



Project Antea Environmental Statement:

Development of Cement Production Plant and Associated Quarrying Activities, Albania

Environmental and Social Impact Assessment (ESIA)

JOB NUMBER: 5049164			DOCUMENT REF: Project Antea Environmental Statement Rev 2.1.doc			
Final Draft	Final Draft	ESIA Team	NB	JB/Titan/EBRD/IFC	AGI	March 2008
2.1	Issue for Final review	ESIA Team	NB			January 2008
2	Issue for Final Review	ESIA Team	NB			December 2007
1	Issue for Consultation	ESIA Team	NB	AGI / Titan / EBRD / IFC	AGI	August 2007
		Originated	Checked	Reviewed	Authorised	Date
Revision	Purpose Description	ATKINS				

CONTENTS

NON-TECHNICAL SUMMARY	6
1. INTRODUCTION & BACKGROUND	1-6
General Introduction	1-6
Project Background	1-6
Site Development Programme	1-6
Need for the Development	1-6
Alternatives Sites	1-6
Overview of the Preferred location	1-6
General Geography	1-6
Present Land Use and Settlement Patterns	1-6
Purpose of the ESIA	1-6
Findings of the Scoping Study	1-6
Approach to the ESIA	1-6
Layout of the Statement	1-6
2. ESIA FRAMEWORK AND ALBANIAN REGULATIONS	2-6
EU EIA Requirements	2-6
EBRD and IFC EIA Requirements	2-6
Albanian EIA Legislation	2-6
Development Legal Controls and Guiding Principles	2-6
Design Requirements against the Best Available Techniques	2-6
Occupational, Health and Safety Law	2-6
3. DESCRIPTION OF THE PROJECT	3-6
Layout of the Proposed project	3-6
Overview of the Project	3-6
Operational Activities	3-6
4. BEST AVAILABLE TECHNIQUES (BAT) ASSESSMENT	4-6
Introduction	4-6
Layout and Scope of the Assessment	4-6
Definition of BAT	4-6
BAT Assessment: Cement Production	4-6
BAT Assessment: Quarry Operations	4-6
Discussion	4-6

5.	DESCRIPTION OF THE EXISTING ENVIRONMENT	5-6
	Overview	5-6
	Socio-Economic and Cultural Issues	5-6
	Archaeology and Cultural Heritage	5-6
	Landscape and Land Use	5-6
	Natural Habitats	5-6
	Climate	5-6
	Meteorology	5-6
	Air Quality	5-6
	Noise	5-6
	Geology	5-6
	Water Resources and Management	5-6
6.	IMPACTS ASSOCIATED WITH CONSTRUCTION	6-6
	Introduction	6-6
	Overview of Construction Activities	6-6
	Socio-economic Aspects	6-6
	Air Quality	6-6
	Surface Waters and Effluent	6-6
	Land Quality and Groundwater	6-6
	Energy and Greenhouse Gas Balance	6-6
	Materials Use and Waste Management	6-6
	Ecology	6-6
	Landscape and Visual	6-6
	Traffic and Transport	6-6
	Noise and Vibration	6-6
	Archaeology and Cultural Heritage	6-6
	Risk Management	6-6
7.	IMPACTS ASSOCIATED WITH OPERATION	7-6
	Air Quality	7-6
	Land Quality and Groundwater	7-6
	Energy and Greenhouse Gas Balance	7-6
	Raw Material Use and Waste Production	7-6
	Ecology	7-6
	Landscape and Visual	7-6
	Traffic and Transport	7-6
	Noise and Vibration	7-6
	Socio-Economic Aspects	7-6
	Archaeology and Cultural Heritage	7-6
	Summary of Environmental and Socio-economic Impacts and Proposed Mitigation Measures.	7-6

8.	IMPACTS ASSOCIATED WITH CLOSURE AND DECOMMISSIONING	8-6
	Introduction	8-6
	Site Closure Plan	8-6
	Materials Use, Waste and Effluent	8-6
	Air Quality	8-6
	Surface Waters and Effluent	8-6
	Land Quality and Groundwater	8-6
	Ecology	8-6
	Landscape and Visual	8-6
	Traffic and Transport	8-6
	Noise and Vibration	8-6
	Socio-Economic Aspects	8-6
	Archaeology and Cultural Heritage	8-6
9.	OUTLINE ENVIRONMENTAL MANAGEMENT PLAN & MONITORING PROGRAMME	9-6
	Introduction	9-6
10.	PUBLIC COMMUNICATION STRATEGY AND INFORMATION PROGRAMME	10-6
	Introduction	10-6
	Stakeholders	10-6
	Stakeholder Engagement: The ESIA process	10-6
	Stakeholder Engagement & Communication: Construction phase	10-6
	Stakeholder Engagement & Communication: Operational phase	10-6

APPENDICES

APPENDIX 1: Installation Layout

APPENDIX 2: Socio-Economic Assessment Appendices

APPENDIX 3: Landscape Assessment Appendices

APPENDIX 4: Ecological Assessment Appendices

APPENDIX 5: Transport Study

APPENDIX 6: Hydrogeology Conceptual Model

APPENDIX 7: Road Safety Assessment Study

List of Tables

Table 1.1 - Project Alternatives	1-6
Table 2.1 - Updated WHO Air Quality Guideline Values, $\mu\text{g}/\text{m}^3$	2-6
Table 4.1 - BAT Assessment: Main Plant and Process	4-6
Table 4.2 - BAT Assessment: Ancillary Plant and Equipment Process	4-6
Table 4.3 - BAT Assessment: Emissions Control and Abatement	4-6
Table 4.4 - BAT Assessment: Management Techniques	4-6
Table 4.5 - Quarry Operations: BAT Assessment Summary:	4-6
Table 5.1 - Project Population by Village	5-6
Table 5.2 - Kruja District Population Structure	5-6
Table 5.3 - Land Ownership	5-6
Table 5.4 - Information about Economic Activities by Village	5-6
Table 5.5 - Prices Paid to Gatherers of Sage (in ALL)	5-6
Table 5.6 - Percent of Households Brett and Picrraga Working in Lime 1995-2006	5-6
Table 5.7 - List of 48 Mammal Species Occurring in Albania of Conservation Concern	5-6
Table 5.8 - Vegetation Types at the Proposed Quarry Sites, with Estimates of Cover	5-6
Table 5.9 - Red Data List (IUCN) of Plants of Burizana Area	5-6
Table 5.10 - Bird, Reptile, Amphibian and Invertebrate Species Recorded During Survey	5-6
Table 5.11 - Monthly and Annual Rainfall Data from Selected Stations (for the years 1950-80)	5-6
Table 5.12 - Relative Frequency Distribution of Wind Speed and Direction, %	5-6
Table 5.13 - Monthly Mean, Absolute Maximum and Minimum Temperatures	5-6
Table 5.14 - Mean Monthly and Annual Precipitation	5-6
Table 5.15 - Maximum 24 Hourly Precipitation by Months	5-6
Table 5.16 - Monthly Distribution of Relative Humidity	5-6
Table 5.17 - Updated WHO Air Quality Guideline Values, $\mu\text{g}/\text{m}^3$	5-6
Table 5.18 - Annual Mean Pollutant Concentrations in Tirana, $\mu\text{g}/\text{m}^3$	5-6
Table 5.19 - Albania's Water Profile	5-6
Table 5.20 - Hydrological Features of Principal Rivers in Albania	5-6
Table 5.21 - Traffic Volume Counts	5-6
Table 6.1 - Summary of Construction Impacts and Mitigation Measures	6-6
Table 7.1 - Surface Characteristics	7-6
Table 7.2 - Stack Characteristics	7-6
Table 7.3 - Pollutant Emission Rates, g/s	7-6
Table 7.4 - Nearby Sensitive Receptors	7-6
Table 7.5 - Maximum Pollutant Increments at Representative Locations, $\mu\text{g}/\text{m}^3$	7-6
Table 7.6 - Maximum Domain-Wide Increments to Pollutant Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Table 7.7 - Annual Mean Pollutant Concentrations for the Existing Situation (2007)	7-6
Table 7.8 - Annual Mean Pollutant Concentrations without the Cement Plant (2010)	7-6
Table 7.9 - Annual Mean Pollutant Concentrations with the Cement Plant (2010)	7-6
Table 7.10 - Pollutant Emissions from the Road Network	7-6
Table 7.11 - Change in Emissions with Cement Plant (2010)	7-6

