negative, and enhance positive socio-economic impacts is detailed in the ESAP presented in Chapter 7. The mitigation has the following key elements:

- Develop and implement a communication strategy;

- Develop and implement an employment strategy and disseminate this widely;
- Consolidation all social development activities;
- Promote opportunities for private enterprise;
- Develop and implement a project training policy; and
- Develop and implement a local procurement policy.

7.10 Noise and vibration

A range of mine related activities generate noise and vibration across the mine but it is only blasting that is considered a significant source. According to calculations of current mine activities, the noise level at the SPZ boundary is less than 50 dB(A) and this has also been confirmed by annual measurements. Although there will be a significant increase in mining activities, these activities will not all be concentrated within the current mine area. Given the lack of receptors that could result in noise or vibration disturbance or nuisance, around the mine potential impacts are considered unlikely.

The potential impacts of noise and/or vibration associated with the mine expansion are considered, on the basis of the above, to be minor in terms of the external environment with the potential of moderate occupational exposures. The correct use of Personal Protective Equipment (PPE) will ensure that the occupational health impact risks are effectively mitigated.

7.10.1 Mitigation

There are no direct measures to reduce ambient noise but these are not required given the noise levels that are measured at the site boundary and the noise levels likely to be generated by the expanded operation. Abatement measures are all geared towards occupational health protection and include the use of ear protectors and hermetically sealed cabins on the excavators.

7.11 Impacts associated with the proposed refinery site early works

The following points give a list of the key impacts and the mitigation that is proposed:

- Fugitive dust: Only vegetation that is essential to accommodate construction activities will be removed, and site and access roads will routinely be sprayed with water;
- Combustion gases: On-site equipment will be fitted with catalytic converters and mobile equipment will be serviced regularly to ensure proper operations;
- Sedimentation: The surface area affected by construction activities will be limited. The presence of diversion ditches up-slope of the disturbed areas are planned to minimize the quantity of surface water runoff that may become contaminated and require treatment. Settlement ponds will also be provided to trap suspended sediment and channel bed load;
- Impacts to water resources: The extraction of potable water from the Aiuva is relatively low (at $15m^3$/day), therefore, the impact on water flow regimes will not be significant (early works will be undertaken in spring);
- Impacts to birds and mammals: A strict “no” poaching policy will be implemented;
- Noise: Machinery will be fitted with noise suppression devices;
- Socio-economic impacts: Employment opportunities are likely to increase. Therefore there will be an increase in household incomes, spending on goods and services and skills levels and future marketability of people employed; and
- Impacts to vegetation: The total area to be transformed is relatively small and the surrounding vegetation is not significantly sensitive to disturbance.

The impacts associated with the early works activities are not likely to be significant and are largely restricted to the area directly affected by the early works activities /adjacent to the site. In addition, if the refinery does not proceed because of Komi Aluminium’s decision, or is not authorized, Komi Aluminium will reclaim/rehabilitate all this area to match the previous land use and/or according to reasonable

stakeholder requests.

8. ENVIRONMENTAL AND SOCIAL ACTION PLAN

8.1 Purpose and scope

The need for implementation of an Environmental and Social Action Plan (ESAP) during development of the MTBM Project is stipulated by the International Finance Corporation[13] (IFC) the European Bank for Reconstruction and Development (EBRD) and Russian regulations[14]. The ESAP serves to ensure:

- Compliance with all Russian, World Bank Group and EBRD guidelines and standards;
- Compliance with all permit conditions; and,
- Effective monitoring and mitigation of project impacts.

8.2 Scope

The ESAP includes mitigation measures, monitoring, management, and an implementation schedule. This information is provided for construction and operation of the mine, man camp, and ancillary facilities. It includes mitigation and monitoring for all potential impacts associated with the proposed mine expansion.

8.2.1 Impact summary

The impacts of the proposed 6.0 million tonne per year expansion are summarized in Table 8.

8.3 Detailed mitigation of environmental and social impacts

The mitigation that will be included as part of the implementation of the expanded operation is presented below.

