

# Komi Aluminium Komi Aluminium Programme

## *Environmental Analysis*

### EARLY WORKS PROGRAMME FOR THE PROPOSED SOSNOGORSK REFINERY SITE IN ACCORDANCE WITH INTERNATIONAL FINANCE CORPORATION AND EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT REQUIREMENTS

**Prepared By:**  
CSIR ENVIRONMENTEK  
P.O. Box 395  
Pretoria  
0001

**Contact Person:**  
Rob Hounsom  
Tel: +27 31 242-2300  
Fax: +27 31 261-2509  
Email: [rhounsom@csir.co.za](mailto:rhounsom@csir.co.za)

**In Partnership with :**  
Ecoline EA Center (Moscow)  
DewPoint International  
(Colorado)  
Komi Institute of Biology  
(Syktyvkar)

**DATE: March 2004**

**Version 4**



## **EXECUTIVE SUMMARY**

### **INTRODUCTION**

SUAL Komi BV is presently in the planning stages of an integrated aluminium development in Komi Republic, Russian Federation. The integrated aluminium development will comprise an expansion in bauxite mining operations at the Middle Timan Bauxite Mine (MTBM), together with an alumina refinery in the Sosnogorsk area and an aluminium smelter in the vicinity of Pechora. The establishment of the refinery and smelter are contingent on the feasibility of expanding the mine. The location of the refinery is currently being evaluated as a key 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 will be submitted to the Russian Authorities in March, 2004 as per Russian requirements. In addition, an Environmental and Social Impact Assessment (ESIA) will be completed as per the requirements of EBRD and IFC and an 'OVOS' completed as per the Russian Regulations. Both of these processes will be complete by September 2004 and disclosed into the public domain.

The economic viability of the overall programme is dependent on the early establishment of the refinery at the proposed Sosnogorsk site. Therefore, Komi Aluminium are proposing to undertake an Early Works programme. Komi Aluminium would like to undertake these key activities before the 2004-2005 winter period. This document provides a background, summary of the early works and the associated impacts of these activities.

Initially, two locations were proposed for the construction of the refinery: 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. This 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 120 hectares (ha) and 280 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 positioned in close proximity (5-7km) to the site together with a bulk potable water reservoir.

### **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 350 hectares. This will involve felling trees and storing them on-site prior to removal. There will be opportunities 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. Here again, 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 CPT Cone Penetrometer Testing) at 50 m interval;
- 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.

#### **IMPACTS ASSOCIATED WITH THE 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 regularly be serviced 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<sup>3</sup>/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 firm "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. If the refinery does not proceed due to a decision by Komi Aluminium, as a result of future studies (such as hydro-geological impacts, detailed ESIA for the refinery, and the feasibility study for the refinery) not supporting implementation of the project or a negative conclusion by the SER, the project will not be pursued. In this case, all of the early works features will be reclaimed and returned to native conditions, and/or according to reasonable stakeholder requests.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
Introduction .....	i
Description of the Early Works .....	i
Impacts associated with the Early Works .....	ii
1 Introduction .....	1
1.1 Background .....	1
1.2 The Developer .....	1
1.3 Environmental and Social assessment studies .....	2
1.4 Purpose of this document .....	3
2 The Proposed Site .....	4
2.1 Location .....	4
2.2 Site selection .....	4
2.3 Factors influencing the choice of the Sosnogorsk site .....	5
2.3.1 Absence of Protected Areas .....	5
2.3.2 Availability of Infrastructure .....	5
2.3.3 Biodiversity Loss .....	5
2.3.4 Availability of Water .....	5
2.3.5 Socio-economic impacts .....	5
2.4 The Sosnogorsk site .....	6
3 The Proposed Refinery .....	6
4 Scope of Proposed Early Works .....	8
4.1 Refinery and Construction Camp Site Clearance and Platform Preparation .....	8
4.2 Clearing Passage for Access Roads .....	10
4.3 Establishment of Rail Facilities .....	10
4.4 Ongoing investigations .....	11
4.5 Relocation of 35 kV Power Line .....	12
4.6 On-site Person Camp .....	12
5 Environmental and Social Impacts and Environmental Management Measures for Early Works Activities .....	13
5.1 Air quality impacts .....	13
5.1.1 Fugitive dust .....	13
5.1.2 Combustion gases .....	14
5.2 Impacts on water resources .....	14
5.2.1 Sedimentation .....	14
5.2.2 Water extraction .....	15
5.3 Loss of biological resources .....	15
5.3.1 Impacts to vegetation .....	15
5.3.2 Impacts to birds and mammals .....	15
5.4 Noise .....	16
5.5 Socio-economic impacts .....	16
5.6 Summary of environmental and social impacts .....	17
6 The “No Go” option .....	18
7 Conclusion .....	18

- Figure 1: Location of the MTBM and the proposed refinery and smelter sites
- Figure 2: Map showing the relative positions of the two proposed sites together with key surrounding features.
- Figure 3: Railway and forest cover in the vicinity of the Sosnogorsk site
- Figure 4: Plan of proposed refinery site “early works”
- Figure 5: Proposed rail facilities at the proposed refinery site
- Appendix A: Public consultation and disclosure for the early works programme on the proposed Alumina refinery
- Appendix B: The Alumina Refining Process and its Environmental and Social Effects
- Appendix C: Water Quality Parameters in the Aiuva River
- Appendix D: Socio-Economic Characteristics of Sosnogorsk

## 1 INTRODUCTION

### 1.1 Background



Komi Aluminium is currently undertaking a feasibility study to determine the viability of developing an integrated aluminium complex in the Komi Republic (located to the northeast of Moscow in the Russian Federation) (Figure 1).

The integrated aluminium programme if it proves viable will include the expansion of the Middle Timan Bauxite Mine (MTBM), the development of a greenfields alumina refinery and the development of a greenfields aluminium smelter. The integrated programme is one of the few underway in Russia at present and is certainly the largest undertaken in Russia since Soviet times.

**Figure 1: Location of the MTBM and the proposed refinery and smelter sites**

It also represents the most significant potential investment project ever undertaken in the Komi Republic. Prior to commencing with the integrated aluminium programme it is essential for Komi Aluminium to undertake a feasibility study for the proposed refinery. Should the refinery not prove feasible, it will have a major negative impact on the entire aluminium programme and may result in the programme being terminated. The purpose of this study is to ensure that the expansion will be environmentally and socially acceptable, economically viable and technically feasible. The feasibility study is due for completion early in 2005. The economic viability of the overall programme is dependent on the early establishment of the refinery at the proposed Sosnogorsk site.

### 1.2 The Developer

The project sponsor is the SUAL Group, Russia's second largest aluminium producer and a major exporter. The Group's parent company is SUAL International Ltd (Bahamas) and its management company is OAO SUAL-Holding (Russia). The SUAL Group has an integrated aluminium operation, mining bauxite, refining alumina, smelting aluminium and producing semi-finished and some finished aluminium products. ZAO Komi Aluminium is owned 100% by the SUAL Group. ZAO Komi Aluminium is a greenfield company, established to operate the planned integrated bauxite/alumina/aluminium project.

### 1.3 Environmental and Social assessment studies

Assessing the environmental viability and social acceptability of the integrated aluminium complex is a legal requirement in the Russian Federation<sup>1</sup> as well as being a requirement of international lending agencies (including the International Finance Corporation<sup>2</sup> (IFC) and the European Bank for Reconstruction and Development<sup>3</sup> (EBRD)).

The environmental assessment process for the integrated aluminium complex was initiated in August 2003 with the preparation of an environmental audit of the current operations at the Middle Timan Bauxite Mine. The audit was completed in December 2003 and released for public review and comment. The hard copies of the documents were placed at the Komi Aluminium offices in Moscow, Ukhta and Syktyvkar, the IFC offices in Moscow and Washington and the EBRD offices in London. Electronic versions of the documents are available on the following website: [http://www.sual.com/business/komi\\_aluminium/ecology/](http://www.sual.com/business/komi_aluminium/ecology/) and linked to from the following: <http://ifcln001.worldbank.org/> and <http://www.ebrd.com/projects/index.htm>. All documents have been prepared in English and Russian.

Each of the projects that make up the integrated complex is the subject of their own Environmental Assessment processes (including associated public participation exercise), however, a Public Participation and Disclosure Strategy which provides a framework in which public consultation will be undertaken for the integrated aluminium complex programme has been prepared and will be disclosed in March 2004. As the feasibility of the refinery is contingent on the feasibility of the mine expansion, the final approvals for each component of the integrated aluminium complex are related.

The Environmental Assessment processes at the mine are ongoing with the preparation of an Environmental and Social Impact Assessment which is due for public release in end-March 2004 and the preparation of an OVOS (due for completion at the end of September, 2004). Both of these assessment processes have been the subject of public participation programmes with public meetings held in February and March in Chinavoryk and Emva. A Public Consultation and Disclosure Plan was prepared for the mine Environmental Assessment processes and submitted for public comment and review in December, 2004. The public consultation programme for the Early Works activities is presented in Appendix A.

As a key condition of the IFC and EBRD approving funding for the expansion of MTBM beyond 2.5 MTPA an Environmental and Social Impact Assessment must be completed for the refinery and the refinery must have a positive approval of the Russian environmental authorities. As a consequence, an ESIA and OVOS are currently underway to determine the environmental and social acceptability of the proposed refinery. The ESIA process was initiated in February 2004 with public meetings held in Sosnogorsk and Kerki. During the first week of March a series of public meetings was held on the proposed refinery. These meetings were held in Ukhta (Friday 5 March, 2004) and Kerki and Sosnogorsk (Saturday 6 March, 2004). The meetings were extremely well attended with approximately 200 people attending in total. In general terms, there was a prevailing negative sentiment in Ukhta towards the proposed refinery but this appears to have been largely driven by the strong presence at the meeting of the Save the Pechora Committee. A generally more positive sentiment prevailed at the Kerki and Sosnogorsk meetings. A final PCDP will be disclosed in the public domain in April, 2004.

Komi Aluminium has not yet publicly announced the choice of the Sosnogorsk site. As a result the draft Declaration of Intent could not be presented but the Terms of Reference for the EIA were presented and made available to meetings participants. Copies of the Terms of Reference (a document of some 40 pages) were made available for people to take home and

---

<sup>1</sup> The State Law "On Environmental Protection", 2002 and The State law "On Environmental Review", 1995

<sup>2</sup> OP 4.01 Environmental Impact Assessment

<sup>3</sup> Environmental Policy (2003)

review, and contact details provided for verbal and/or written comments. The following was thus presented at the meetings:

- An overview of the proposed alumina refinery highlighting the industrial process and the two sites being considered
- An overview of the site screening exercise showing the differences between the two proposed sites
- A description of the environmental assessment process that would be used
- An overview of the Terms of Reference and the public participation process

Key issues to emerge from the public meetings are listed below:

- The impact of the loss of the resource (i.e. 'giving up' the bauxite);
- The conservation value of the areas where the deposits occur
- The choice of refinery technology and its bearing on the use of high grade versus low grade bauxite
- Dust from the transport of the bauxite
- Jobs
- Social development – benefits that will accrue to people living in the area
- Use of local labour
- Air pollution emissions – in the context of the oil refinery in Ukhta
- Possible utilization of the red mud
- Establishing the refinery closer to the ore source
- Choice of environmental consultants i.e. why were Russian consultants not chosen
- Perceptions of health being poor as a result of the pollution load in the area
- Radioactivity in the bauxite

This exercise will be supplemented with the disclosure of a refinery specific PCDP in April 2004. The ESIA and OVOS will both be completed by September 2004 at which time they will be submitted to the authorities for environmental approval. Given the need for early establishment, however, Komi Aluminium are seeking permission to embark on an "Early Works" programme to prepare the site for later construction activities and to conduct additional investigations on the environmental and engineering feasibility of the site. The early works are proposed to be undertaken from May through November 2004.

If the feasibility studies and/or the ESIA indicate that the refinery is not viable, the early works activities will be sacrificial. Komi Aluminium recognise this risk and wish to continue with the Early Works activities. Early works will not commence until the Russian authorities have, provided written approval of the Declaration of Intent and land allocation documents<sup>4</sup>.

#### **1.4 Purpose of this document**

As indicated earlier, Komi Aluminium are wishing to undertake early works on the proposed refinery site. Early works are considered necessary so as to establish the refinery, if it proves feasible, as soon as practically and legally possible. Komi Aluminium would like to undertake certain key activities before the 2004-2005 winter period.

This document sets out to provide a rationale for the proposed site that has been selected for the refinery (Section 2), outlines the nature of alumina refining (Section 3), provides a description of the proposed early works activities (Section 4) and details the environmental and social impacts associated with the activities (Section 5). The public consultation programme for the Early Works activities is presented in Appendix A. In addition, the

---

<sup>4</sup> This is a strict EBRD requirement.

document provides a description of the refinery activities and associated environmental impacts (Appendix B).