Table 7.12 - Antea Cement Plant Carbon Dioxide Emissions	7-6
Table 7.13 - Raw Materials Used (Tonne/year)	7-6
Table 7.14 - Wastes Produced	7-6
Table 7.15 - Cement Plant Import / Export Quantities	7-6
Table 7.16 - Plant Impacts to the Surrounding Highway Network	7-6
Table 7.17 - Noise on Road Network	7-6
Table 7.18 - Noise from the Production Process	7-6
Table 7.19 - Noise from Flysch Quarry	7-6
Table 7.20 - Noise from Limestone Quarry	7-6
Table 7.21 Summary of Project related land acquisitions	7-6
Table 7.22 - Summary of Employment by Skill Level	7-6
Table 7.23 - Comparison of Gross Annual Salaries - Regional Comparison (US\$)	7-6
Table 7.24 Categories of people affected by the project (PAP) due to land acquisition	7-6
Table 7.25 Summary of representative impact on larger herb gathers	7-6
Table 7.26 - Meetings Held in Relation to New Road	7-6
Table 7.27 - Level of Risk (LoR) Estimates of Proposed Road Links and Proposed Mitigation Measures	7-6
Table 7.28 - Summary of Impacts and Proposed Mitigation Measures	7-6
Table 8.1 - Summary of Site Closure Impacts and Mitigation Measures	8-6
Table 9.1 - Mitigation Measures / Enhancement Plans - Construction Phase	9-6
Table 9.2 - Environmental Monitoring Plan - Construction Phase	9-6
Table 9.3 - Social Action Plan - Construction Phase	9-6
Table 9.4 - Social Monitoring Plan - Construction Phase	9-6
Table 9.5 - Environmental Monitoring Plan - Operational Phase	9-6
Table 9.6 - Social Action Plan - Operational Phase	9-6
Table 9.7 - Social Impact Monitoring - Operational Phase	9-6
Table 10.1 - Stakeholder Engagement Through ESIA Processes (Quarries and Cement Plant)	10-6
Table 10.2 - Stakeholder Engagement Through ESIA Processes (New Road)	10-6
Table 10.3 - Potential Communication Requirements of Stakeholders during the Construction Phase	10-6
Table 10.4 - Communication Strategy During Operation	10-6

List of Figures

Figure 1.1 - Location of Proposed Project: National Scale Overview	1-6
Figure 1.2 - Location of Proposed Project: Local Scale Overview	1-6
Figure 1.3 - Location of Proposed Roadway to the Cement Plant	1-6
Figure 3.1 - Process Flow: Cement Production and Associated Activities	3-6
Figure 3.2 - Schematic Layout of the Quarry Bench Design for Limestone Quarry	3-6
Figure 3.3 - Schematic Layout of the Quarry Bench Design for Flysch Quarry	3-6
Figure 3.4 - Raw Material Pre-blending and Storage	3-6
Figure 3.5 - Raw Materials Preparation	3-6
Figure 3.6 - Solid Fuel Preparation	3-6
Figure 3.7 - Single Kiln Line - Preheater / kiln with Precalciner and Clinker Cooler	3-6
Figure 3.8 - Cement Grinding and Cement Dispatch (Bulk Loading and Packing)	3-6
Figure 5.1 - Existing and Proposed Protected Areas in Albania	5-6
Figure 5.2 - Climatic Zones of Albania	5-6
Figure 5.3 - Map of Albanian Phyto-climatic Zones	5-6
Figure 5.4 - Holm Oak Forest (Quercus ilex L.)	5-6
Figure 5.5 - Typical Evergreen Mediterranean Shrub (Macchia)	5-6
Figure 5.6 - Typical Garrigue	5-6
Figure 5.7 - Broadleaved Oaks Regenerate after Protection	5-6
Figure 5.8 – Steppe-grassland Vegetation at its Final Stage of Degradation (soil erosion)	5-6
Figure 5.9 - Reptile Habitat at Proposed Limestone Quarry Site	5-6
Figure 5.10 - Proposed Cement Plant Area with Drinking Pool in Background	5-6
Figure 5.11 - Typical Access Track through Study Proposed Flysch Quarry Site where Pools Form	5-6
Figure 5.12 - Grazed Areas at Proposed Flysch Quarry Site	5-6
Figure 5.13 - 24 h Precipitation Allocation	5-6
Figure 5.14 – Wind Rose Diagram for Podgorica, 2003 to 2006	5-6
Figure 5.15 - Mean Monthly Temperatures Distribution	5-6
Figure 5.16 - Mean Monthly Precipitation Distribution	5-6
Figure 5.17 - Mean Monthly Distribution of Relative Humidity	5-6
Figure 5.18 - Geology of the Region of Burizana -Droje and Areas of Picrraga	5-6
Figure 5.19 - Geology of the Boka e Kuqe Limestone	5-6
Figure 5.20 - Geology of the Boka e Kuqe Limestone – Cross Sections	5-6
Figure 5.21 - Geology of the Burizana Flysch Deposit	5-6
Figure 5.22 - Geology of the Burizana Flysch Deposit– Cross Section	5-6
Figure 5.23 - Hydrographic Map of Albania	5-6
Figure 5.24 - Cement Plant Access Highway Network and Turning Movement Count Locations - Wider Area	5-6
Figure 5.25 - Vore Highway Intersection Turning Movement Count Locations	5-6
Figure 5.26 - Gjorm Railroad Yard	5-6
Figure 5.27 - Cement Plant Access - Immediate Vicinity	5-6
Figure 7.1 - Facility Schematic	7-6
Figure 7.2 – Nearby Locations of Sensitive Receptors	7-6

Figure 7.3 – Annual Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.4 – Maximum Daily Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.5 – Maximum Hourly Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.6 – Annual Average Particulate Matter Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.7 – Maximum Daily Average Particulate Matter Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.8 – Annual Average Oxides of Nitrogen Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.9 – Maximum Hourly Average Oxides of Nitrogen Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.10 - Maximum Annual Average Nitrogen Dioxide Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.11 - Maximum 99.79 th Percentile of Hourly Average Nitrogen Dioxide Concentrations, $\mu\text{g}/\text{m}^3$	7-6
Figure 7.12 - Maximum Eight Hourly Average Carbon Monoxide Concentrations, mg/m^3	7-6
Figure 7.13 - Maximum Eight Hourly Average Carbon Monoxide Concentrations, mg/m^3	7-6
Figure 7.14 - Typical Pre-heater Kiln Processing System – Illustrating the Liberation of CO_2	7-6

ABBREVIATIONS

a.s.l	Above sea level
BAT	Best Available Techniques
BREF	BAT Reference note
CO	Carbon monoxide
CO ₂	Carbon dioxide
COD	Chemical Oxygen Demand
EA	Environment Agency (England and Wales)
EBRD	The European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ES	Environmental Statement
ESIA	Environmental and Social Impact Assessment
EITI	Extraction Industry Transparency Initiative
EU	European Union
IFC	International Finance Corporation
HFO	Heavy Fuel Oil
HIV	Human Immunodeficiency Virus
IPPC	Integrated Pollution Prevention and Control
IUCN	World Conservation Union
JI	Joint Implementation
km	Kilometre(s)
kV	Kilovolt(s)
m	Metre(s)
m ³	Cubic metre(s)
mg/l	Milligramme(s) per litre
Mg CO ₂ /TJ	Megagrammes of CO ₂ per terajoule
m ³ /h	Cubic metre(s) per hour
MJ/m ³	Megajoule(s) per cubic metre
mm	Millimetre(s)
NGO	Non-governmental Organization
NO _x	Oxides of nitrogen
PAP	Project affected people
PCDP	Public Consultation and Disclosure Plan
SCR	Selective Catalytic Reduction

SNCR	Selective Non-Catalytic Reduction
SO ₂	Sulphur Dioxide
t	Tonne
tpd	Tonnes per day
TU	Trade Union
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars
VOC	Volatile organic compound
WHO	World Health Organisation

NON-TECHNICAL SUMMARY

Introduction

Antea Cement, part of the Greek owned Titan Group, proposes the construction of a cement production facility in Albania, built and operated to world class design and technological standards. The facility will be capable of producing 3 300 tonnes per day (tpd) of clinker (the main component of cement) and will incorporate the development of two quarries associated with producing the main raw materials for this operation. The location of the proposed development is near the communities of Burizana, Picrraga and Brett in Albania. This *Non-Technical Summary* describes the key impacts of the proposed development on the environment and local people through construction, operation and decommissioning phases.