8.3.1 Air quality control measures

The following mitigation will be implemented by the mine to prevent or reduce air quality impacts:

- Diesel operations will be optimized including monitoring generator loading and redistributing the load where required;
- All combustion devises, including mobile equipment will be regularly serviced and correctly maintained;
- Combustion sources will be monitored on a regular basis to ensure that they are operating within design parameters for emissions;
- An aggressive campaign of road watering and control of vehicle speeds will be implemented to reduce dust loading as a result of mine activities;
- Mining and hauling equipment will be equipped with catalytic converters; and
- The possible use of low sulfur diesel fuel will be investigated for all diesel uses across the site (but most especially vehicles).

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[13] *Procedure for Environmental and Social Review of Projects – Guidance Note C: Outline of an Environmental Action Plan*, IFC, September 1998, pp. 45-46.

[14] SNiP 11-01-95 "*Instructions on the process for development, approvals, confirmation, and composition of project documentation in construction of facilities, buildings and equipment*". 1995

Table 8: Summary of impacts associated with the proposed expansion of the Middle Timan Bauxite Mine to 6.0 mtpa.

Impacts associated with	Extent	Duration	Intensity	Probability	Significance
Dust	Local	Long term	Moderate	Probable	Low
Emissions from fuel burning appliances	Local	Long term	Low	Probable	Low
Impacts on fish diversity and population in the Vorykva river	Regional	Long term	High	Probable	High
Regional impacts of groundwater abstraction	Regional	Long term /permanent	High	Probable	High
Waste	Local	Long term	Low	Improbable	Low
Hazardous materials	Local	Short term	Low	Possible	Low
Terrestrial ecology*	Regional	Long term	Moderate	Probable	Moderate
Human health	Local	NA	Low	Improbable	Negligible
Heritage resources	Regional	NA	Moderate	Possible	Moderate
Job creation	Regional	Long term	Moderate	Probable	Moderate to high
Local spending	Regional	Long term	Moderate	Probable	Moderate
SME development	Regional	Long term	Moderate	Probable	Low
Noise and vibration (ambient environment)	Local	Long term	Low	Improbable	Low
Noise and vibration (occupational exposure)**	Local	Long term	Moderate to low	Improbable	Low

*i.e. excludes the potential impact of dewatering on the ecology of the Vorykva.

** significance rating is based on the correct use of PPE

8.3.2 Land disturbance

An Erosion and Sediment Control Plan will be developed and implemented to prevent surface water contamination by suspended solids as a result of land disturbance. This will include:

- Minimising the overall mine footprint;
- Maintaining water protection zones as ‘no-go’ areas;
- Establishing bridges or culverts for all stream crossings;

- Designing the bridge that will be constructed over the Vorykva River to forgo support structures that would otherwise impact on the river bed or banks;
- Establishing catchment and diversion of stormwater;
- Using the settlement ponds that will be established for the mine dewatering, for stormwater that may be contaminated with suspended sediment;
- Pursuing interim reclamation to stabilize all disturbed land areas that may pose a risk of stormwater contamination;
- Only removing vegetation from those areas where it is absolutely necessary (i.e. directly affected by project activities);
- Slopes will be minimized and where unavoidable will be revegetated; and,
- Disturbed areas will have appropriate drainage controls that prevent runoff from both entering the disturbed area or being discharged into an uncontrolled manner on the downstream side of the disturbance.

8.3.3 Soils

The following mitigation will be implemented by the mine to prevent or reduce impacts on soils:

- Limit the quantity of soil that needs to be stockpiled;
- Implement the Mine Reclamation and Rehabilitation Plan;
- Where stockpiles are unavoidable these will be designed in such a way as to reduce the potential of leaching from surface water and contamination from other sources (e.g., petroleum spills); and
- Implement Spill Prevention, Containment and Control Plan and Erosion and Sediment Control Plan.