## **2 THE PROPOSED SITE**

### **2.1 Location**

The proposed alumina refinery will be constructed on a 2.5 km by 1.5 km plot with 350 and 370 hectares being allocated for the refinery and red mud pond respectively. The site will be located about 15km north east of the town of Sosnogorsk in an area between an existing railway line and a 110 kV power line. The land is currently owned by the State and a Land Allotment Process has been initiated by Komi Aluminium. A high-pressure gas pipeline as well as the Komi republic road is positioned in close proximity (5-7km) to the site together with an existing bulk potable water reservoir.

### **2.2 Site selection**

As part of the pre-feasibility process a range of possible sites were initially considered for the refinery. Following further investigations these were narrowed down to two possible choices namely the so-called Ukhta and Sosnogorsk sites (the location of the sites is shown in Figure 2). Respective local authorities had previously identified the sites.

From an economic and technical point of view, the sites require reasonable proximity to transport infrastructure – especially rail but roads as well, energy sources including fuel and electricity, water sources and general services. From an environmental point of view the following criteria was used in identifying a preferred site:

- *Air quality impacts* – proximity of sensitive downwind receptors;
- *Water resource protection* – proximity of vulnerable surface water bodies or groundwater aquifers that could be affected by refinery activities;
- *Social impacts* – the vulnerability of existing settlements to the influx of a large construction force that makes demands on infrastructure and services;
- *Waste* – availability and proximity of waste sites for disposing of municipal and hazardous waste;
- *Biodiversity/ecology* – ecosystem integrity on the site and proximity of sensitive and/or protected areas;
- *Logistics* – transport of raw material to and finished product from, the refinery;
- *Noise* – proximity of receptors sensitive to noise disturbance;
- *Sanitary and water protection zones* – federal regulations dictate sanitary and water protection (buffer) zones that must be respected.

At a regional scale there was little difference between the two sites, as they occur in similar biophysical and socio-economic environments. Both proposed sites are presented together with the surrounding geography in Figure 2. At the local scale, however, there were important differences between the two proposed sites. This influenced the selection of Sosnogorsk as the most suitable location for the refinery. These differences are presented below.



## **2.3 Factors influencing the choice of the Sosnogorsk site**

### *2.3.1 Absence of Protected Areas*

The Sosnogorsk site has no protected areas close to the proposed location of the refinery, whereas the Ukhta site has a forest reserve in close proximity and other reserves that could be directly affected by project activities.

### *2.3.2 Availability of Infrastructure*

One of several key success factors for the refinery is the relatively low cost of transporting both the bauxite to the refinery and the alumina from the refinery to various customers. This is dependent on the rail links between the bauxite source and the refinery and the alumina customers and the refinery. The Sosnogorsk site has established infrastructure as opposed to the Ukhta site, which will require the construction of a railway line of 32km and an additional gas line to provide gas to the Ukhta site. The Ukhta site will also require the upgrading of the existing, access road. The Sosnogorsk site on the other hand will require the construction of a new 10km access road to the plant and a bridge to cross the Aiuva River.

### *2.3.3 Biodiversity Loss*

In terms of the general biophysical environment of the sites, the Ukhta site was deemed preferable for the establishment of the refinery, since the Sosnogorsk site is homogeneous and relatively less transformed than the Ukhta site. This suggested that the loss of forest habitat at the Ukhta site would be less significant than the equivalent loss at the Sosnogorsk site. However, additional infrastructure requirement at the Ukhta site would result in a substantially larger 'footprint' in terms of potential biodiversity loss, than the Sosnogorsk site and in these terms the latter site was considered to be more favourable.

### *2.3.4 Availability of Water*

The Sosnogorsk site has the nearby Ajuva and Izhma Rivers where process water can easily be sourced, whereas at the Ukhta site process water would not be easily accessible and require further infrastructure development with related impact on the environment.

### *2.3.5 Socio-economic impacts*

From a social impact point of view it is likely that Sosnogorsk would be more vulnerable to social impacts than Ukhta, simply by virtue of its size and the relatively fewer services that are likely to be available. Infrastructure in Sosnogorsk is similarly less extensive and thus the introduction of a large labour force is likely to result in impacts of greater significance to Sosnogorsk than to Ukhta. Similarly, Ukhta would be in a better position to supply labour to the project than Sosnogorsk thus increasing the ratio of locally sourced labour in the workforce.

That said it is important to recognise that Sosnogorsk and Ukhta are a short distance from one another and people living in Ukhta could relatively easily continue living there while working either at the operational refinery or as part of the construction team. Nonetheless the Ukhta site is deemed preferable to the Sosnogorsk site from a social impact point of view by virtue of the relatively greater vulnerability of Sosnogorsk to the demands of a large labour force and possible influx of work seekers.

## **2.4 The Sosnogorsk site**

The Sosnogorsk site is situated some 15 km northeast of Sosnogorsk adjacent to the railway line (Moscow to Vorkuta) and some 6 km southwest of the village of Kerki. Sosnogorsk has a population of some 31 400 whereas the population of Kerki is 800. The official level of unemployment in Sosnogorsk is 2,6% which is less than the Komi average. The site is relatively low lying and level, explaining the dominance of forest and the few wetland corridors traversing the area. Part of the site is marshy suggesting a high water table. The River Aiuva is close to the site (lying some 3 to 7 km from the railway line). There are no protected areas in the immediate area surrounding the proposed site.

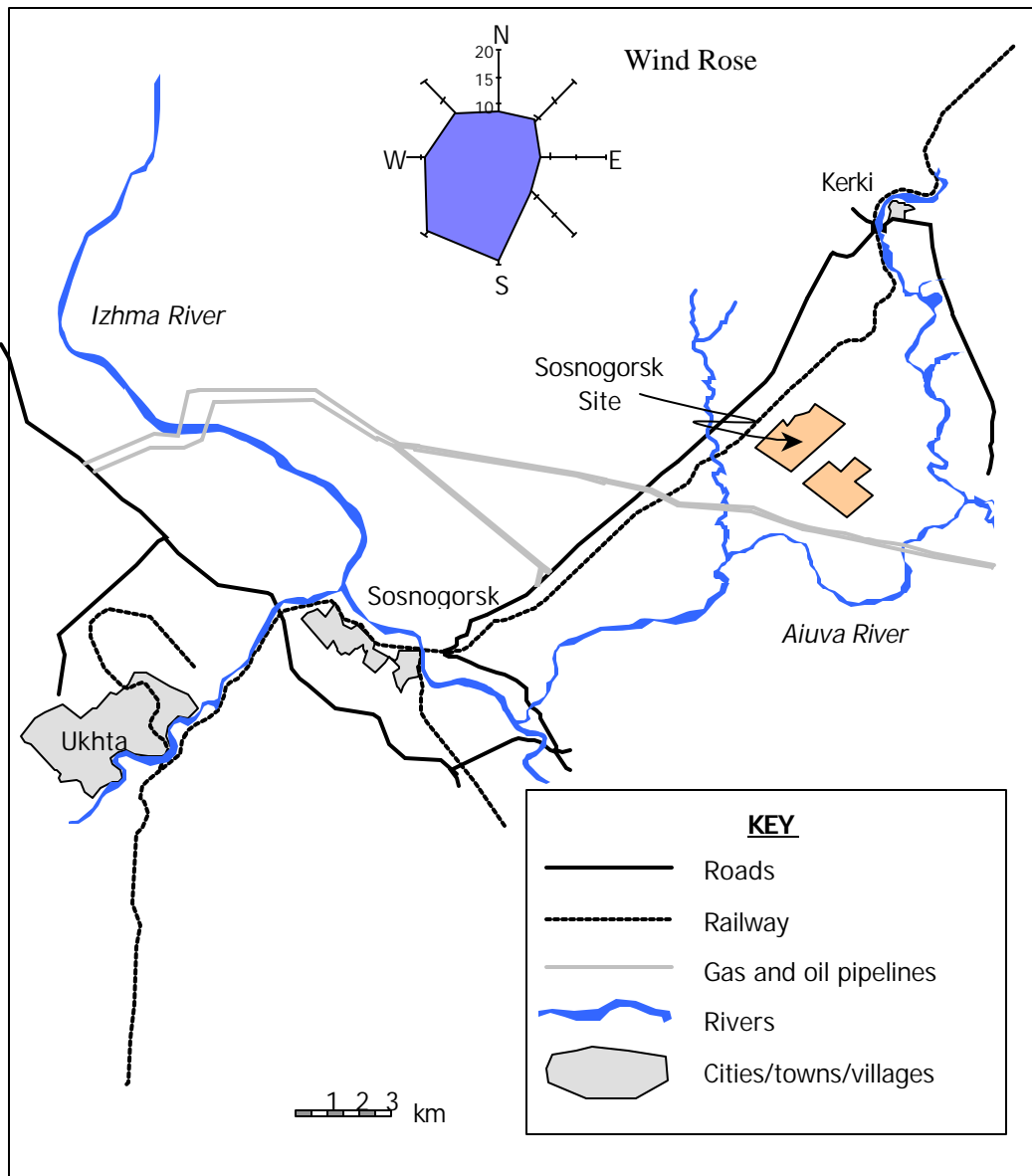
The general environment is quite homogeneous. The forest, although clearly of a secondary nature (i.e. possibly affected by past forestry operations and/or the incidence of fire), is in a generally intact, un-fragmented and ecologically functional state. There is also the possibility that there are patches of indigenous forest within the area. This mixed reforestation is deemed third category forest excluding that occurring within the 500 m water protection zone around the river, which is first category forest.

Infrastructure at the Sosnogorsk site includes the railway line (Fig. 2), a road to the northwest of the railway line, power lines (which run along the railway line) and a gas pipeline that runs due south of the site (within 2 km). In addition, water required for the refinery can be sourced directly from the River Aiuva.

## **3 THE PROPOSED REFINERY**

As indicated, the proposed development is an alumina refinery with a alumina production capacity of 1,400,000 tonnes per year. Assuming a price per tonne of US\$225, the refinery would generate revenue of some US\$315,000,000 per annum. The development cost of the refinery is estimated to be US\$857 million. Construction is planned to start in the summer of 2005 with full production commencing in the first quarter of 2008. 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.

A three chamber red mud pond is proposed with a filling plan of 6 months for each chamber and a lag period of 12 months for the mud to settle. After solidification the pond will be filled again. Each chamber will be lined with high-density polyethylene (HDPE) and bentonite (a clayey material) and a 30-year disposal capacity is proposed. The function of the refinery and the details of its operation are described Appendix B.



**Figure 2:** Map showing the relative positions of the two proposed sites together with key surrounding features.



**Figure 3: Railway and forest cover in the vicinity of the Sosnogorsk site**

## **4 SCOPE OF PROPOSED EARLY WORKS**

### **4.1 Refinery and Construction Camp Site Clearance and Platform Preparation**

In order to prepare the site for possible subsequent construction activities, the area of the refinery and the area of the construction camp will be cleared of all vegetation. The total footprint of the area to be cleared will be approximately 350ha, this figure is based on an approximation of the site area reflected on the site plan (Figure 4). Further land clearing during the early works is dealt with in later sections.

Preparing the site will involve felling trees and storing them on-site prior to removal. There will be opportunities 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 no SMME take up the opportunity to make use of the felled timber, Komi Aluminium will remove the trees from site and transfer them to local distribution centres.