The development will be partly funded by the European Bank of Reconstruction and Development (EBRD) and the International Finance Corporation (IFC). This project is categorised as 'A' by the EBRD and the IFC. Projects in category 'A' require an *Environmental and Social Impact Assessment (ESIA)*. The findings of the ESIA are published in the *Environmental Statement*, of which this Non-Technical Summary is a part. A Public Consultation and Disclosure Plan (PCDP) has also been produced which acts to drive the process of public consultation.

As the investment banks are considering their participation in Antea Cement they are particularly interested in the following issues:

- All potential environmental and social impacts have been taken into account and appropriately assessed, where they are reasonably foreseeable;
- The proposed development is environmentally and socially sound and sustainable in light of the potential environmental and social impacts; and
- Appropriate public consultation of the project and its impacts has been undertaken for a minimum of 60 days. This is done through the publication of the Environmental Statement.

The contents of the Environmental Statement are as follows:

- Description of the proposed facility and the existing environmental conditions at the proposed development site;
- Assessment of the impact of the proposed development on the existing environment and the local people;
- Recommendations for measures to limit these impacts (the mitigation measures); and
- Description of the extent of the residual environmental impact following the implementation of the proposed mitigation measures.

Availability of the ESIA Documentation

The documentation relating to the ESIA will be available at the following locations:

- The Non-Technical Summary will be placed on the EBRD website (www.ebrd.com) and the IFC website (www.ifc.org), which will also contain information on where the full ESIA documents will be available and a link to Antea Cement's website.
- The full ESIA documentation and Non-Technical Summary will both be available in English and Albanian at the Antea office (Rruga e Durrësit, (Ish Uzina Tirana), Pallati "Lim-Em" Shkalla 4D, Zyra 1, Tirana, Albania) care of Mrs Teuta Dobi, Telephone +355 4 230402 / +355 692090547). Copies of the ESIA documentation will also be held at Kruja Municipal Council offices and the Thumana Commune Council offices.
- The findings of the ESIA will also be explained directly to the public through an exhibition and brief presentation to be held at two locations near to the proposed facility. The exhibition materials will be left in place for several days to provide the public with opportunity to view them. During that time a presentation and question and answer session will be arranged, attended by representatives of Antea and environmental and social experts.
- The PCDP will be available at the aforementioned Antea Cement office, at the World Bank Group Info Shop (www.worldbank.org), at the EBRD Business Information Centre in London and Resident Office in Tirana, on the EBRD website (www.ebrd.com) and also on the project sponsor's site (www.titan-cement.com).
- Hard copies of the materials will also be available at the EBRD regional office in Tirana.

Location of the Proposed Development

The cement plant and associated quarries will be situated within the municipality of Picrraga and close to the town of Burizana, to the north east of Tirana. The location of the two quarries has already been agreed with the local authorities and the ESIA has considered the

potential to locate the cement plant next to either quarry. The proposed location of the quarries and cement production facility is rural in character. There are a number of small residential communities within 10km of the sites, including the large community of Burizana and Picrraga. Figures 1 and 2 illustrate the location of the proposed cement plant and its associated quarries.

Vehicular access to Burizana is via a small road that winds through the town, past a local school. At present this route is used by a local quarry. This road leads to a rough track which has been opened up to gain access to the proposed limestone quarry area and cement plant. As part of the development plans, it is proposed that a new road is opened up from the main highway to the cement plant. The approach to this area is through a valley bordered by steep mountains across rough terrain. The area within which the plant is located has been designated as an area for industrial development by the municipal authorities. The route of the proposed road is illustrated in Figure 3. A road safety study has been undertaken as part of this ESIA to assess the potential hazards to the local communities posed by the development of new roadways and their use by traffic associated with the proposed development. The results of this assessment are discussed in the 'Social and Economic Issues' section of this summary.

Despite the designation as an industrial area there are no existing facilities in the immediate vicinity of the proposed plant. There is however another, large cement plant and an associated limestone quarry approximately 6 km to the east of the proposed plant, near the historic city of Kruja. The cement plant is situated on the plain and is of a similar scale to the plant proposed by Antea. This cement plant is not situated adjacent to its quarry but instead several kilometres north of it. The quarry is situated on the approach to the city of Kruja, whilst the cement plant is situated on the plain below Kruja.