8.3.4 Surface and groundwater impact mitigation

Develop and implement a zero impact discharge strategy, by the end of 2004, for the expanded mine operation by following the steps listed below:

- Further investigate, define and quantify the groundwater and surface water condition in the vicinity of the mine;
- Characterize the full extent of the dewatering on regional groundwater and identify and quality impacts;
- Quantify the exact dewatering volumes and determine whether the dewatering will result in leakage from the Vorykva River;
- Propose mitigation options that will reduce both the quantity of pumped groundwater as well as the loss of water from the aquifer;
- Characterize the flow hydrology, hydraulics and related aquatic habitat in the Vorykva;
- Determine thresholds of potential concern in the Vorykva to define the maximum discharge quantity that could be tolerated by the river without impact; and
- Finalize, disclose for consultation and, if appropriate implement the Mine Dewatering Plan.

8.3.5 Wastewater treatment

The following mitigation will be implemented by the mine to prevent or reduce impacts associated with waste water discharge:

- Construct a wastewater treatment facility at the man camp with a capacity of ~125 m^3/day
- Wastewater discharge quality will meet WBG, EC and Russian regulatory requirements and standards

8.3.6 Vegetation

The following mitigation will be implemented by the mine to prevent or reduce impacts on vegetation:

- For any new land disturbance minimize the extent of the footprint
- Minimize air pollution and fugitive dust emissions
- Implement the Mine Reclamation and Rehabilitation Plan
- Implement Spill Prevention, Containment and Control Plan and Erosion and Sediment Control Plan

8.3.7 Birds and mammals

The following mitigation will be implemented by the mine to prevent or reduce impacts on birds and/or mammals:

- Minimise mine footprint
- Educate workers to uphold conservation principles
- Maintain and enforce anti-hunting and poaching policy
- Maintain and encourage free access to regulators to police the access road
- Maintain ecological monitoring.

8.3.8 Archeology

In order to address possible archeological finds, the mine will develop and implement an archeological preservation and protection plan that will define procedures to be implemented in the event of a archeological find during mine operations

8.3.9 Waste management

A waste management plan will be developed and implemented for the expanded mine operation. The waste management plan will satisfy Russian regulatory, IFC and EBRD requirements (specifically the EC Framework directive on waste). The waste management plan will specify procedures for:

- Minimising waste at source;
- Segregation and temporary storage;
- Re-use and recycling;
- Final disposal; and
- Monitoring of waste management performance.

In order to fulfil these requirements two facilities will be established at the mine. These are:

- A formal municipal waste landfill at the mine that meets Russian regulatory, IFC and EBRD requirements (specifically the EC Landfill Directive).
- A dedicated waste transition area that can be used as a central collection area for waste generated at the mine, and from where the waste once segregated, can be sent for recycling, recovery or disposal.

8.3.10 Health and Safety Program

The mine will develop and implement a mine Health and Safety Plan (HSP)[15]. The HSP will include information and management interventions in respect of:

- Worker responsibilities;
- Emergency procedures;
- Accident investigation procedures;
- General health and safety guidelines;
- Personal protection;
- Employee information and training; and,
- Transportation safety.

8.3.11 Fuel Spill Prevention Plan

The mine will develop and implement a component of the Spill Prevention, Control, and Countermeasures plan (SPCC). The SPCC will include information and management interventions in respect of:

- Materials, properties, quantities, and containers;
- Safe practice in transporting materials;
- Spill responsibility;
- Readiness;
- Accidental release notifications, and protocols;
- Spill prevention;
- Spill control and countermeasures; and,
- Employee training.

8.4 Reclamation and rehabilitation plan

The mine will develop and implement a reclamation and rehabilitation plan (RRP). The RRP will include information and management interventions in respect of:

- Establishing land use objectives;
- Reducing the mine footprint;
- Managing soil and overburden;
- Recovering soil-making material such as weathered basalt;
- Ensuring the stability and safety of the areas being reclaimed;
- Sloping & contour ripping;
- Reintroduction of overburden and topsoil;
- Re-vegetation;
- Establishing and propagating a nursery;
- Reclamation success monitoring;
- Minimising waste dump areas and developing suitable drainage; and

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[15] HSP will be based on the World Bank's Occupational Health and Safety Guidelines (World Bank, 1988), Russian health and safety requirements, and the U.S. Mine Safety and Health Administration (MSHA, 1980-1998) guidelines as well as applicable EC requirements

- Progressive restoration.