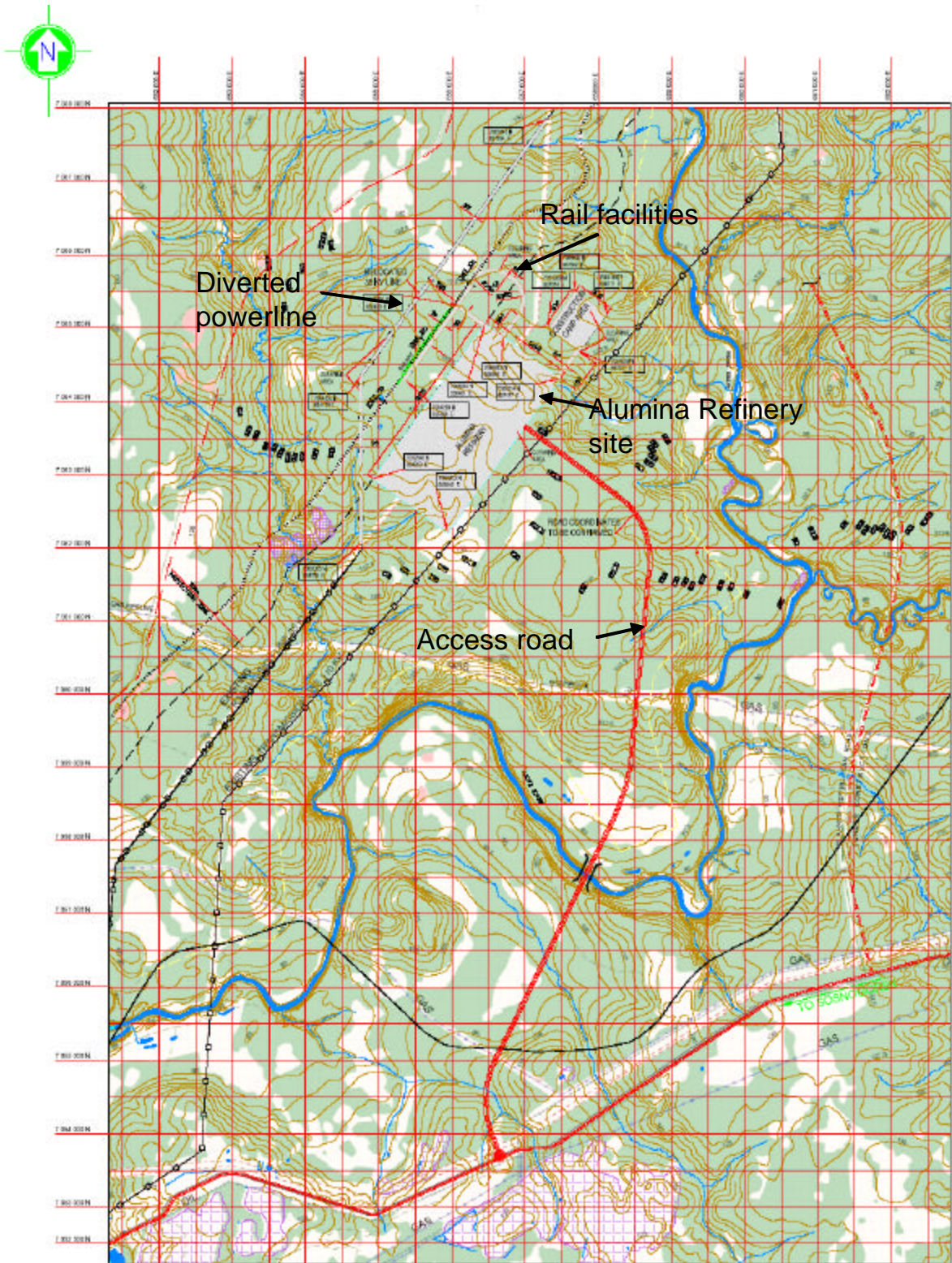
In addition, the site will be grubbed. Grubbing consists of excavation and disposal of stumps, roots and organic surface material. The organic surface material (top soil) will be stored in a designated area within the plant area for future use.

Following the felling of trees, 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 and spilled materials or contaminated water from flowing into the Aiuva River will be constructed around the refinery and personcamp areas.

It is envisaged at this stage that finished grade at the refinery will be el,133.5 suggesting that 50% of the refinery plant area will be excavated. Excavated earth will be discarded within the plant area as this material can not be reused as backfill for roads or at plant buildings. 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 required also in all areas to be filled. All imported material will be sourced from permitted sites. The source of this material is still under investigation, however, it is planned that the material will be sourced locally.



Figure 4: Plan of proposed refinery site “early works” (not to scale)



Perimeter drainage ditches will be constructed around the refinery and person camp areas. In addition, perimeter fencing will be installed at the refinery and construction camp areas. This work will be carried out when the Refinery site preparation described above has been completed.

#### **4.2 Clearing Passage for Access Roads**

The proposed route from Sosnogorsk to the refinery site is presented in Figure 4. The total length of the access road is approximately 9.5 km with an average width of 33 m. This translates to a total disturbance area of  $313,500\text{m}^2$  (31ha) this figure is based on an approximation of the site area reflected on the site plan (Figure 4). Similar to the clearance for the construction area, all trees and vegetation will be cleared for the road pathway, however, no platform or fill material will be imported and no actual road construction activities will be undertaken.

The road alignment was selected so as to have a minimum disturbance on the Aiuva River.

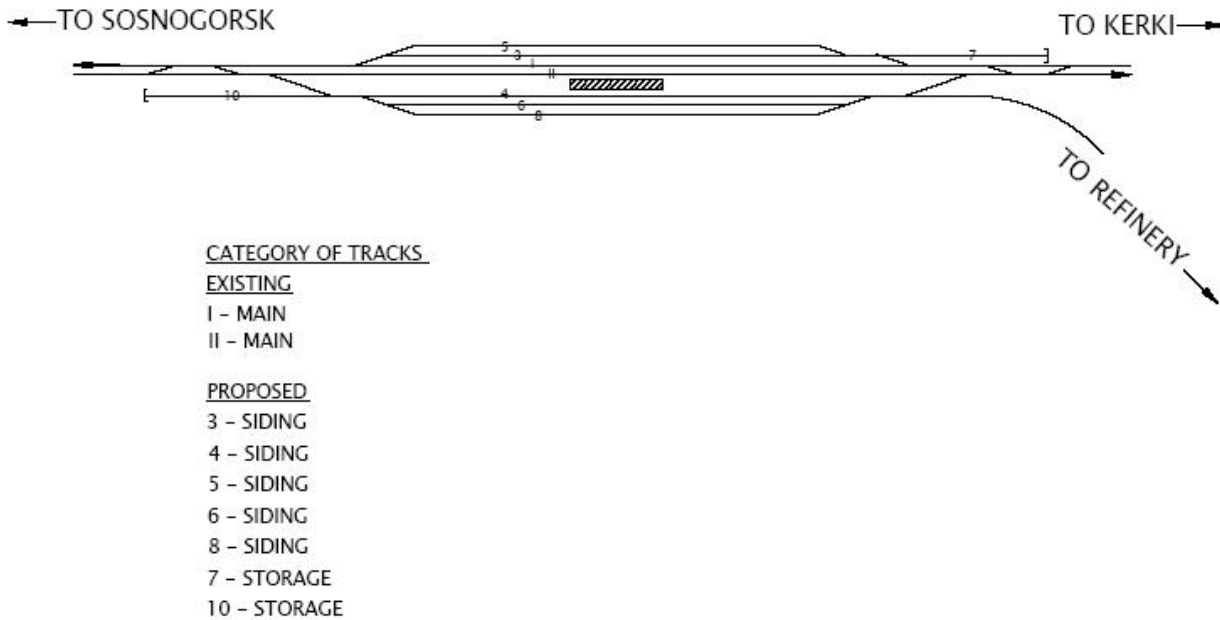
Figure 4 reflects that the road will need to cross the River Aiuva as a consequence, therefore, a bridge will need to be constructed to facilitate this crossing. The construction of the bridge over the River Aiuva will be the subject of a more detailed environmental assessment study and, therefore, falls outside of the Scope for Early Works.

#### **4.3 Establishment of Rail Facilities**

In order to ensure that bauxite can be readily transported to the refinery site, railway facilities (including the construction of a rail platform and rail spur – as per Figure 5) will be constructed on the existing Sosnogorsk – Kerki rail line. The nature of the proposed on-site rail facilities are reflected in Figure 5.

Figure 5 reflects the rail link between the existing Sosnogorsk – Kerki line and the refinery. In order to prepare the site for this construction, similar activities will be undertaken as per the road clearance activities. It is possible that the rail line facilities will form a part of the early works scope

TRACK PLAN  
PROPOSED STATION AT 1586 km



**Figure 5: Proposed rail facilities at the proposed refinery site.**

#### 4.4 Ongoing investigations

Following the clearance of the areas (refinery and person camp, access road and railway spur line), detailed geo-technical investigations will be conducted, as follows:

- a) Refinery site: Investigation will require boreholes at 100 m intervals and CPT (**Cone Penetrometer Testing**) at 50 m interval. It is estimated that approximately 100 boreholes and 200 CP tests will be required. A static pile load test will be conducted on approximately 5 piles
- b) Access road to the refinery: Investigation will require bore holes for the bridge supports and a number of test pits and bore holes to be defined along the 11.5 km long road alignment
- c) Railway spur line: Test pits and bore holes to be defined along the railroad spur alignment

In addition, a detailed topographic survey will be required to create maps at 1:2500 and ground contours at 0.5 m intervals. The survey will be conducted at the refinery site, construction camp area, railway spur and main access road. The survey will also be conducted following completion of clearing and grubbing activities.

#### **4.5 Relocation of 35 kV Power Line**

As per Figure 4, an existing 35 kV powerline traverses the proposed refinery site. In order to accommodate the refinery construction and operation, the powerline will be relocated directly north (from a point approximately 500m from the south-west corner of the site). The relocation will run parallel with the site (on the opposite side of the railway line). The relocation will not involve any disturbance of vegetation and will be undertaken so as to not disturb any electrical supply.

#### **4.6 On-site Person Camp**

A non-permanent person camp will be established on site during the early works operations. The camp will house approximately 100 workers in temporary, "caravan-type" accommodation. The need to accommodate workers on-site will be mitigated through the employment of local people to the maximum extent possible. The camp will not be retained during the construction period. At that time a formal camp will be established.

##### *Water supply*

On the basis that the person camp will be occupied by approximately 100 people for a duration of 5 months, it is calculated that considering; showers, food preparation and laundry facilities, the daily consumption of water will be 15 m<sup>3</sup> or approximately. The Quality of water in the Aiuva is suitable for human consumption (Appendix C), therefore, water will be sourced from the Aiuva River.

A Water Use permit will be obtained prior to any abstraction from the Aiuva.

##### *Waste*

All domestic waste produced during the early works activities will be collected into on-site skips and transported to a domestic waste management facility for disposal. On the basis that the person camp will be occupied by approximately 100 people for a duration of 5-months and that the average volume of waste generated per person will be 8kg/week it is likely that the total volume of waste generated during the early works activities will be approximately 17 tons. Waste-types will include: food discards, packaging, clothing etc. No hazardous wastes will be generated.

At present there is no domestic landfill site in Sosnogorsk, therefore, wastes will be transported to Ukhta. The Sosnogorsk administration has indicated that they are in the process of addressing the problem but it is not clear where or when a permitted domestic waste landfill will be established. It is worth noting that the lack of formalised disposal facilities may present problems at a later stage in the project and it is worth starting a process of better understanding the planning that exists to establish waste disposal facilities in the area.

No maintenance of vehicles or other machinery will be permitted on-site so as to prevent the spillage of oils etc. All machinery requiring maintenance will be transported to either Sosnogorsk or Ukhta for the works to be undertaken.

On site sanitation facilities will be provided for workers and will be drained regularly by tanker for disposal in a domestic sewage treatment facility. On the basis that the person camp will be occupied by approximately 100 people for a duration of 5-months and that the average volume of wastewater generated per person will be 1.2m<sup>3</sup>/week, it is likely that the total volume of waste generated during the early works activities will be approximately 2,940 m<sup>3</sup>.

A detailed waste management plan will be prepared prior to the commencement of the early works activities to ensure that the workers do not disturb any areas outside of the construction camp (including preventing any recreation activities such as fishing in the Aiuva River), do not cause a disturbance to the local community etc.)



Komi Aluminium will require the early works contractor to allocate environmental management responsibility to a management-level member of their work team. No specific environmental manager will be employed for these activities.

## **5 ENVIRONMENTAL AND SOCIAL IMPACTS AND ENVIRONMENTAL MANAGEMENT MEASURES FOR EARLY WORKS ACTIVITIES**

### **5.1 Air quality impacts**

#### *5.1.1 Fugitive dust*

Site clearance (for the refinery and personcamp, access road and railway spur line) is a source of dust emissions that may have substantial temporary impact on local air quality. Dust emissions are likely to vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. Based on field measurements of total suspended particulate (TSP) concentrations surrounding apartment and shopping center construction projects (considered to be of a similar nature to the proposed early works in terms of dust generation), the approximate emission factor for construction activity operations are [EPA-AP42]:  $E = 2.69 \text{ ton/hectare/month of activity}$ .

Therefore, assuming a building area of 350 hectares and an early works period of 5 months the total suspended particulate emission can be estimated at approximately 6,457 tonnes for the early works period. Assuming a total disturbance area of 31ha for the road area, the total suspended particulate emission can be estimated at approximately 417 tonnes for the early works period.