Figure 1 - Location of Proposed Project: National Scale Overview



Figure 2 - Location of Proposed Project: Local Scale Overview

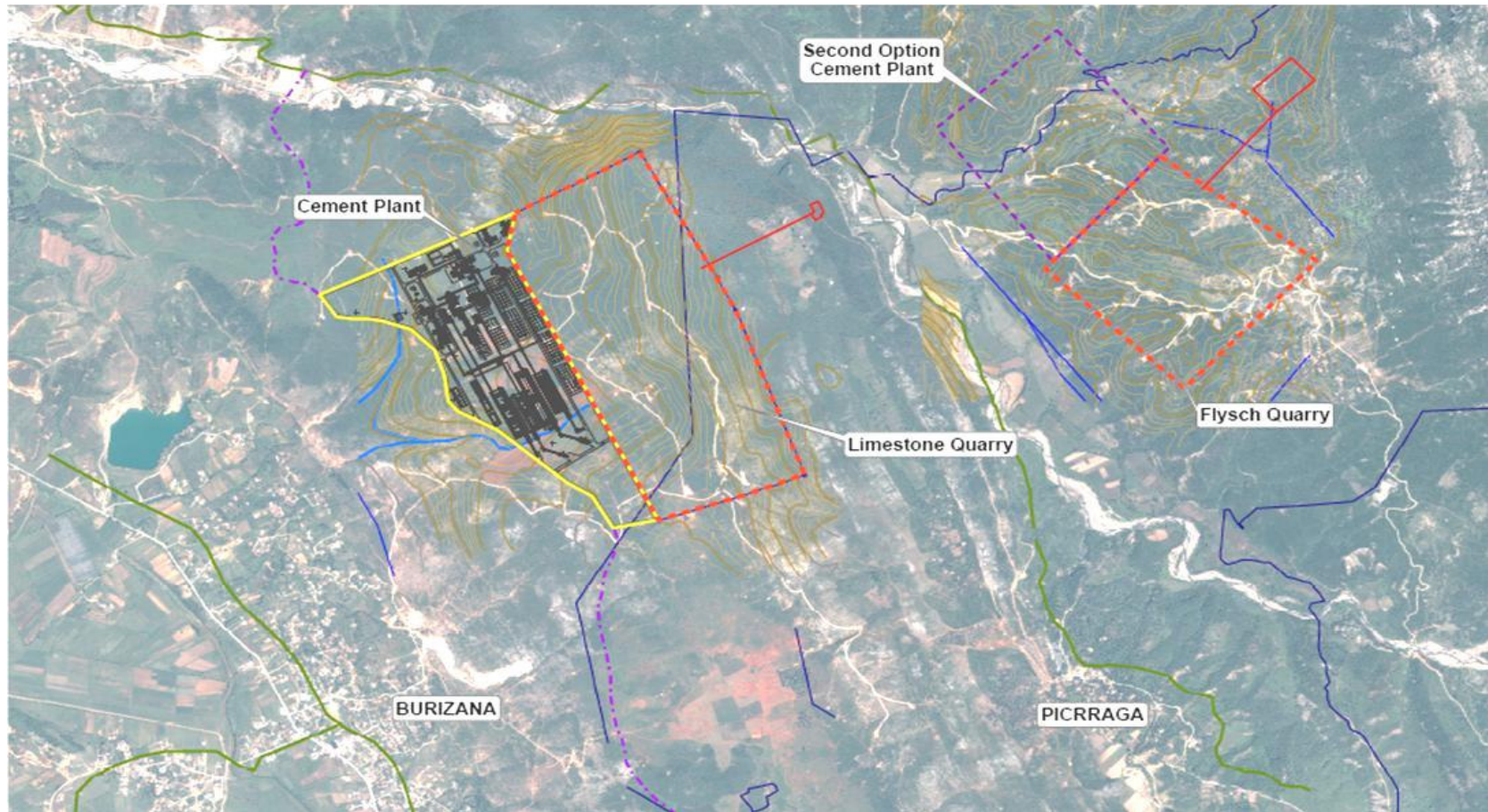


Figure 3 - Location of Proposed New Road Link to the Cement Plant



Overview of Cement Production

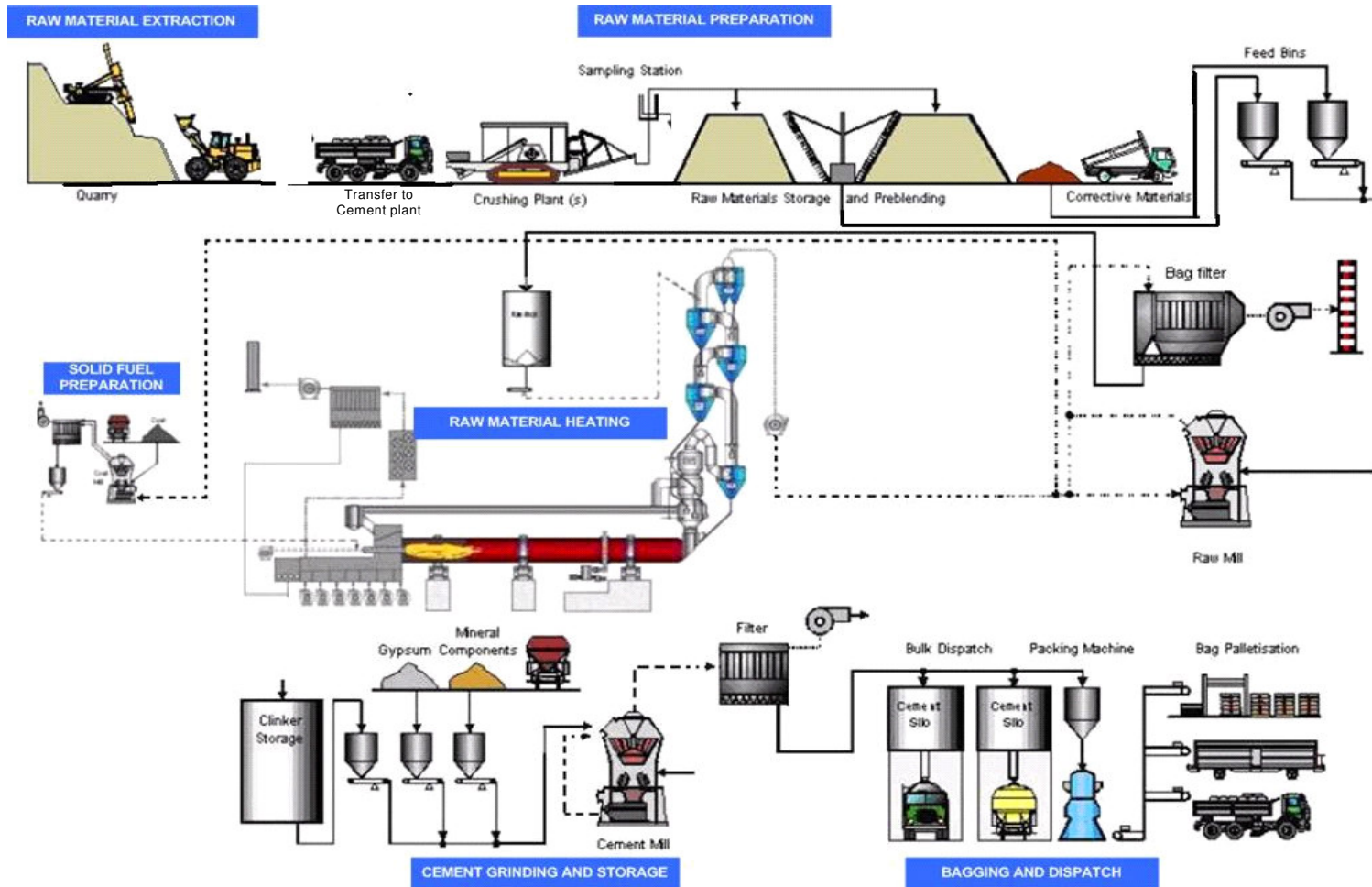
The proposed plant will produce cement from solid raw materials extracted from the adjacent quarries. The raw materials are heated to a very high temperature causing the thermal reactions which produce cement clinker. This clinker is then crushed to produce the cement for sale. A Process Flow Diagram illustrating the process is presented in Figure 4. A brief summary of each stage of the production process is as follows:

- **Raw Material Extraction:** Extraction of the raw materials is from local quarries. The main raw materials are limestone (chalk) and silica-aluminate (a clay-like material also known as “flysch”). The extracted materials will be loaded on to transporters and taken to the cement plant area. In order to prevent dust emissions during the transport of extracted materials, all raw material preparation will be place in a controlled environment at the cement plant. No crushing will take place at the quarries. In the event that incidental dust emissions do arise at the quarries or during transport of quarried materials to the cement plant, the quarried materials and roadways will be sprayed with water to prevent wind entrainment of the dust.
- **Raw Material Preparation:** Once the raw materials have arrived at the cement plant they are crushed in separate crushers to produce the correct size of stone for feeding into the cement production process. In order to minimise dust emissions at crusher inlets, water curtains will be used. Crushed materials will be stored in large covered stock piles. No crushed materials will be stored outdoors. The process of crushing, stacking and reclaiming for the purpose of feeding into the next stage of the process also achieves raw material ‘pre-blending’. The raw materials then fed in to separate feed bins.
- An iron source and bauxite are also required to make cement and these will be delivered to site from external sources and stored in silos. These materials will be needed in relatively small quantities.
- From the feed bins, the raw materials are fed to the raw mill, where they are ground to a fine powder. Before entering the raw mill, each material is weighed to adjust the chemistry of the raw mix. The ground raw material (raw meal) is transported to the homogenization silo, where it is blended (homogenized), by following a certain extraction sequence as the material leaves the silo.
- At all stages of raw material preparation, appropriate methods will be used to prevent escape of dust, including enclosed conveyors and storage, minimisation of material drops, use of bag filters at the raw mill. All bag filters will be designed and operated to ensure particulate emissions below 30 mg/Nm³, in accordance with industry standards.
- **Solid Fuel Preparation:** The production of cement requires a significant amount of energy. In order to provide this energy, conventional solid fuels are burned, e.g.

coal, petroleum coke or lignite. The fuels will be transported to the cement plant by lorry from local ports. In this case, most probably Durrës. The fuel used in the Antea cement plant will have been extracted overseas. Before being burnt, the fuels, like the raw materials, have to be crushed prior to feeding into the cement production process.