8.5 Socioeconomics

The mine will develop and implement a ***communication strategy*** that details procedures and actions required for:

- Stakeholder identification
- Stakeholder engagement mechanisms
- Establish partnerships
- Maximise Information disclosure and Consultation
- Dealing Specifically with the Komi Community

The mine will develop and implement an ***employment strategy*** that details procedures and actions required for:

- Maximising local employment
- Defining unambiguously, the “area of influence” of the project,
- Ensuring gender equality in appointments
- Using a single recruiting agency
- Broadly publicizing the employment strategy beyond the area of influence of the project

The mine will develop and implement a ***training policy*** that details procedures and actions required for:

- Coordination with local vocational and higher education institutes on training needs and building capacity to meet project recruitment needs,
- In-service training and qualifications upgrade for unskilled and semi-skilled workers,
- Providing external training where needed

The mine will consolidate and implement a ***social development programme*** that is based on the following principles:

- Keeping the programme affordable, sustainable and aligned with broader mine business and policy objectives
- Prevent usurping of municipal or district functions
- Managing expectations so that there are not undue expectation or misunderstandings of what the mine will and will not support.

The mine will Implement the ***private investment partnership*** (PEP) with a specific focus on:

- Increasing access to markets for SMEs
- Raising the level of local management skills
- Reducing administrative and legislative barriers
- Educating and informing the public of the importance of the private sector
- Creating transparent demand profile that can be disseminated to local suppliers
- Designing and implementation of a solid, sustainable strategy
- Complement SME development efforts with a targeted, sustainable financial model

The mine will develop and implement a project local procurement policy that includes:

- An initial market survey to establish local capacities to meet the mine expansion requirements and delineate areas of local, national and international procurement for the various goods and services required

- Defined monitoring targets for local procurement
- Maximising local procurement of goods and services
- Strengthening local business capacity to meet the mine expansion's procurement needs
- Advertising procurement requirements locally first
- Establishing a dedicated small business support function within the project
- Expressly prohibiting any procurement from State Enterprise M-222.

8.6 Implementation and monitoring

An Environmental Monitoring Program (EMP) for the proposed mine expansion will be implemented to ensure that the project is in compliance with Russian operating permits and environmental regulations as well as World Bank Group and EBRD policies and guidelines, and to evaluate the effectiveness of the environmental mitigation measures as described in the ESAP. The monitoring requirements include:

- Site air quality – emissions at source and ambient concentrations;
- Groundwater quality – establishing and using wells to monitor water table fluctuations and groundwater composition (chemical and bacteriological);
- Surface water quality and hydrology;
- Aquatic resources - using hydrobiological indicators (benthos and ichthyofauna) to give an objective appraisal of the engineering measures used to mitigate impacts at the site;
- Flora – continuing the currently utilised ICP Forest methodology;
- Fauna; and,
- Socio-economics including:
    - public consultation and disclosure process;
    - impacts on local employment levels to include:
    - number of local individuals directly employed by the project;
    - number of households directly employed by the project;
    - entrepreneurial activities associated with the project;
    - changes in income profiles;
    - changes in overall community development.
- Health and Safety Monitoring including:
    - Noise exposure monitoring

8.7 Environmental management

SUAL Group has recently begun to implement a program designed to ensure that all operations within the group are adequately staffed with appropriately trained EH&S personnel. This program includes adding staff at both the corporate and local operations level including:

- Sual Group - recently appointed a Corporate Environmental, Health and Safety Senior Manager.
- Komi Aluminium - has appointed a full time Environmental Manager
- MTBM - a more comprehensive HSEC structure will be established by Bauxite Timana and will include:
- HSEC manager (based in Ukhta); and
- On-site environmental officers.

8.8 Environmental training

Environmental training will be conducted across the SUAL Group Russian and international experts.

8.9 Implementation schedule

The ESAP is summarized in Table 9 as an implementation plan, with indications of the commensurate cost implications of the various environmental and social actions.