The transportation of particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed for fugitive dust emissions. Results indicate that, for a typical mean wind speed of 16 km/hr (the approximate maximum wind speed at the Sosnogorsk site), particles larger than about 100  $\mu\text{m}$  are likely to settle out within 6 to 9 meters from the edge of the road or other point of emission. Smaller particles that are 30 to 100  $\mu\text{m}$  in diameter are likely to settle within a few hundred metres of the source. Smaller particles, particularly PM10 have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence and could settle significantly further from the site.

Given the distance of the proposed site and the access road from local residences, the retardation of wind velocity due to the surrounding vegetation and the settling of materials resulting from precipitation – the potential impact of dust as either a nuisance factor or for human health is extremely low. It is further unlikely that dust will impact on the functionality of vegetation in the impact area.

Despite the low likelihood of significant impacts, dust will be managed during the early works phase through:

Only removing the vegetation that is essential to accommodate construction activities;

- Limit traffic speeds on unpaved roads to 20 km/h; and
- Spraying the site roads and access roads with water routinely throughout construction to reduce dust.

Following the implementation of the management measures outlined above, the impacts resulting from dust will reduce significantly. In particular the dampening of soils will result in an order of magnitude decrease in the total dust emissions during the construction period.

#### **5.1.2 Combustion gases**

Combustion gases will be emitted from on-site mobile equipment. These emissions are difficult to predict due to the fact that there will be no set routes for most of the mobile equipment. Mitigation measures that will be taken to reduce emissions include:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel; and
- On-site equipment will be equipped with catalytic converters where necessary.

### **5.2 Impacts on water resources**

During the early works phase the impacts on water resources will be due to sediment washdown into the surrounding water courses and extraction for potable purposes.

#### **5.2.1 Sedimentation**

During the early works programme, the following water related management measures will, therefore, be applied:

- Implement measures to limit the surface area affected by construction activities, by restricting access and operational routes for construction vehicles.
- Provision of sanitary facilities and connection of these facilities to the local sewage collection network or transport of sewage waste by truck to the local sewage disposal facilities.

The Aiuva River has a water protection zone of 500 m in which no activities can take place and the refinery has a sanitary protection zone of 1,000 m. Although the water and sanitary protection zones may be waived, according to legislation, the zones cannot overlap so that no point of the refinery boundary can be closer than 1500 m to the river. The sanitary protection zone will be respected for all of the early works activities.

This suggests that the potential for sedimentation to the Aiuva River is extremely low. As such the impact on downstream water users and river biota is both unlikely to occur and will be of very low intensity.

In order to ensure that the potential for sedimentation is further minimised, diversion ditches will be provided up-slope of the disturbed areas to minimize the quantity of surface water runoff that may become contaminated and require treatment. Diversion ditches will be located a minimum 5 m from the edge of disturbed areas and will be designed to be non-erodible for the 10-year flood flow. Ditch armouring will be provided where maximum velocities exceed 1.5 m/s.

Settlement ponds will be provided to trap suspended sediment and channel bed load before release of clarified surface runoff into the natural streams. The ponds will be sized to remove the 0.02 mm diameter sediment size and provide detention times of 16 to 24 hours during the 1:10 year flood. No bridge facilities will be constructed over the Aiuva River during the early works, therefore, no associated impacts will be experienced during this phase.

#### 5.2.2 *Water extraction*

The extraction of potable water from the Aiuva is relatively low (at 15m<sup>3</sup>/day), therefore, the impact on water flow regimes will not be significant particularly as much of the early works activities will be undertaken in spring immediately following the melt when base flow is at a peak. The water requirements of the operational smelter are less than 2% of the river flow so these requirements will be negligible and within the permitted requirements (which state that water extraction is permitted as long as the extraction is less than 2% of the current river flow). As stated previously, however, a Water Extraction Permit will be obtained before commencing with any extraction operations.

The on-site activities will be at the surface and on-site storage facilities for solid and effluent waste management will be provided, therefore, no impact on groundwater resources will occur. On the basis of the implementation of mitigation measures presented here, the residual impact will be negligible (i.e. no sedimentation of the Aiuva River will occur during the early works activities and water extraction will not affect the availability of water in the River).

### 5.3 **Loss of biological resources**

#### 5.3.1 *Impacts to vegetation*

The on-site vegetation is of an already disturbed homogeneous nature with no rare or endangered species present on the site<sup>5</sup>. The conversion of natural habitats to industrial land will result in a significant loss of biological resources. In the case of the early works, the total area to be transformed is relatively low and the vegetation that will be lost is not significantly sensitive to disturbance. In addition, impacts to vegetation may result from dust generated during the clearing and grubbing activities. These effects are minor and short-term. Nevertheless, vegetation clearing will be limited to only those areas where it is absolutely needed. As a result, the significance of loss of natural vegetation is considered to be low.

#### 5.3.2 *Impacts to birds and mammals*

Impacts to birds and mammals can occur due to the footprint of the operations and the presence of additional people and equipment. This can lead to loss in habitat and upset of natural patterns. Given the already disturbed nature of the site, the limited size of the area to be affected and the fact that no rare or endangered species are known to occur in the area, it is unlikely that any birds or mammals will be significantly affected by the proposed early works.

In addition, the presence of people on the site could lead to an increase in hunting and poaching. A firm policy against hunting and poaching will be implemented by Komi Aluminium. The policy will serve to prevent any hunting by contractors so as to mitigate impacts to any large game species from poaching or hunting in the area. The policy will not apply to fishing except to state that fishing

---

<sup>5</sup> In very broad terms the vegetation in the area of the proposed refinery is largely similar to that in the vicinity of the refinery. This means that the ESIA currently being completed can provide a reasonable description of the vegetation types likely to be encountered in the area.

may not occur in protected areas. The policy will be enforced through the on-site manager responsible for environmental issues. Again the principle of restricting vegetation clearing to only those areas where is definitely needed, will serve to mitigate these potential impacts. The residual impact on birds and mammals, as a result of early works activities, is considered negligible.

#### 5.4 Noise

Using standardised equipment and on-site operations, the noise that is likely to be generated during the construction phase are detailed below:

Noise source	Distance from source	Noise level dB(A)	Community response
Earth works	At source	85-97	
	500m	65-77	None
	1 000m	59-71	None
	2 000m	53-65	None

During the early works programme, the noise levels are likely to fluctuate. Noise generated during this phase is of short duration and will not cause a disturbance due to the distance of the nearest community from the site, the noise mitigation provided by the local vegetation and that all machinery will be fitted with noise suppression measures. Noise may cause some initial disturbance to mammals living near to the proposed site. These mammals will move away from the site into similar habitats nearby – given the homogeneous nature of the nearby habitats the availability of suitable areas for the mammals to move into will not have a negative implication. The impact of noise will not cause disturbance to local residents or wildlife.

#### 5.5 Socio-economic impacts

A detailed description of the socio-economic characteristics of Sosnogorsk is provided in Appendix D.

The early works programme will employ 100 people for a 5 month period. As a result of the early works programme, employment opportunities are likely to increase in the Sosnogorsk area, resulting in the following potential impacts:

- Increase in household incomes of those directly employed during the construction phase.
- Increase in spending on goods and services.
- Increase in skills levels and future marketability of people employed during the early works phase and the potential for ongoing employment in the later construction and operation phases.

It has been proposed that the labour force will be housed in temporary housing adjacent to the site. The camp will not directly affect Sosnogorsk except during times when workers are relaxing away from the camp facilities. Impacts could include:

- Increased socially disruptive behaviour such as drunkenness, fighting and noise.
- Increased illegitimate pregnancy rate and the spread of sexually transmitted diseases.
- Increased damage to property and littering.
- Increased spending in Sosnogorsk businesses.

These impacts are unlikely to manifest if workers are sourced directly from Sosnogorsk as planned.

Komi Aluminium will engage directly with the Sosnogorsk Municipality to manage social impacts. It will not be possible to prevent people coming to Sosnogorsk in search of employment. All that can be done is to ensure that expectations regarding possible employment creation are actively downplayed (through clear, simple and persistent communication) and that support is given to local and other authorities who will be forced to deal with the impacts associated with an influx of people seeking employment. Potential health impacts during construction will be managed through the implementation of HIV/AIDS awareness campaigns, the establishment of on-site facilities to deal with work related injuries, emergency support and the implementation of occupational health and safety programmes. Komi Aluminium will undertake to ensure that the illegal sale and abuse of alcohol and narcotics is prevented at the early works site.

Komi Aluminium will ensure that job opportunities are created initially for local people and will work directly with the Sosnogorsk Municipality to determine the most effective mechanism to create and sustain jobs locally.

## 5.6 Summary of environmental and social impacts

Impact	Nature	Probability	Intensity	Spatial Scale	Duration	Significance
Dust generation	Negative	Likely	Low	Local	Short term	Low
Impact on water availability	Negative	Likely	Low	Regional	Short term	Low
Impact on water quality	Negative	Unlikely	Low	Regional	Short term	Low
Loss of biological resources	Negative	Definite	Medium	Regional	Short term	Medium
Noise	Negative	Definite	Low	Local	Short term	Low
Employment opportunities	Positive	Definite	Medium	Regional	Short term	Medium
"Anti-social behaviour of workers)	Negative	Likely	Medium	Regional	Short term	Medium

### Key:

- Nature of impact: this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?".
- Probability: This considers the likelihood of the impact occurring.
- Intensity: Here it should be established whether the impact is destructive or innocuous, and should be described as either low (where no environmental functions and processes are affected), medium (where the environment continues to function but in a modified manner) or high (where environmental functions and processes are altered such that they temporarily or permanently cease).
- Spatial Scale: This should indicate whether the impact will be local extending as far as the site and its immediate surroundings, or whether the impact may be realised regionally, nationally or even internationally.
- Duration: This reflects the lifetime of the impact, as being short term (0 - 5 years), medium (5 - 15 years), long term (where the impacts will cease after the operation of the site), or permanent.
- Significance: The significance of each impact has been rated as either critical, high, medium, low, or not significant.

## **6 THE “NO GO” OPTION**

The environmental and social suitability of the refinery is the subject of an ongoing Environmental Assessment process (which is due for completion in late-August 2004), therefore, it is possible that the project will not receive environmental authorisation. In addition, the feasibility study for the integrated aluminium complex is still underway. In the event that the project not receive authority approval or should it prove to not be feasible, Komi Aluminium will fully restore any disturbed areas, thereby, limiting the possibility for long term environmental degradation. In this regard, Komi Aluminium fully recognize the risks associated in undertaking the early works activities in that should the project not be feasible for technical, economic, social or environmental reasons, the early works will be sacrificial (i.e. to no avail).

An aggressive rehabilitation plan for all disturbed areas will be implemented and will include:

- Removal of all structures constructed on-site (including: rail infrastructure, diversion drains and catchment ponds, temporary housing etc.);
- Restoration of soil structures;
- Replanting all disturbed vegetation.

A detailed restoration plan will be drawn up prior to commencement of rehabilitation activities and only in the event of the refinery not receiving environmental approval.

## **7 CONCLUSION**

This document has provided a brief description of the scope of the early works proposed for the Sosnogorsk refinery site. 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. For the small risks of impact that do exist, effective mitigation iteration can easily be implemented to ensure that the impacts are not manifest. In addition, if the refinery does not proceed because of Komi Aluminium's decision or is not authorized by TEO/OVOS regulators, Komi Aluminium they will reclaim/rehabilitate all the areas to the close land use that it was before and/or according to reasonable stakeholder requests. The results of this study show that the possible impacts will be low or moderate, and mitigation measures proposed will ensure that all these impacts are kept low. This together with initiatives such as reducing the amount of vegetation to be removed mitigates the moderate impact of the loss of biological resources request if deemed reasonable.

As part of the Komi Aluminium Programme, Komi Aluminium will implement an integrated Health, Safety, Environmental and Community Plan for the entire programme. The integrated programme will detail all activities that could potentially negatively impact on the environment, what must done to prevent such impacts and what Komi Aluminium must do to ensure that no such impacts manifest.

## **Appendix A: Public consultation and disclosure for the early works programme on the proposed Alumina refinery**

### **Introduction**

As part of the feasibility study for the refinery, it will be necessary to conduct so-called 'early works' on the site proposed for the alumina refinery. These early works will be used in support of examining the technical feasibility of establishing the refinery on the proposed Sosnogorsk site. This will mean that permission will be required for the early works programme *prior* to a final decision on the acceptability of the refinery. The public consultation and disclosure framework presented in this document will be used to provide opportunity for raising comments and concerns on the scope of the proposed early works, to ensure that the decision on the early works programme is an informed one. The principles described in the main body of the PCD Strategy will be used for the early works programme, the specifics of which are described below.

### **Public meetings**

A single set of public meetings will be held in Ukhta, Sosnogorsk and Kerki. The draft environmental analysis of the early works will be presented at these meetings and opportunity provided for comment on the same. This will happen by distributing the draft documents at least 30 days prior to the meetings using the mechanisms and principles described in the PCD Strategy.