- **Raw Material Heating:** The raw materials are added and heated to high temperatures; the cement “clinker” being formed as a result of thermal reaction. The Antea cement plant will use the most modern and efficient design for undertaking this process. The raw materials are first fed into a 5 stage ‘pre-heater’ heated by hot gases from next stages of the process. The end part of the pre-heater is called the ‘pre-calciner’, where more than half the fuel is burnt and the chemical reactions are well underway. The raw material mix enters the large, horizontal kiln where the remaining fuel is burnt and the final high temperature chemical reactions take place. The produced clinker is then cooled before storage.
- **Cement Grinding and Storage:** The clinker is ground with additives (e.g. gypsum, limestone, fly ash) depending on the quality requirements of the final cement. The cement dust is then stored in large silos.
- **Bagging and Despatch:** Part of the cement will be sold in bulk and will be transported in specialised bulk road transporters. The rest will be bagged on site at a bagging plant, before being despatched to the customer.

Figure 4 - Process Flow Diagram: Cement Production and Associated Activities



Reasons Why the Cement Plant is Needed

The proposed cement plant is needed as:

- It will provide a valuable source of cement for use within the country to support infrastructure development and the national building programme.
- It will reduce the need for Albania to import cement from overseas and act as a source of production of cement that can be exported overseas. This will have a very positive effect on Albania's balance of payments, improving its financial standing.
- It will provide local jobs and improvements to local infrastructure.

Alternatives Considered

The main alternatives to the development of the new cement plant can be summarised as follows:

- Do nothing: This option would mean that the local environment would remain in its present condition, degraded by local land pressures. Choosing this option would also mean that there will be no economic growth as a result of the cement plant development.
- Locate the quarries and plant elsewhere: A location near Torovice, which has appropriate reserves of limestone and flysch, was considered. This location was rejected due to the sensitivity of the local habitat and issues associated with local infrastructure and materials transport.
- Locate the cement plant adjacent to limestone quarry: This is the most convenient location with regards to supply of the bulk raw material, limestone and ease of access to the main arterial road running north to south of Burizana. This area is also socially and ecologically not as sensitive as the Picrraga valley. However, the location high above the agricultural plain means that it will be possible to see some parts of the plant from many kilometres away from certain vantage points.
- Locate the cement plant adjacent to flysch quarry: This will result in more significant industrial development in the quieter Picrraga valley and transport of greater volumes of materials over longer distances because the plant will be located away from the source of its main raw material, limestone. It is usual for the cement plant to be located near the limestone quarry.

Main Parts of the Development

The main characteristics of the project are:

- Construction of an integrated 3 300 tpd clinker production line and cement production facility. Construction will be completed by 2010 and will be undertaken mainly by a specialist equipment supplier from China. The construction of the facility will require the presence of up to 700 Chinese workers on site.
- The opening of a limestone and flysch (silica-aluminate) quarry to supply the major raw materials for the production process.
- Opening of new roads and development of existing roads principally between:
 - The flysch quarry and cement plant
 - The cement plant and the main arterial highway running to Burizana.
- Transport of large volumes of materials along these routes as well as using the established transport infrastructure. Transport will be along roads, using heavy goods vehicles.
- Associated with the development will be the construction of a power line to connect the cement plant with the main existing power line importing energy into the region. The details of the power line, in particular potential routes are being considered at the time of writing this report. The procedures of assessment, as well as the design, construction and operation of the power line shall be in accordance with international standards, specifically those adopted by the EBRD and IFC.

Design and Operational Standards Followed in the Development

It is the commitment of the parent company of Antea, Titan Cement, to design and operate the proposed development to the same standard as its industrial developments in other parts of the world. This also complies with the requirements of the investment partners, the EBRD and IFC.

The design and operational criteria for the facility have been based upon guidance provided by the European Union and the World Bank. The European Union, under its Directive on the control of pollution (Integrated Pollution Prevention and Control (96/61/EC)) has established a benchmark standard for industrial activities. The standard relates to the main aspects of industrial design and operation and sets out the Best Available Techniques (BAT) for prevention and control of pollution. The BAT is detailed for each major industrial activity in a series of documents called the EU BAT Reference (BREF) notes. There is a specific BREF note for the production of cement, which details the suitable design and operational standard

for this industrial sector. This is the main standard adopted by the EBRD investment partner. Similarly, the World Bank Group through the IFC have issued the EHS Guidelines, which detail the requirements for the design and operation of industrial facilities. Within these guidelines are guidelines for the cement industry. This is the main standard adopted by the IFC investment partner. The two sets of guidance are complementary.

Of particular importance to this project are emissions to air and assurance that the plant will comply with the appropriate benchmarks for emissions to air. Oxides of nitrogen are of particular importance when controlling emissions from cement plants. The operator has stated that the plant will be designed and operated to meet World Bank emission limit standards as stated in the EHS Guidelines for Cement Manufacturing. Therefore, the emissions from the cement facility should not exceed:

- Particulates 30 mg/Nm³
- Oxides of Nitrogen (NO_x) 600 mg/Nm³
- Oxides of Sulphur (SO_x) 400 mg/Nm³

These emission limits are comparable with the emission limits required in the EU BREF with the exception of Oxides of Nitrogen. The BAT emission limit for Oxides of Nitrogen as stated in the EU BREF is stated as 500 – 800 mg/Nm³, dependent on the controls used.

Controls on all other pollutants also have to adhere to the guidelines laid out in the aforementioned standards. For all pollutants the maximum concentrations have to be achieved without dilution (i.e. main stack to contain only process gases), at least 95% of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours.

In contrast to the cement plant, there are no official standards published by the EU or World Bank for quarrying activities. For the purpose of assessing whether the proposed design and operation of the quarries is to a standard that is appropriate (i.e. BAT), an assessment was made using a number of documents issued from Europe, including some legal guidance. A key document used in this respect was entitled Good Environmental Practice in “The European Extractive Industry: A Reference Guide”, produced on behalf of the European Union.

In addition to the use of international design standards for the cement plant, Antea will operate the quarries to the same standards as its parent company does with its quarries in Europe and North America, taking into account local sensitivities in its operational activities. Similarly, the investment partners, the EBRD and IFC, expect the same level of operational management of the quarries as would be expected were the development to be taking place in Europe or North America.

The proposed design and operation provided by the operator indicates that the plant, quarries and associated infrastructure developments will comply with the appropriate World Bank design and operational standards. With regards to emissions of oxides of nitrogen the plant will operate in line with the requirements of Albanian Law and World Bank international standards, but fall short of the strictest BAT requirement stated in the EU BREF. The limits set in the EU BREF are usually achieved through the use of abatement technologies. Antea state that they will operate within the World Bank limits without the need for NO_x abatement technologies. Air impact modelling assessment indicates that there will not be an adverse impact on local air quality as a result of the proposed emissions of oxides of nitrogen. As part of the management plan, the operator will be required to undertake an assessment when the plant is operational of the air emissions impact and whether the installation of abatement technologies is necessary. The plant has been designed to ease the retrofitting of abatement technologies should this be deemed necessary at a later date. These issues are discussed further in this report in the sections relating to the assessment of the technologies proposed (Chapter 4) and in the section concerning the effects on local air quality (Chapter 7). A summary of the conclusions of the assessment are presented in this Non-Technical Summary.

Condition of the Existing Environment

The area surrounding the proposed development site is a semi-natural rural landscape of flat agricultural lowland fields contrasting with hilly or mountainous scrubland. The key characteristics are dramatic, deforested ridgelines with areas of soil erosion and scrub cover whose muted colour and rough texture greatly influences the landscape character. Small settlements and individual properties are scattered throughout the region. The predominant land use is agriculture. Hillier areas are used for grazing up to the point at which they become too steep.