Table 9: Implementation plan for environmental and social actions for the proposed expansion of the Middle Timan Bauxite Mine

	Description	Item	Detailed Requirements	Schedule	Estimated budget (US$'000)	
					Up front	Recurrent (annually)
1	ESAP from the environmental and social due diligence audit (DDA)	1	As detailed in the DDA	As detailed in the DDA	852	200
2	Air quality management requirements	1	Emissions management and monitoring programme	July 2005	100	100
		2	Mine dust control procedures	December 2004	50	300
3	Modify mine dewatering strategy to ensure that the proposed mine expansion does not result in significant impacts on: • The Vorykva River • The VSIR • Regional groundwater	1	Further investigate, define and quantify the groundwater and surface water condition in the vicinity of the mine	July 2004	100	0
		2	Characterize the full extent of the dewatering on regional groundwater and identify and quality impacts	August 2004	100	0
		3	Quantify the exact dewatering volumes and determine whether the dewatering will result in leakage from the Vorykva River	September 2004	50	0
		4	Propose mitigation options that will reduce both the quantity of pumped groundwater as well as the loss of water from the aquifer	October 2004	50	0
		5	Characterize the flow hydrology, hydraulics and related aquatic habitat in the Vorykva	August 2004	150	0

	Description	Item	Detailed Requirements	Schedule	Estimated budget (US$'000)	
					Up front	Recurrent (annually)
		6	Determine thresholds of potential concern in the Vorykva to define the maximum discharge quantity that could be tolerated by the river without significant negative impact	September 2004	30	0
		7	Finalise strategy with a Mine Dewatering Plan (MDWP)	December 2004	30	0
	Agreement on finally proposed de-watering strategy	1	Technical presentation to IFC and EBRD for review and discussion (independent review if necessary)	November 2004	5	0
		2	Workshop with Russian regulators	November 2004	5	0
			Public consultation and disclosure of final strategy	November 2004	5	0
4	Actions to reduce land disturbance and ecological impacts	1	Erosion prevention and sedimentation control plan (EPSCP)	December 2004	50	300
		2	Vegetation protection procedures	December 2004	50	50
		3	Hunting and poaching policy	December 2004	50	30
		4	Soil management procedures	December 2004	50	100
5	Waste water treatment facility	1	Waste water treatment facility	December 2005	300	50
6	Archaeological preservation and protection plan	1	Archaeological preservation and protection procedures	December 2004	40	20
7	Waste management plan	1	Municipal waste landfill	December 2005	500	50
		2	Waste transition facility	April 2005	150	20

	Description	Item	Detailed Requirements	Schedule	Estimated budget (US$'000)	
					Up front	Recurrent (annually)
		3	Finalize Waste Management Plan (WMP)	December 2004		
8	Health and safety programme	1	Health and safety programme	December 2004	25	50
9	Fuel spill prevention and control plan	1	Full spill prevention, countermeasures and control plan (SPCCP)	July 2005	25	50
10	Reclamation and rehabilitation plan	1	Develop interim, pit and mine closure reclamation and rehabilitation procedures	December 2004	300	0
		2	Complete mine reclamation deed (with IFC/EBRD review and approval)	April 2005	50	0
		3	Establish mine reclamation fund	July 2005	Unknown	Unknown
		4	Finalize a comprehensive Mine Reclamation and Rehabilitation Plan (MRRP)	December 2005		
10	Off-set programme	1	Investigate, define and implement an off-set programme	December 2007	100	Unknown
11	Socio-economic interventions	1	Develop and implement communication strategy	December 2004	50	150
		2	Develop and implement employment strategy	December 2006	50	50
		3	Develop and implement training policy	December 2006	50	250
		4	Consolidate social development programme	December 2004	50	Unknown
		5	Develop and implement private investment partnership (PEP)	December 2005	50	Unknown
		6	Develop and implement local procurement policy	December 2004	50	150

	Description	Item	Detailed Requirements	Schedule	Estimated budget (US$'000)	
					Up front	Recurrent (annually)
12	Environmental and social monitoring programme	1	Extend existing environmental monitoring programme to include addition requirements specified in the ESAP	July 2005	300	200
		2	Implement independent external audits to confirm implementation of environmental and social actions.	6 monthly reducing to annually once implementation fully commenced	0	60
13	HSEC system	1	Develop and implement an integrated HSEC system for the Komi Aluminium Programme	December 2008	300	100
	TOTAL				4,117	2,280