### **Newspaper articles and publications in popular media**

An article will be written describing the early works programme and related environmental impacts and their significance. The article will also include details of the public meetings as well as contact details for acquiring further information. The article will be published in Knyazhpogost News as well as in regional newspapers.

### **Radio and television interviews and announcements**

The public meetings will be advertised on local radio and television stations prior to the public meetings. The press will also be invited to attend the meetings and where required interviews will be given on the EA and public consultation and disclosure process. The following media will be used for this purpose: Gazeta "Ukhta", "Ukhtinskoe Radio", Sosnogorskoe Radio, Gazeta "Zarya Timana".

### **Internet**

Supporting information on the proposed early works programme will be posted on the following internet site:

[http://www.sual.com/business/komi\\_aluminium/ecology/](http://www.sual.com/business/komi_aluminium/ecology/).

### **Brochures and information sheets**

An information sheet will be developed that summarises the key issues of the early works programme in easily accessible language. These information sheets will be distributed at least 2-weeks prior to the public meetings.

### **Reading rooms and information centres**

The following reading rooms and information centres will receive the information outlined above:

	<b>NAME</b>	<b>ADDRESS</b>	<b>TELEPHONE</b>
--	-------------	----------------	------------------

City of Ukhta	<b>Mr. Petr Novoselchenko</b> , Deputy General Director of ZAO Komi Aluminium	Prospekt Lenina 26 b, Ukhta, 169300	+82147 67342
	<b>Ms. Maria Kotova</b> Ecologist, MTBM		+82147 13204
	<b>Ms. Svetlana Strekalova</b> Library of Domestic Reading (Visitor's Center)	Ul. Mira, 5 Ukhta, 169300	+82147 33546
City of Syktyvkar	<b>Ms. Tatiana Evdokimova</b> Institute of Biology, Komi Scientific Center, Russian Academy of Sciences	Ul. Kommunisticheskaya, 28 Syktyvkar, 167982	+8212 241247
City of Emva	<b>Ms. Natalia Kravchuk</b> City of Emva Administration (Visitor's Center)	Ul. Dzerzhinskogo, 81, Emva, 169200	+82139 21033
	<b>Mr. Anatoly Shevelev</b> Head of Knyazhpogost District Environmental Protection Committee	Ul. Dzerzhinskogo, 110 Emva, 169200	+ 82139 24977
City of Sosnogorsk	<b>Elena Melekhina</b> Sosnogorsk District Administration (Visitor's Center)	Ul. Zoi Kosmodemyankoi, 17 Sosnogorsk, 169500	+ 82149 54907

### Stakeholders

The following stakeholder groups will be targeted:

#### *Local communities*

Various methods and instruments of information dissemination and feedback collection will be applied to draw local community members into the early works presentation. Communities from Sosnogorsk, Ukhta and Kerki will be targeted for direct involvement in the consultation and disclosure process.

#### *Non-governmental (public) organizations (NGOs)*

As a minimum, the following organisations will be notified of the early works presentations:

- Greenpeace Russia..
- "Save the Pechora" Committee.
- "The Memorial"
- Association of small business development.
- "Komi-Kotyr/Komi-Voityr"

Additional NGOs that may emerge during the EA process will also be included.

#### *Other authorities*

Bauxite Timana and Komi Aluminium will contact and consult with federal level state and municipal control agencies to identify the most significant environmental aspects of the early works.



#### *Religious communities*

The public consultation process on the early works will account for the concerns of the churches located in Sosnogorsk, Ukhta and Kerki communities.

#### *Small and medium enterprises (SME) and SME -supporting structures*

The business associations or SME supporting structures in the districts Sosnogorsk and Ukhta will be identified through the EA process and invited to the discussions on the proposed early works programme.

#### *Indigenous people*

The participation of indigenous people (Ukhta, Sosnogorsk, Kerki, Ust-Ukhta, Pozhnya and other small villages in the area) in the early works programme presentations through indigenous people organizations will be promoted.

#### *Other civil society structures*

Other civil society structures that may be interested in discussions on the early works programme may include:

- Service providers;
- Media (local newspapers, radio stations TV);
- Leaders of local cooperatives community based organisations, women and youth organisations.

#### *Mass Media*

The following local mass media will be involved:

- Gazeta "Ukhta"
- "Ukhtinskoe Radio"
- Sosnogorskoe Radio
- Gazeta "Zarya Timana"

#### *Grievance Mechanism*

Any grievances that arise with regard to the early works programme can be raised through the following permanently available phone number and e-mail address:

e-mail address: info@komial.ru  
telephone number: (82 147) 67342

#### **Concluding statements**

It is recognized that all of the principles and commitments presented in the PCD Strategy apply equally to the consultation and disclosure process for the early works programme even if they have not been pertinently listed.

## APPENDIX B: THE ALUMINA REFINING PROCESS AND ITS ENVIRONMENTAL AND SOCIAL EFFECTS

### ALUMINA REFINING

Aluminium is one of the most common metals in use in the world today. Aluminium is a relatively new metal in the sense that it was first produced commercially only in the late nineteenth century. Aluminium is light yet strong, corrosion resistant, a good conductor of electricity and can be easily made into a variety of shapes and forms. It is widely used and is in increasing demand from a wide range of industries.

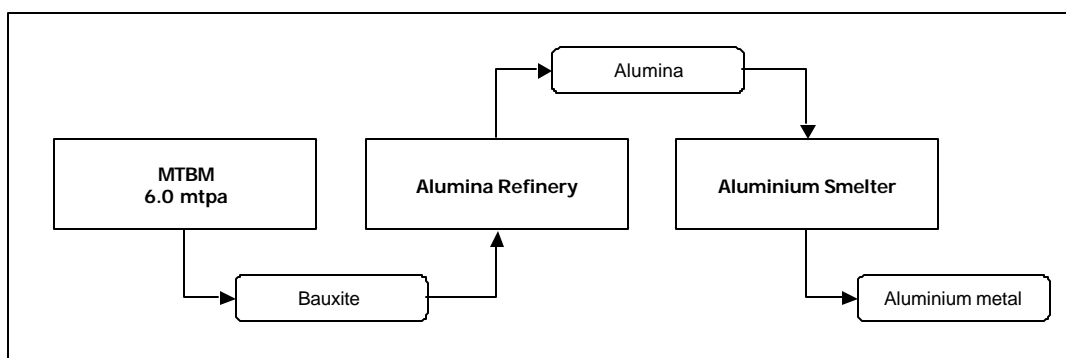
Aluminium never occurs as a metal in its natural form, but rather as an oxide in a range of compounds, including bauxite - the base raw material for primary aluminium production. However, aluminium is not produced directly from bauxite. The bauxite is first refined to form alumina (pure aluminium oxide) and it is the alumina that forms the key input material for aluminium smelters (Fig. 3).

### The choice of technology for the refinery

Given the projected quantities of Bayer Grade bauxite from the mining operation (MTBM), the Bayer process has been selected as the technology for the alumina refinery. The Bayer process remains the most cost-effective method of producing metallurgical grade alumina. In the section that follows the key components of the Bayer process that will be used for the Sosnogorsk refinery are described.

### Stages in the Bayer Process

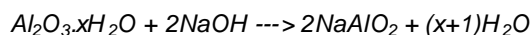
The Bayer Process consists of four stages, which are shown schematically in Figure 1 and described in the section that follows.



**Figure 1:** Schematic presentation of the aluminium production process showing the passage of bauxite from the mine to the refinery where alumina is produced, and from there to the smelter where aluminium metal is produced.

*Stage 1: Grinding & Digestion*

In this first stage, bauxite is ground into small particles, generally less than 0.5 millimetre in size. This is achieved by milling the bauxite with some caustic soda solution in a multi-compartment rod/ball mill. The bauxite slurry is then heated to 100 °C and held for some hours to enable desilication reactions to occur (some silica from the bauxite dissolves and reacts with caustic soda to form insoluble silica products). The ground bauxite slurry is then sent to a digester and mixed with additional caustic soda (sodium hydroxide) solution at high pressures and temperatures to dissolve the available aluminium oxide (alumina) according to the following chemical reaction:



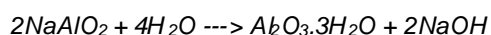
Conditions within the digester (concentration, temperature and pressure) vary according to the properties of the bauxite ore being used. The Timan bauxite is mostly a boehmitic bauxite ( $x=1$ ) and higher temperatures theoretically favour the amount of alumina that can be dissolved per volume of caustic soda solution. Temperature and caustic soda solution concentration selection is usually determined by economic (capital cost of equipment to handle higher temperature/pressure/concentration versus higher caustic soda solution productivity) and operability factors (scaling rates).

#### *Stage 2: Clarification*

The resulting liquor contains a solution of sodium aluminate and undissolved bauxite residues that mainly contain unextracted alumina, iron, silicon, and titanium oxides. These impurities are removed by settling in thickeners followed by polish filtration to remove remaining amounts. This bauxite residue, known colloquially as "[red mud](#)", is then washed with water in counter current washing trains to remove most of the caustic solution. Washed red mud slurry is then disposed to red mud storage areas.

#### *Stage 3: Heat Interchange and Precipitation*

The clear sodium aluminate solution is pumped through heat exchangers to cool the solution to a temperature that will aid the precipitation process (heat from the hot sodium aluminate solution is used to reheat the sodium aluminate solution returning to the digestion area). The cooled solution is added to large agitated tanks called precipitators. Fine particles of alumina hydrate are added to seed the precipitation of pure alumina particles, which follows the chemical reaction:



The 'spent' liquor is then recycled to the grinding and digestion stage via heat exchange described above. Evaporation of water from spent liquor using multi-effect evaporators and steam is also done to maintain volume balance / provide water to wash red mud.

#### *Stage 4: Drying and Calcining*

The alumina trihydrate crystals from the precipitation stage are classified into product and seed size fractions. The seed fraction is recycled to the start of the precipitation stage.

The product sized crystals slurry is then filtered/washed to remove caustic solution, and fed into a fluidised bed calcination kiln at 1100°C to drive off the chemically combined water. The resulting product is aluminium oxide ( $Al_2O_3$ ) a white powder, which is the feedstock for aluminium smelters. The mechanism for this step is complex but the process, when carefully controlled, dictates the properties of the final product.

### **Labour requirements**

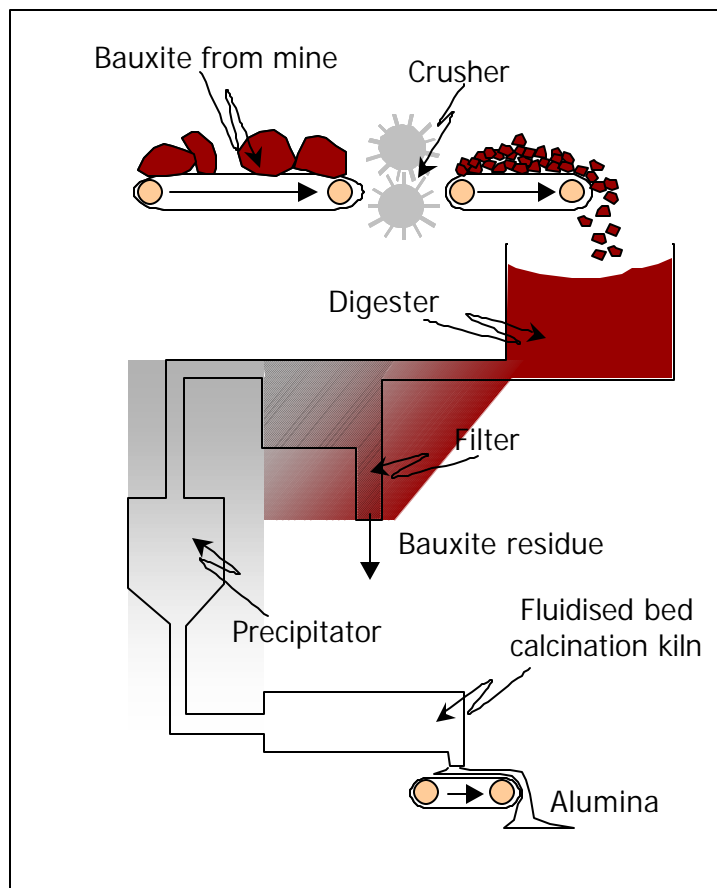
During operations the refinery is expected to require a labour force of approximately 850 persons with the major portion of the labour force expected to be sourced from the Sosnogorsk/Ukhta area. A comprehensive training programme will be developed and implemented for the labour force. Approximately 4000 workers will be employed during the

construction of the refinery. A labour camp will be established adjacent to the refinery site but the exact position of the camp has not yet been established.