The area of the proposed project development (cement plant and quarries) is open scrub land that is used partly for grazing, hunting, gathering and as a source of wood for fuel. This wood is also used as a fuel for burning limestone to produce material for whitewashing. Limestone burning is undertaken in dedicated pits which scatter the upland areas of this region. The result is an area partially denuded of vegetation other than low lying scrub. Degradation is most evident near villages and on agricultural land on steep slopes; once it has reached this extreme state (i.e. with soil erosion taking place), then floristic composition is affected and meaningful restoration of both soil and vegetation will take many years to achieve.

In order to identify what plants and animals are present at the proposed sites, an animal identification specialist from Atkins and a plant identification specialist from Tirana University undertook field investigations in March 2007. These field investigations were supported by extensive research of the background of the locally occurring plants animals based on previous assessments of the area and region.

Whilst the Burizana area is ecologically diverse the habitat is not unique in Albania. Similar habitats and species are found elsewhere in the region e.g. the Dajti National Park. Nevertheless, because of the phyto-climatic zone in which Burizana is situated and despite the degradation, a range of quite species-rich habitats are represented at each location and along the routes of the proposed access roads. Field visits did not reveal significant differences in fauna present at the two sites, but from the vegetation perspective the flysch area appeared to be the more diverse, while parts of the limestone site are entering a final and severe stage of degradation with soil erosion taking place. Both proposed quarry sites fall within the lowest (of four) altitudinal vegetation zones that have been distinguished in Albania, namely "Sclerophyllous evergreen forest and shrub" (or Typical evergreen Mediterranean vegetation). This zone can be divided further, into 5 well-recognised vegetation types (including macchia and garrigues), representing various stage of degradation.

There are no protected habitats within the proposed development areas nor are they considered to be "Critical Habitat" as defined by IFC's Performance Standard 6 "Biodiversity Conservation and Sustainable Natural Resources Management" - these being areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species (according to the IUCN Red List of Threatened Species or as defined in national legislation). Though some plants, reptiles and amphibians found at or near project sites are of conservation concern and are on the Albanian and IUCN Red Lists, these species are widespread at a national and/or European level. The reptiles and amphibians that are on the IUCN Red List are in the "least concern" category, while the plants are not on the IUCN Red List at all.

Climatic conditions of the area are typically Mediterranean; characterized by hot and dry summers and mild, wet winters. The annual precipitation is high around Burizana; nationally the precipitation ranges from 750mm at the coastal areas to 4,444mm at the mountains. The terrain in the Burizana region is crossed by a well developed system of torrents, rivers and streams that discharge into the Adriatic Sea. The River Droje collects water from the Skenderbeu and Shengjergji mountains and, after the village of Shperdhëti, flows into an artificial channel, which consists part of the drainage system of the lowlands of the village Thumana.

Groundwater in Albania is extremely important as it is the only source of potable water. Due to the location of the proposed facility between the coastal delta plains and the rugged mountainous highlands, two types of aquifers are present in the sub-ground of the region. These are porous gravely aquifers and, carbonate, fissured, and karstified aquifers. There is a considerable number of water boreholes drilled and exploited by individuals in the wider area of Rinas – Thumane. Their maximum exploitation rate amounts to 500-600 l/sec or 15,768,000 – 18,921,600 m³ annually.

Effects During Construction

The main contractor for the development is CBMI, a Chinese-based company who has significant experience in similar construction developments. It is expected that a maximum of 700 workers will be on site at any one time and it is planned that they will live in a specially constructed camp. The camp will be located adjacent to the construction site to the east of Burizana and will have all the necessary facilities to make the camp self-contained, including recreational facilities. The construction camp will consist of several pre-fabricated buildings and necessary infrastructure.

The construction activities will include:

- Site clearance, ground modelling and landscaping;
- Utilities and services connections to site;
- Foundation excavations and installation of concrete footings;
- Erection of building steel frames and cladding;
- Installation of equipment;
- Ancillary facilities erection;
- Services and utilities connections;
- Building fitting-out; and
- Commissioning (due for 2010).

The main direct ecological impact resulting from the construction phase of the project will be the loss of vegetation associated with the “clearance” at the two quarry areas, the cement plant and construction camp sites and the access road alignments. With soil and vegetation removed, the habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates) will also be destroyed along with any fauna that cannot readily move away when site clearance takes place.

Translocating vegetation on a large scale is unlikely to be feasible. However, it is Titan’s usual practice to establish forest nurseries in association with its projects. Tree seedlings are used (i) to provide physical screening of quarries and cement plant sites and (ii) for subsequent site restoration. The establishment of one or more nurseries in relation to the two proposed project sites should assist with short-term mitigation and longer term on and off-site restoration of damaged habitat.

Vegetation loss at the quarry and cement plant sites cannot be avoided, but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation. Careful consideration needs to be given to the plant species that are to be raised in a nursery. For

habitat restoration, native species should be used in preference to exotic and/or commercial forestry species, though there may be a role for commercial species if there is local demand for wood-producing plantations. In particular, consideration should be given to the propagation of indigenous herbal species with medicinal and other practical uses. i.e. species that are favoured by neighbouring communities. Species of known biological conservation value should also be favoured i.e. rare or threatened plant species and those known to be important food plants for wildlife, e.g. butterflies.

To achieve this, a “habitat survey and management study” needs to be conducted in and around the two sites in order to:

- (i) assess in more detail the type, distribution and condition of the existing vegetation (and soil cover);
- (ii) assess better the presence and status of fauna, especially species of conservation significance, and
- (iii) develop habitat and species management proposals. This will require close consultation with local scientists and communities to ensure that their requirements are met and that they subsequently comply with any management practices.

It is proposed that seed and other propagation material (e.g. bulbs and cuttings) will be collected for the plant nursery in the area adjacent to the development. A competent horticulturalist (preferably with ecological training or interests) will be required to oversee the collecting of the material, its propagation at the nursery and its subsequent planting). The horticulturalist should also participate in and contribute to the quarry extraction plan with regard to the sequence of the quarries development. With a knowledge of the clearance sequence and time-table and subsequent quarrying schedule, any programmes for surveying fauna and vegetation can be tied into the site-stripping programme. In addition to the horticulturalist, an ecologist will need to be appointed (with some occasional international support if he/she is lacking in experience of ecological mitigation) to contribute to the habitat survey and management study, and to survey and translocate fauna, where this is deemed desirable.

For the quarry access roads, an Ecological Method Statement should be developed in conjunction with the designer/contractor to provide a mechanism to ensure that the necessary protection measures are put in place. Adjustments to the alignment and construction methods will be made to avoid sensitive areas wherever practical and to allow e.g. suitable stream/river crossings to be incorporated.

With regards to emissions to air, construction activities can generate dust that can cause a nuisance to local residents and cause a health risk to construction workers. As the nearest residential receptors are approximately 1 km from the main development site it is considered unlikely that there will be an impact on local people. The main risk is considered to be the exposure of workers on site. Dust control measures, together with the use of appropriate personal protective equipment and appropriate maintenance of vehicles will be used to mitigate this impact. The impact of emissions of vehicle exhaust gases on air quality is considered negligible.

Water in the vicinity of the construction site can become polluted as a result of releases of materials used during construction. Potentially polluting materials will be carefully stored in suitable containment in order to reduce the risk of pollution incidents from spills and leaks. In order to manage the domestic effluent produced at the site which will be an issue particularly during construction with the large numbers of workers present at the site, a sewage treatment plant will be constructed. The plant which is being designed at the time of writing will be designed to take into account the load placed upon it during the construction phase and will be permanent for use treatment of domestic effluent during the operational phase of the project. The final effluent will be released to an, as yet unspecified, location.

Due to the semi-natural rural character of the proposed site, the transitory visual impacts of construction works are expected to be moderately adverse due to the introduction of prominent structures and construction equipment. However, the topography of the area will provide a natural level of screening of the works and the layout of the site will be sensitively planned to use this to minimise negative visual impacts.