### Raw material requirements

The principal raw material requirement is bauxite of which some 4,400,000 tonnes per annum (wet) will be required to produce the 1,400,000 tonnes of alumina. Additional raw materials include:

Lime: 123,400 tonnes per annum  
Caustic: 201,000 tonnes per annum (50% NaOH)



Flocculents: 970 tonnes per annum

**Figure 2: Schematic illustration of the Bayer Process**

Alumina refining consumes an average of 145 kg of caustic soda and 88 kg of lime per metric tonne of alumina. At this stage it is anticipated that all these materials will be delivered to the refinery by rail.

### Preliminary water need and proposed water sources

The refinery will require potable water for domestic purposes and industrial (process) water. The maximum potable water requirement is estimated at 500m<sup>3</sup> per day, and is likely to be supplied by the Katidved well field operated by the City of Sosnogorsk. During construction it

is likely that the potable water requirement will be some 1,500m<sup>3</sup> per day and this will be sourced from the same supply.

The required maximum quantity of industrial water is estimated at 8,000 m<sup>3</sup> per day and sourced from the nearby Ajuva River. The quantity of water is less than 2% of the low flow condition of the Ajuva, to ensure that there will be no impact on the river function. The water will be pumped from a pump house located on site at the Ajuva River that will be constructed as part of the project. It is expected that actual water use will be between 50-60% of these design values (both industrial and potable water) but the design figures are required for peak flow demands.

### **Preliminary energy need and energy supply sources**

The refinery will require electrical power and high and low pressure steam. The electrical power requirement is 47 MW with some 432 tonnes per hour and 100 tonnes per hour of high and low pressure steam respectively. Because there is a need for both electricity and steam the opportunity exists to establish a natural gas fired cogeneration plant to produce both the electrical power and steam. A second option would be an on-site gas fired steam generation plant and then sourcing electrical power from the existing Komi power distribution system. Further investigations are required before a final decision will be made on the power supply configuration.

### **Transport needs**

The major form of transport will be rail and this will be used to transport the bauxite from the Middle Timan Bauxite Mine in Knyazphogost as well as to the users of the alumina. Some 4.4 million tonnes of bauxite will be transported to the proposed refinery. Additional bulk input materials will also be transported by rail and these include lime, caustic and flocculants.

A road network will also be established for vehicles to access the site. This will include transport of workers and general logistics. Access to the site will be via a 10 km new road starting at a point approximately 6 km southeast of the City of Sosnogorsk on the existing Ukhta-Nijini Oder road. The road will come in from the south of the plant and will require the construction of a bridge across the Ajuva River.

### **Production use**

The rail network will also be used to transport the finished product to the various users. This includes approximately 700,00 tonnes per year of alumina to the planned smelter at Pechora and the remaining 700,000 tonnes of alumina to domestic smelters in the Irkutsk/Krasnoyarsk region.

### **Housing and social provisions for the enterprise staff**

No direct information is available at present but it is envisaged that a construction camp will be established in close proximity to the refinery.

### **Land resources need**

The land resources required include a 350 hectare area for the refinery and a 370 hectare area for the red mud storage. Right of way for the rail access, service roads, water and gas lines, power lines and so forth will require an additional 36 hectares. It is estimated that some 30 hectares will be required for the car road access to the site. The plant is currently being

designed for a 30-year life span, which may well be extended as that time approaches. As such the land required would be for at least this period and possibly up to 50 years.

### **Sewage water discharges**

A dedicated sewage treatment plant will be established as part of the refinery infrastructure. This will be a package type unit and will be designed to ensure that all effluent limits are met in discharge from the plant. A temporary arrangement for sewage disposal will be required during the construction phase that has still to be defined.

## **ENVIRONMENTAL ASPECTS OF ALUMINA REFINERIES**

The environmental aspects of the proposed refinery are summarised in Table A1. These include atmospheric emissions, water use and discharge, solid waste and energy use. These are described in more detail below.

### *Atmospheric emissions*

Atmospheric emissions include bauxite dust from handling and processing; limestone dust from limestone handling, burnt lime dust from conveyors and bins, alumina dust from materials handling, red mud dust and sodium salts from red mud stacks (impoundments), caustic aerosols from cooling towers, and products of combustion such as carbon dioxide, sulphur dioxide<sup>6</sup> and nitrogen oxides from boilers, calciners, mobile equipment, and kilns. The calciners may also emit alumina dust and the kilns, burnt lime dust. Dust emissions will be controlled with dust collectors, enclosed conveyors, storage silos, pneumatic transfer systems, electrostatic precipitators (ESP) for fluid bed calciners.

### *Waste water*

The refinery will have limited wastewater discharges. Stormwater runoff and spillages will be contained within containment areas for eventual recycling into the main process.

### *Industrial wastes*

The main solid waste from the alumina plant is red mud (as much as 1.7 tonnes of mud per tonne of alumina produced), which contains oxides of alumina, silicon, iron, titanium, sodium, calcium, and other elements. The pH of the red mud is between 10 and 12. Disposal is to an impoundment pond and some 2.3 million tonnes of red mud will be disposed per annum (see 'Bauxite Residue' section below for a more detailed description of the red mud characteristics).

Hazardous wastes from the alumina plant include spent sulphuric acid from de-scaling tanks and pipes (which is normally disposed with red mud where it is neutralised by caustic containing red mud).

Table 1: Summary of environmental aspects likely to be associated with the proposed alumina refinery.

Environmental aspects	Composition/Quantity	Sources
-----------------------	----------------------	---------

---

<sup>6</sup> As natural gas will be used for the power plant and the fluidised bed calciners, SO<sub>2</sub> emissions are likely to be less than 50 tonnes/y. Such quantities would be insignificant.

Atmospheric emissions	Bauxite dust including trace metals contained in the bauxite. Fugitive dust Fugitive emissions (including VOCs and speciated organics)	Bauxite handling Bauxite grinding Limestone handling Fuel storage Digestion Precipitation and clarification Precipitation and clarification
	Carbon monoxide, nitrogen oxides, sulphur dioxide (trace quantities only) and particulate matter (PM <sub>10</sub> ) .	Kiln stack(s)
Materials handling and spills	Sodium hydroxide  Acids (including sulphuric and hydrochloric) Fuels (natural gas, petrol, diesel) Proprietary chemicals (including biocides, flocculants and defoamers)	Digestion  Digestion Entire site Entire site
Waste water	Rainwater/stormwater runoff (diffuse runoff of bauxite, red mud and other materials handled on site). Effluent and sewage	Entire site
Red mud	2 tonnes/tonne of alumina	Liquor purification
Energy use	41 MW (for 1.4 mtpa refinery) 1000 GJ/hour steam (for 1.4 mtpa refinery)	Entire site
Greenhouse gases	1 tonne CO <sub>2e</sub> per tonne of alumina	Entire site
Noise		Entire site

### Greenhouse Gases

Greenhouse gas emissions of 1 tonne of CO<sub>2e</sub> (carbon dioxide equivalents) per tonne of alumina are generated primarily from fuel consumption and from energy consumed in producing the lime and caustic soda ancillary materials.

### Bauxite residue

[Bauxite](#) is composed principally of the monohydrate and trihydrate forms of alumina in varying proportions. Major impurities are the oxides of iron, silica and titanium, while elements such as zinc, phosphorus, nickel and vanadium are present in trace amounts. The residue from the alumina production contains undissolved impurities, plus alumina that is not extracted in the process. Most alumina producers add lime at some point in the process and the lime forms a number of compounds that end up with the bauxite residue. The amount of bauxite residue generated, per tonne of alumina produced, varies greatly depending on the type of bauxite used, from 0.3 tonnes for high-grade bauxite to 3.5 tonnes for very low grade. Its chemical and physical properties are dependent, primarily on the bauxite used and, to a lesser extent, the manner in which it is processed. The wide range in the chemical composition of bauxite residues is summarised in Table A2.

**Table 2: Constituents of bauxite residues (red mud)**

Constituent	Typical composition
Fe <sub>2</sub> O <sub>3</sub>	30 - 60%
Al <sub>2</sub> O <sub>3</sub>	10 - 20%
SiO <sub>2</sub>	3 - 50%
Na <sub>2</sub> O	2 - 10%
CaO	2 - 8%

Apart from the alkalinity that is imparted by liquors in the process, the residue is chemically stable and non-toxic. Bauxite residue is most often disposed of on land using one of a variety of methods. Once the disposal site has been decommissioned it can be used to grow crops or other vegetation. Alternatively the land can be used for building, depending upon the moisture content of the residue. Bauxite residue has also been used for infilling at coastal sites with no known adverse environmental effects.

The alumina plant discharges red mud in slurry of 50% solids by use, using high-efficiency deep cone thickeners. The lime used in the process forms insoluble solids that leave the plant along with the red mud. Recycling the lime used as a filtering aid to digestion to displace the fresh lime that is normally added at this point can minimize these lime-based solids. Finally, effluent volume from the alumina plant can be minimized or eliminated by good design and operating practices: reducing the water added to the process, segregating condensates and recycling to the process.

#### *Environmental protection measures*

The design of the plant will integrate Best Available Techniques (BAT), as recommended by the European Commission (Ref: Integrated Pollution Prevention and Control (IPCC) – Best Available Technique Reference Document on the Non Ferrous Metals Production Process – May 2000).

BAT for the production of alumina by the Bayer process requires the process to be optimized to reduce energy consumption, to remove dust and to reuse red mud transport water. World Bank guidelines will be observed, such as the use of a liner for the red mud impoundments.

#### **Resource requirements**

The proposed 1.4 mtpa refinery will require approximately 47 MW of electrical power and 1000 GJ/hour of steam. Although there is an existing combined heat and power station at Sosnogorsk that could provide 200MW, it cannot supply the steam required for the refinery operation and for this reason it is likely that there be a dedicated power and steam generation facility on the refinery site. There are existing gas supply pipelines in the area that could be used to supply the proposed power and steam generation facility(ies). Process water will be sourced from rivers such as the Izhma and the Aiuva. Approximately 840 permanent workers will be employed at the proposed refinery but no figures are yet available on the size of the construction workforce.

#### **ENVIRONMENTAL VULNERABILITIES**

Although the Sosnogorsk site emerged as the preferred site during the site selection process certain environmental vulnerabilities were also identified for the Sosnogorsk site, that need to be carefully considered during the environmental assessment process, and ultimately in the design of the facility should it be approved. These are described in the sections that follow.

#### *Water resource protection*

The key issue in terms of water resource protection are possible discharges from the red mud storage area as well as rainwater runoff. Such discharges have the potential to result in direct impacts on both ground and surface water resources. Of the two sites the Sosnogorsk site is deemed to be the more vulnerable of the two to such impacts, given the proximity of the River Aiuva and the high water table at the site.

#### *Social impacts*

As was presented earlier, Sosnogorsk may be vulnerable to social impacts by virtue of its size and the relatively few services that are likely to be available. The introduction of a large labour



force may result in impacts of significance to Sosnogorsk. Attention will need to be paid to ensuring that these impacts are effectively managed. There are several NGOs operating in Ukhta including Komi Kotyr (focuses on promoting the rights of indigenous peoples) and a number of cultural societies (Komi, Slavic, Ukraine, Azerbaijan and so forth).

The local population is generally concerned with possible environmental impacts of the proposed refinery such as an increase in the general impact on the area, possible water pollution and impacts on protected areas (natural parks and woodland reserves). Public opinion in Sosnogorsk can be described as cautiously optimistic, with people being keen to have access to new job opportunities but concerned also about potential adverse impacts of the refinery on the environment.

### *Waste*

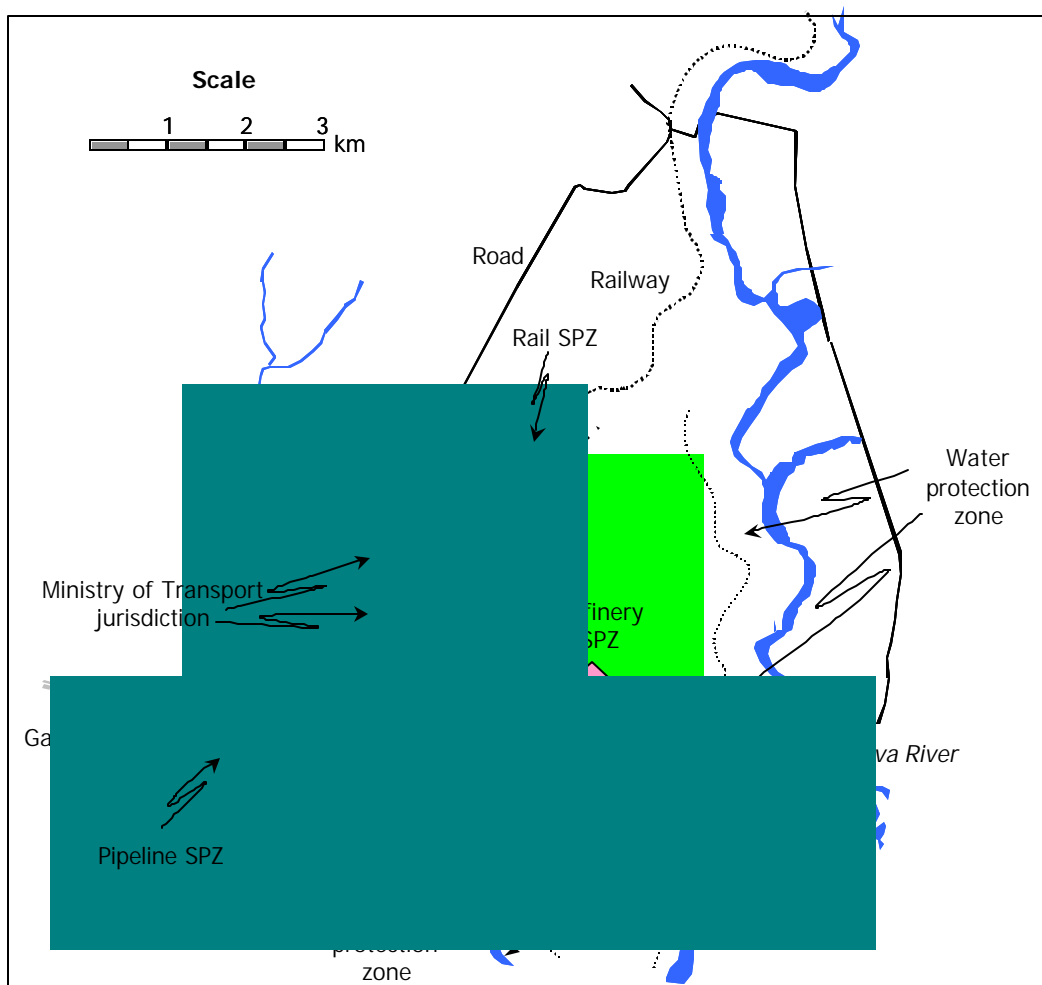
There is no permitted municipal waste disposal facility in Sosnogorsk and municipal waste is currently being disposed on a non-permitted landfill. The Sosnogorsk administration has indicated that they are in the process of addressing the problem but it is not clear where or when a permitted domestic waste landfill will be established. At the same time, there is no hazardous waste facility in Komi Republic at all. It is worth noting that the lack of formalised disposal facilities may present problems at a later stage in the project and as such a process of better understanding the planning that exists to establish waste disposal facilities in the area must be started as an urgent priority.

### *Sanitary and water protection zones*

Sanitary protection zones (SPZs) are defined for alumina refineries (Class 1 hazard) as being a minimum of 1000 m from the boundary of the site. In addition the smaller rivers occurring in the area have water protection zones of 50 m on either side and may be more depending on the relative position of the site to the river mouth and the defined river category. In terms of the Sosnogorsk site, the area between the railway line and the Aiuva River is quite limited, with a water protection zone of 500 m in which no activities can take place. In addition the railway has an SPZ of approximately<sup>7</sup> 50 m (referred to as a sanitary 'break') but

---

<sup>7</sup> The exact distance is determined using a formula



**Figure 3: Schematic illustration of the currently proposed refinery position at the Sosnorgorsk site showing the sanitary and water protection zones.**

this can overlap with the SPZ of the refinery boundary<sup>8</sup>. The gas pipeline also has an SPZ of some 50 m on either side.

#### POTENTIAL ENVIRONMENTAL IMPACTS

Given the environmental aspects of the refinery describe earlier and the general environmental character and vulnerability/susceptibility the following potential impacts should need to be considered in the environmental assessment.

#### Air Quality

Air quality is an issue that would raise most concern in Sosnorgorsk and this is further complicated by other sources of pollutants in the area. Related impacts could include impacts on people's health, vegetation and/or animals. Potential atmospheric emissions could include bauxite dust from handling and processing; limestone dust from limestone handling, burnt

<sup>8</sup> There is also a 500 m area on either side of the railway that is the jurisdiction of the Ministry of Transport.

lime dust from conveyors and bins, alumina dust from materials handling, red mud dust and sodium salts from red mud impoundments, caustic aerosols from cooling towers, and products of combustion such as sulphur dioxide and nitrogen oxides from boilers, calciners, mobile equipment, and kilns. The calciners may also emit alumina dust and the kilns can give off burnt lime dust.

It is unlikely that these emissions will result in direct impacts in their own right. The modern technology that will be deployed in building the refinery will ensure that atmospheric emissions are controlled to the point that they will not pose a risk of significant impact to human health or the environment. That said, an important issue that will have to be addressed during the more detailed assessment is the possible cumulative effects as a result of other sources. Again, early indications do not suggest that these cumulative effects will result in significant impacts on human health or the environment.

### **Greenhouse Gases**

Greenhouse gas emissions of 991 kg of CO<sub>2e</sub> (carbon dioxide equivalents) per metric tonne of alumina are generated primarily from fuel consumption and from energy consumed in producing the lime and caustic soda ancillary materials. This excludes the greenhouse gas consequences of electricity generation for the refinery but these are likely to be relatively slight given the use of natural gas to fuel electricity generation.

### **Water Resources**

A key issue relating to water resource is the availability of process water to meet the demands of the refinery and the optimisation of water reuse and recycling. The main source of water will be the Ajuva River and there may be some concern relating to its capacity and the ability to supply the refinery with the 8,000 m<sup>3</sup>/day of industrial water required. Early indications are that the water requirements are less than the required 2% of water flow during low flow conditions but this will need to be further investigated during the detailed assessments.

### **Water Quality**

The most pertinent issue relating to water quality is possible discharges from the red mud storage area as well as rainwater runoff. Such discharges have the potential to result in direct impacts on both ground and surface water resources. The situation is further complicated by the fact that the Sosnorgorsk site has a high water table and is in close proximity to the River Ajuva. This is an impact of potentially high significance that will have to be mitigated through the judicious siting of the red mud storage areas, effective management and maintenance of the red mud storage area and good control and management of stormwater.

### **Red mud disposal**

A key issue is the disposal and management of the bauxite residue. Capacity and lining of the red mud ponds will be an issue. Current technological practises have shown decreases in the volume of the waste are possible as well as the ability of the lime and waste to be recycled. The design of the red mud facility and operational procedures will be crucial to ensuring that the risk of impact is prevented or minimised. The present design of the site is such that the red mud storage will be positioned at an elevation of approximately 133 metres above MSL, with the tailings (red mud storage) at an elevation of 130 meters above MSL.

### **Hazardous Waste**

The disposal and management of hazardous waste is an important issue, particularly since there are no hazardous waste disposal sites in the Komi Republic. Transportation of the waste will therefore be an additional concern. Domestic waste disposal will clearly present a problem as there are no permitted landfills in the vicinity of the site.

## **Biodiversity**

The construction of the proposed project and infrastructure may have impacts on biodiversity, particularly should rare and/or endangered species be found on site. Given the nature of the prevailing habitat, this seems unlikely but will obviously need to be more fully investigated as part of the EIA. A more direct threat to biodiversity than the physical destruction of habitat in building the refinery, lies in the possibility of spills of chemicals, and/or red mud discharges that may reach the river. Again as described above the risk of such spills can be reduced substantially through suitable engineering on the refinery site, the creation of bunding and spill recovery infrastructure in areas of chemical transfer and good control of stormwater. Various preventative facilities and processes can also be applied to the design and operation of the red mud storage to ensure that the risk of discharge from the red mud storage is kept as low as possible.

## **Noise/Visual**

The alumina refinery produces noise especially during the construction and operation phase. Given that there are no sensitive receptors in close proximity to the proposed site, noise is unlikely to result in a significant impact. That said, noise abatement measures will need to be implemented to ensure the protection of worker's hearing.

The refinery will be constructed on a 700 ha plot and together with associated infrastructure will result in a significant visual changes to the current landscape. The intensity of this impact will be compounded by constant illumination at night. Through careful design, appropriate architecture, colour and lighting, the visual impacts of the refinery can be reduced.

## **Social Issues**

From a social impact perspective, Sosnogorsk would be vulnerable to social impacts, simply by virtue of its size and the relatively fewer services that are likely to be available. Infrastructure in Sosnogorsk would be less extensive and thus the introduction of a large labour force would result in impacts to Sosnogorsk. However, it is important to note that the proposed project will create job opportunities and possibly improve the quality of people's lives in Sosnogorsk and it is likely that workers could also travel in from Ukhta reducing the potential strain on services and infrastructure in Sosnogorsk.

## APPENDIX C: WATER QUALITY PARAMETERS IN THE AIUVA RIVER

### Translation

Physical/chemical laboratory  
OOO "Geologist-1"  
PK, Ukhta, St. Geologov, 2, tel: 5-78-97

### PROTOCOL # 2 Of quantitative chemical analysis of water

Laboratory # 33 client sample number 3p  
Name of water source (well, spring, perforation) and its # river Ajuva  
Client GGP  
Date of sampling 09.02.2004  
Date of testing running: beginning 10.02.2004 completion: 12.02.2004

SNC-LAVALIN INC REÇU/RECEIVED	
CONTRÔLE DES DOCUMENTS DOCUMENT CONTROL	
27 FEB 2004	
PROJET PROJECT	015540
CODING	GE-0001/01

Index name	Unit of measurement	Analysis result	Norm of MPC* (maximum permitted concentrations)	MBH (Local Standard)
1	2	3	4	5
Smell (flavor) at 20 degr. C	points	earth 1	2	
Taste at 20 degr. C	points	missing 0	2	
Color (degree)	degree	20	20 (35)	
Turbidity	EMF	5.2	2.6 (3.5)	
Transparency	cm	>03		
pH	unit pH	6.06	9-Jun	
Oxidability (perm.)	mg/dm3	5.71	5	
Mineralization	Mg/dm3	95.45	1000 (1500)	
Dry (solid) residue	Mg/dm3	82	1000	
Phenol index	Mg/dm3	<0.002	0.25	
Tamols	Mg/dm3		0.5	
Petroleum products	Mg/dm3	< 0.05	0.1	
Total hardness	Mg-equiv./dm3	1.12	7.0 (10.0)	
Calcium	Mg-equiv./dm3	0.84		
Iron (ferrum) total	Mg/dm3	1.05	0.3 (1.0)	
Ammonium ions	Mg/dm3	0.05	2.0	
Carbonate-ion	Mg-equiv./dm3	0.00		
Hydro-carbonate ion	Mg-equiv./dm3	1.07		
Chlorides	Mg/dm3	0.87	350	
Sulphates	Mg/dm3	5.98	500	
Nitrites	Mg/dm3	< 0.02	3.0	
Nitrates	Mg/dm3	0.69	45.0	
Manganese	Mg/dm3		0.1 (0.5)	
Fluorides	Mg/dm3		1.2	
Chemical need of Oxygen	Mg O2/dm3	19.2		
Additional study				
Suspended matters	Mg/dm3	0.39		

Executor signature Lynova 12.02.2004

Head of laboratory signature Yodina

Notes: 1. Testing protocol results cover the samples subjected to testing.

2. Re-typing the testing protocol without the permission of the laboratory management is forbidden.

3. Specific error value according to the normative documentation on testing methods is issued to the "Client" on the first request and is made out in the form of "Amendment" to the protocol.

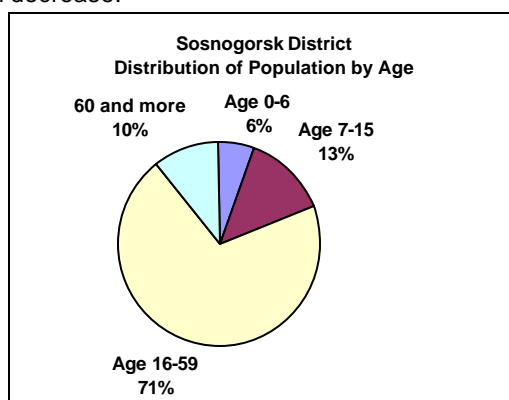
## APPENDIX D: SOCIO-ECONOMIC CHARACTERISTICS OF SOSNOGORSK

### Overview and Demographic Profile of the District of Sosnogorsk

The Sosnogorsk District was created in 1955. It is home to a population of about 58,000 individuals over a surface of 16,500 km<sup>2</sup>. 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:

- The population has been slowly but steadily decreasing over the last 15 years; the decrease rate has been in average 0.5% over the last three years.
- This decrease in the population is mainly caused by a natural decrease (the death rate being significantly higher than the birth rate): 14.5 deaths per thousand against 9.0 births per thousand. The death rate is slightly lower than the average in the Russian Federation (15.6 in 2002), while the birth rate is the same as the Russian average.
- Slightly more people tend to settle in the area than those who leave, although this is far from offsetting the natural decrease.
- The life expectancy at birth is 57.3 years for males and 67.8 years for females, in line with Russian Federation averages.
- The distribution of the population by age is shown on the graph opposite.