The effects of the traffic generated by the construction phase are likely to be moderately adverse when considered within the context of the relatively low volumes of traffic that passes through the local area daily.

Finally, noises levels are likely to be fairly high and any noise associated with construction activities is likely to have negligible impact. Measures to reduce construction noise levels will be included in the Environmental Management Plan and Monitoring Programme.

Overall, with the exception of the impacts on ecology within the boundary of the development area, the construction activities are transitory, and are considered likely to have a minor adverse impact on dust levels and a moderate adverse visual impact.

Effects During Operation

The potential effects of the proposed development during operation can be divided as follows:

- Impacts on air quality as a result of emissions from the cement production process and dust from the quarry activities and crushing and grinding processes. Also, international scale impacts as a result of the emissions of greenhouse gases from the production process.
- Impacts associated with noise, particularly the impact of noise on nearby human receptors.
- Impacts of the plant and quarries by changes to the landscape and visual impacts.
- Impacts on the local ecology by the loss of habitat taken by the development and impacts associated with the operations on the surrounding ecology.
- Impact on the surface water regime (hydrology) by changes to the natural drainage of the landscape within the development area and potential emissions of fine particles (suspended solids) into the water as a result of the industrial activities. Potential release of contaminated effluents into the surface water drainage. Also, impact on the underground water, called groundwater (hydrogeology) as a result of extraction of raw materials for use in the industrial process.
- Use of significant volumes of raw materials and the production of waste on an industrial scale.
- Impacts of transport.

Each of these potential issues is addressed in the following sections.

Effects on Local Air Quality

A detailed study of the potential atmospheric emissions from the proposed cement works was undertaken for the proposed development. This study addressed the emissions to air which may occur during the normal operation of the cement kiln, as well as the minor emissions of fine particulate matter from other process stacks. The aim of this study was to assess the effects of these emissions in terms of ground level pollutant concentrations at ground level. These changes in local air quality were then compared with the European Union (EU) air quality criteria as well as the international World Health Organisation (WHO) guidelines.

The emissions to the atmosphere were modelled using the latest version of the US Environmental Protection Agency (EPA) atmospheric dispersion model AERMOD. This is internationally recognised as an advanced dispersion model and is widely used in industrial

regulation. The model was used with four years of meteorological data from a nearby representative location. The AERMOD model takes account of the influence of major buildings and local terrain on the dispersion of atmospheric emissions. The latter feature of the model is of particular relevance given the location of the proposed plant on a plateau above the town of Burizana, not far from a ridge of higher ground forming part of the foothills of the mountainous region inland.

The assessment focussed on the locations of local residential areas (sensitive receptors) where individuals may be exposed for relevant time periods according to the air quality criteria. The wider surrounding area was also modelled in order to generate graphical results which demonstrate the maximum effects due to the plant. These maximum concentrations occur in the uninhabited areas on higher ground in the surrounding area.

It was concluded that at all sensitive receptors, the maximum changes in sulphur dioxide, carbon monoxide, particulate matter and annual average nitrogen dioxide concentrations due to plant operation are a small fraction of the relevant air quality criteria, and future air quality will remain well within these criteria. The principal emission from the cement kiln is oxides of nitrogen. This leads to increases in nitrogen dioxide concentrations (a secondary pollutant) of a few percent of the hourly EU limit value at most sensitive receptors. However, at Picrraga (Popaij) the plant may contribute up to 25% and at Kruja (Pengile) approximately 15% of the criterion. Given the likely very good existing background air quality in these largely rural locations, air quality will remain well within the hourly limit value.

The overall conclusion from the dispersion modelling study is that when the plant is in operation future air quality will be well within the EU limits and WHO guidelines specified for the protection of human health. These limits are set well below the levels at which there are any observable effects on human health or respiratory function in order to protect vulnerable individuals within the population. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.

Screening level assessments of the potential impact from dust emissions from the quarry areas and the potential for pollution from traffic movements associated with the operational phase of the development were also undertaken. Both of these assessments indicated that there will be no significant effects on air quality either as a result of dust emissions from the quarries or due to vehicle emissions.

Emissions of Greenhouse Gases

An assessment of the potential emissions of greenhouse gases from the proposed installation has been undertaken. The assessment concentrated on the main greenhouse gas emission which will be released, which is carbon dioxide. No other significant sources of greenhouse gas are likely to be released as a result of the proposed operations. As with all

cement manufacturing processes, large volumes of carbon dioxide are released as a result of the chemical reactions taking place during manufacture of clinker. In addition, the burning of large volumes of solid fossil fuels to drive the process leads to the release of significant volumes of carbon dioxide. Finally, energy is used to drive auxiliary processes associated with cement manufacture. The energy is delivered as electricity and as in this case is often derived from outside sources rather than generated on site. Most of Albania's electricity is hydro-electric. Hydro-electric power generation does not involve the production of carbon dioxide. The greenhouse gas assessment has taken this into account. However, because of problems with electricity generation within the country of Albania, it is likely that in the short to medium term, most of the electricity will be imported from surrounding countries. In the surrounding countries it is likely that electricity generation is undertaken through combustion of fossil fuels, often through the combustion of coal.

The greenhouse gas assessment indicated that the proposed technology has been designed to minimise CO₂ emissions and is in line with the guidelines for the best available techniques for cement manufacture. Since the cement will be produced locally and used for infrastructure development within the country, this will reduce the greenhouse gases produced to transport cement into the country.

In order to ensure that once operational the cement production process is as energy efficient as possible, the operator will be required to conduct a detailed energy survey 2 years after the plant is fully operational. The aim of the assessment will be to ensure that the plant is operating as efficiently as possible and identify whether it is feasible to adopt measures such as of capture of waste heat for power generation or other uses in order to reduce the carbon footprint of the plant operations. This requirement has been written into the Operational Environmental and Social Monitoring Plan. Additionally, during operation Antea will review the market conditions to identify whether further energy saving technologies could be installed at the site, in particular with view to installing waste to energy plant in the future.

Other Operational Effects

Noise

At the time of undertaking this assessment measured ambient noise data were not available for the local area, and only limited information was available on noise levels from the processing plant, traffic and quarrying activities.

Traffic data has been used to estimate the likely ambient noise levels at noise sensitive receptors and noise source levels for a similar plant in Greece have been used as the basis for the impact assessment. Using this approach it can be estimated that noise levels generated from the cement production plant are unlikely to cause disturbance in any of the nearby communities during the evening or night. There may be some disturbance during the

daytime at the communities nearest to the quarrying activities. This disturbance would be greatest when the quarrying activities are closest to the communities, and before the depth of the quarry provides natural screening of noise to these communities.

Changes in traffic on the local road network when the plant is operational would not give rise to perceptible changes in noise. Properties near the new link roads may be affected by increases in noise from traffic using them.

Vibration is unlikely to be perceptible from any aspect of the project. The company has committed to implement appropriate noise management practices in all aspects of the design and operation of the cement plant, quarry and transport.

A key area of potential noise and vibration emissions is the blasting associated with the limestone quarry. Note there will be no blasting at the flysch quarry. In order to minimise impact of blasting at the limestone quarry, the operator will use internationally recognised techniques of *sequential* blasting in order to minimise the blast wave and therefore reduce any impact of the blasting. Also, blasting will be limited to the daytime.

Landscape and Visual

The landscape and visual impacts will be:

- (i) Change in land cover, use and character, including an increased intensity of activity
- (ii) Visual impact of night time lighting, including the movement of vehicles at night and the provision of above ground utilities
- (iii) Visual impact of the movement of works vehicles and commuter traffic to, from and within the site

Ecology

To reduce impacts on the local ecology as a result of increased human presence, disturbance and exploitation, an educational programme is recommended to inform employees and their families of legal requirements and responsibilities towards wildlife. This should be conducted in a participatory manner since many of the local population may already be well-informed on the renewable natural resources of the area and be a useful source of knowledge. The environmental educational programme could be conducted / facilitated by the on-site ecologist and/or horticulturalist.