In rural areas, the decreasing trend in the population is more notable, in relation with the crisis of the forest industry which provided jobs to the majority of the active rural population.

## **Economic Overview**

The district of Sosnogorsk is presently mainly industrial, while forest and agriculture have become increasingly marginal in the last years. The total industrial production of the District for year 2003 was worth 5,450 million Rubles (about 195 million USD), while in 2003 investment in the productive sector was 3,930 million Rubles (about 140 million USD), in sharp increase compared with past years (2.3 times more than in 2002<sup>9</sup>).

Oil is being exploited in several areas of the District by 5 companies that deliver the crude oil to a refinery located in Ukhta, currently operated by a subsidiary of Russian oil major Lukoil. The main produced is "TebukNeft", also a subsidiary of Lukoil, with 71% of the total oil production of the District. Main problems faced by the oil industry in the area are related with lack of investment in the last years, and potential exhaustion of the reserves in 10-15 years. However, several new reservoirs are reported to be currently investigated. Sosnogorsk town also has a significant gas transformation plant, operated by Severgazprom, a member company of Russian gas giant Gazprom, which processes gas condensates to produce benzene and other sub-products, and a power plant ("KomiEnergo"). Oil and gas represent together 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. The timber production (in terms of cubic meters) was in 2003 only 15% of the production of year 2000, with a 50% reduction occurring between 2002 and 2003 only. This crisis results in severe economic difficulties for the population of several villages of the District, most of which were mainly established to house forest industry workforce and their families.

Formal agriculture in the District mainly produces milk and meat. It is currently being restructured, one of three main state farms of the District being transformed in three smaller private units. Agricultural production is overall very small (about 130,000 litres of milk).

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 town is also described as a "dormitory town" of Ukhta. Housing is cheaper in Sosnogorsk than in Ukhta, and as a result lots of people living in Sosnogorsk actually work in Ukhta, which has a wider industrial and economic base.

## **Occupations**

### **Employment and Unemployment**

The actually working population is 62%<sup>10</sup> of the population in working age<sup>11</sup>. However, only 5% of this working age population is officially registered as unemployed. According to local officials met by the study team, most unemployed people neglect to register themselves with the Ministry of Labour as they are eligible to no benefit.

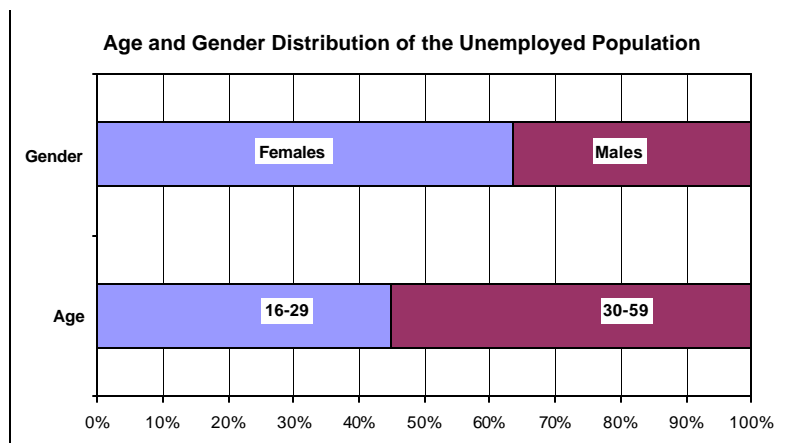
---

<sup>9</sup> This sharp increase was mainly generated by heavy upgrades undertaken at Severgazprom gas plant in Sosnogorsk town.

<sup>10</sup> 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.

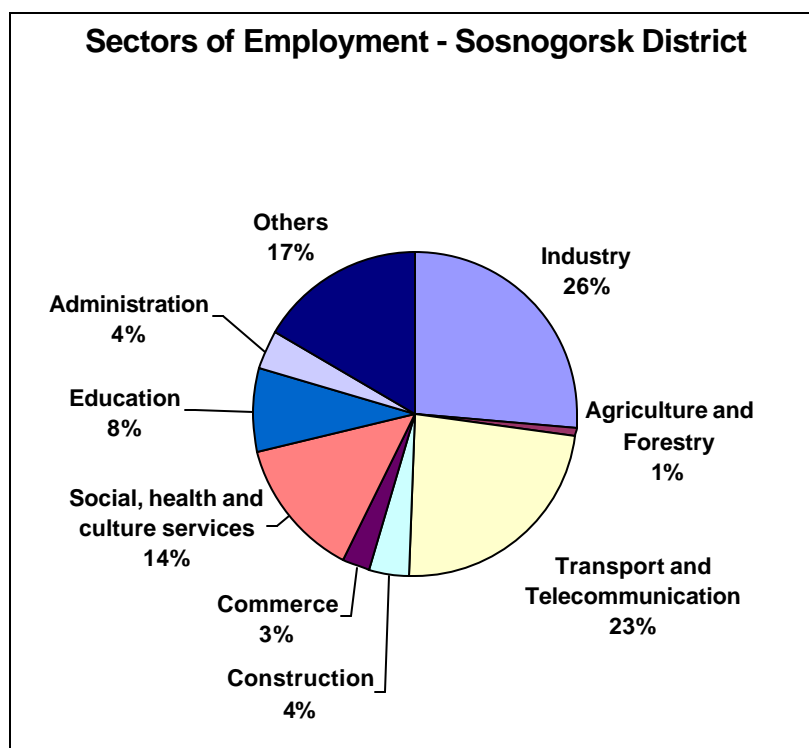
<sup>11</sup> According to the official categorization, the working age population includes females from 16 to 54 and males from 16 to 59.

The breakdown of the unemployed population by gender and by age, shown on the graph opposite, indicates that a majority of unemployed is female, while the unemployed are also predominantly young.



### Main Sectors of Activity

The graph opposite shows the distribution of the employed population in the various economic sectors (year 2002). It confirms the predominance of industry and transport and telecommunication as the main providers of employment, as well as the weakness of the small and medium businesses (commerce and construction).



### Small and Medium Businesses

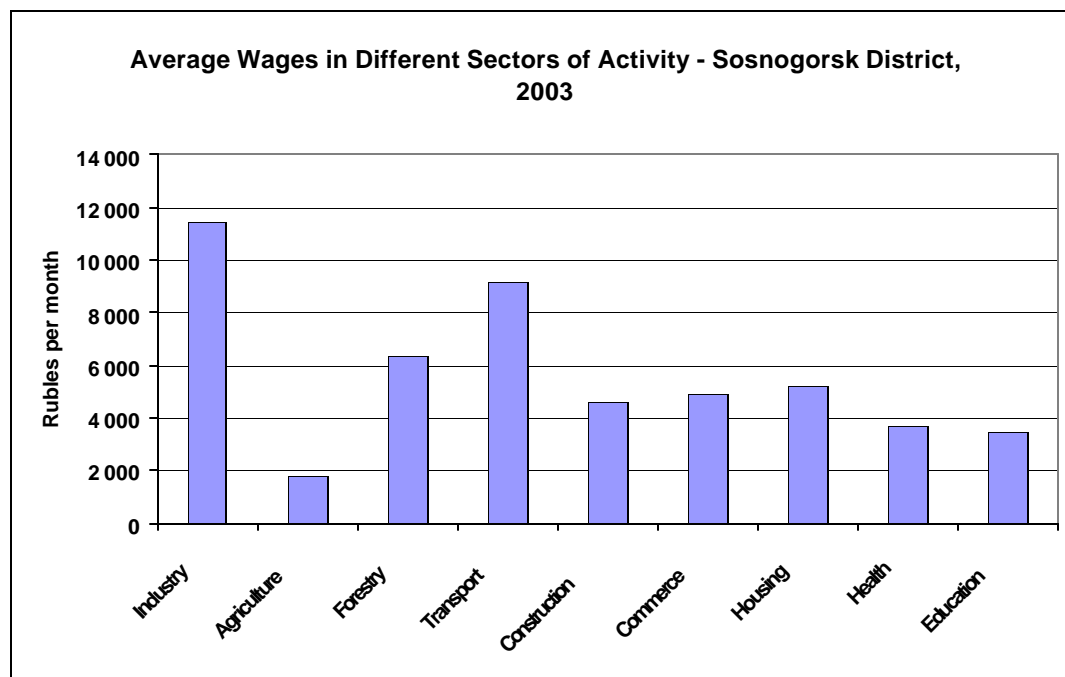
There are 84 registered private small and medium enterprises in the District of Sosnogorsk, providing employment to about 700 persons, and another 1,300 independent workers without juridical denomination. Most are active in small-scale trade (most prominently food), and construction. The "*Municipalnoye Obrazovaniye*" reports having engaged in 2001 and 2002 into a programme of small credit (up to 100,000 Rubles over one year). The municipality also runs a support centre, located in the library, where small businesspersons can obtain reading material relevant to marketing and finance, and Internet access.

### Incomes



## Wages

The average salary in the District was 8,180 Rubles per month in 2003 (about USD 290), 36% higher than that of 2002. Monthly wages in the main sectors of activity were as follows:



## Pensions

There are about 15,000 pensioners in Sosnogorsk District (about 26% of the total population). The average pension is 1,707 Rubles per month (61 USD). Pensions are served to retired workers, but also to invalids, veterans and repressed persons.

## Social and Educational Services

### 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 cases was 43,400 in 2002.

### Education Services

The following table summarizes the situation of public education services in the District of Sosnogorsk:

Type of Facility	Number of Facilities	Number of Pupils/Students	Number of Education Staff
Kindergartens	23	2,330	301
Primary / High Schools <sup>12</sup>	21	7,379	555
General High School <sup>13</sup>	1	200	
Professional Training Schools	3	1,183	

<sup>12</sup> "State Daytime General Education Facilities"

<sup>13</sup> "Gimnazium"

## Administration

In terms of local administration, the district is subdivided into one town of “Republic significance” (Sosnogorsk), 2 urban boroughs<sup>14</sup>, and 7 rural boroughs.

The District of Sosnogorsk is administered by the “*Municipalnoye Obrazovanye*” of Sosnogorsk Town, located in Sosnogorsk. This organization takes care of both the urban area of Sosnogorsk and the rural areas in the district, ie. the few villages and hamlets that are within the boundaries of the district. The elected mayor of the MO is Stromtsov Valentin Andreïevich. In rural settlements, mayors are appointed by the District MO.

### “*Posiolok*” Kerke

The village of Kerke is located at about 6 km to the North-East of the Sosnogorsk potential refinery site, and is the inhabited settlement closest to the site. Its current population is about 740 according to the local mayor. The population is aging, with pensioners forming about 40% of the total population, highly above District averages.

According to an interview with the village mayor, the village was founded as an administrative entity in the early fifties, when ethnic Germans from other regions of the former Soviet Union were forcedly settled in this area. A small hamlet of a few tens of Komi might have existed at this location before. The population grew to about 3,000 persons in the seventies when forestry operations were flourishing. At present, most of the population of German origin has out-migrated (either to Germany, or to bigger towns<sup>15</sup>), and out-migration is continuing as a result of the crisis of forestry enterprises. It is visible that many houses in the village are deserted.

The village has one primary school, designed for 500 pupils and presently attended by only 80. The building is reportedly too large and difficult to heat. It has also a medical center with an assistant doctor, a nurse, a dentist and a laboratory, but the facilities are described as outdated.

---

<sup>14</sup> “*Posiolok*”

<sup>15</sup> In spite of the policy of Germany to repatriate ethnic Germans in the late eighties and early nineties, there is still a significant community of Russian ethnic Germans in Syktyvkar.

The main community development issue described by the local population is the fact that the village is accessible by road only in winter time when the river next to Kerke is frozen. Otherwise, Kerke is accessible only by rail through a pedestrian bridge from the railway station.

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. If the refinery does not proceed due to a decision by Komi Aluminium, as a result of future studies (such as hydro-geological impacts, detailed ESIA for the refinery, and or the feasibility study for the refinery) not supporting implementation of the project or a negative conclusion by the SER, the project will not be pursued. In this case, all of the early works features will be reclaimed and returned to native conditions, and/or according to reasonable stakeholder requests.