Ground, Surface Water and Groundwater

The operation of the facility will incorporate measures to prevent releases to ground, surface water and groundwater. Present, indications are that these will be appropriate to the nature and scale of the installation and that significant impacts should not occur. It is the intention of Antea to extract groundwater from boreholes for use in the industrial activities. Information available indicates that the existing groundwater reserves exploitation rate for water supply and irrigation purposes exceeds by far water requirements for cement production.

Raw Material Use and Waste Management

The bulk of the raw materials used in the production process will be obtained locally from the limestone and flysch quarries. Available information indicates that the company have thoroughly investigated the nature of the raw material reserves and that there should be no issues associated with the use of in appropriate raw materials leading to significant emissions to air from the process. Further, on line testing in the production process will ensure that no unsuitable materials will enter the process. The process produces very little waste and that which is produced will be recycled back into the process.

Waste effluent produced from domestic activities will be treated using a package treatment plant which will be permanently situated at the site and will be operational before the peak of the construction activities. The treatment plant will be designed to take into account the load placed during the maximum number of persons on site. Design details of this plant were being discussed at the time of writing and will comply with the standard GB8978-1996. Review of the available information of the sewage treatment package indicates that the design is appropriate to the load which will potentially be placed upon it. As part of the management programme, the operator is required to submit the final design, location of discharge point and potential impacts, if any, of the discharge.

Transport

Currently access to the plant area is achieved through a road that goes through the village of Burizana. This is clearly a difficult connection especially for heavy vehicles both from the geometric and road safety point of view. A new cement plant connection will be constructed directly to the Shkoder – Fushe Kruja Highway bypassing the urban areas of Burizana and Mamuras. This new connection would directly serve the plant avoiding any interference with village traffic.

A second access to the area between the flysch and limestone quarry locations is provided through a road starting from the village of Mamuras along the northern bank of river Droje. A bridge will be used to connect the two river banks at that point.

It is anticipated that the traffic generated by the construction phase will not have significant impact on current volumes of traffic that use the main arterial highways and the main effect will be the impact on the traffic along the local routes. However, the level of disruption is not expected to be significant and it should be noted that most of heavy transportation connected with ground works will not leave the plant, as excavation material will be stored within the limits of the site area.

The raw materials of limestone and flysch will be transported to the cement plant on new roads between the two quarries and the plant. Limestone will be transported in 90 tonne trucks. There are expected to be approximately 40 limestone truck loads daily. As the road from the limestone quarry is remote from residential areas, it is not expected that there will be any public exposure to emissions from these vehicles. Flysch will be transported in 22.5 tonne trucks, entailing approximately 50 loads daily.

The production of 4,000 tons of products per day will necessitate 200 movements of 20 ton trucks. In order to supply the factory with raw materials it is estimated that 2,300 tons of freight will be entering the plant per day – the equivalent of approximately 120 truck movements per day.

In total, 320 truck trips per day will be needed to adequately serve the factory in the period of full production. This figure is multiplied by 1.3 to provide for future growth and coverage of production peaks. The resulting figure comes up to 420 truck trips per day or an hourly demand of 35 truck trips (for a 12 hour period). This figure translates to one truck movement every 2 minutes in each direction. In conclusion, the maximum traffic demand in and out of the factory is estimated to come up to 120 private cars and 40 heavy vehicles (buses and trucks) for the peak hour per direction. The safety issues to the local communities associated with the development of the roads has been assessed as part of a Transport Safety Study, the results of which are discussed in the 'Social and Economic Issues' section below.

The impacts of the plant operation on the port infrastructure would be the exclusive dedication of half of the Durres Eastern Pier to the plant needs. The remaining half will also be occupied - on a priority basis - for a quarter of the year. As a result the port will receive considerable income and its infrastructure will be upgraded and modernised.

Impacts During Decommissioning

No detailed assessment of environmental impacts associated with decommissioning can be made at present. The plant has an expected lifespan of over 50 years and so only general principles can be established at the present time.

In broad terms, the process of decommissioning is likely to give rise to impacts similar to those experienced in the construction phase. The methods and techniques selected are expected to be in accordance with national and international standards prevailing at the time of decommissioning. Decommissioning will require the:

- Removal of all surface equipment and units;
- Potential removal of hardstanding and surface cover;
- Abandonment of sub-surface utilities or filling and abandonment as appropriate;
- Reinstatement of the site and all project areas to pre-construction conditions. With regards to the rehabilitation of the quarries during operation, the works shall be conducted on an on-going basis in accordance with the accepted timetable set out in the planning proposals to the Albanian authorities.

For the cement plant, Antea will develop a site closure plan during the later stages of project design and maintain the plan throughout the life of the development. The plan should include arrangements for decommissioning the plant in a manner which avoids any pollution and return the site to an acceptable state. In addition any decommissioning plan should take into account the social and economic impacts and include mitigation measures where necessary.

The opportunities the site provides for long term biodiversity conservation purposes should be investigated as part of the site closure plan. There are no identified sites of ecological significance outside the main development areas that should be affected by decommissioning activities, though consideration will need to be given as to the long term use of the access roads to the two quarries. This will depend on their future use. It may be necessary to remove the roads and “re-instate” the ground and vegetation, but maintaining vehicle access or foot access only are also possibilities.

The site closure plan and preceding rehabilitation plans will need to be reviewed and updated in the light of experience with implementing the ecological mitigation and compensation measures – especially the “Habitat Restoration” proposals. These habitat restoration activities will need to be monitored, during the course of the project, so that lessons can be learned and applied prior to and at the time of final site closure.

Overall, decommissioning activities are transitory, and are likely to be similar in magnitude to construction impacts.

Social and Economic Issues

The key impacts of the proposed development relate to four main aspects and these are:

- Employment of construction workers and operation of the construction camp, in particular terms and conditions of foreign worker employment and living conditions;
- The livelihoods of people from Picrraga and Brett whose activities use some of the land to be used by the quarries and cement plan, some of these households are considered as vulnerable households;
- Employment opportunities with Antea and local suppliers to the company and subsequent benefit to the Kruja municipal budget, and
- Road and transport.

The employment of foreign construction camp workers will meet the requirements of the national law for wages, tax and insurance. Foreign workers will have 30 days holiday per year and an annual paid airfare. No details on living conditions and the design of the camp are available at this stage, but mitigation measures for the provision and review of this information and the monitoring of worker quality of life is identified by the ESIA. Worker health, other than minor first aid, will be undertaken through contracts with Tirana based and local services. Major emergencies will be dealt with in Tirana. The Kruja District Health Service with support from Tirana institute for Public Health will provide targeted awareness training for communities who may be more susceptible to different transmittable diseases. A local liaison forum will be established to develop good two-way communications, allowing the information and feedback between the camp and local stakeholders.

A number of households depend for their livelihood on activities that use part of the lands which are to be included in the quarry and cement plant site. Aromatic herb gathering and grazing activities are likely to be the most affected within the boundary of the proposed development. The ESIA identifies the potential scale of these impacts and recommends that a more detailed assessment of the land use by affected graziers and confirmation of the nutritional and financial impacts for grazing herds is undertaken by a livestock and pastures specialist. A full list of herb gatherers earning more than ALL100,000 in 2006 should be identified from aromatic herb sales records. This value takes account of any significant income effects (i.e. greater than 10% of income) as a result of the project, taking into account vulnerable and low income households. Project affected people identified a strong preference for livelihoods compensation to be provided in the form of employment by the new cement plant. The ESIA identifies vulnerable households whose activities and quality of life are expected to be impacted. In the light of the ESIA results and further assessment, Antea is developing a compensation plan. The plan and criteria for eligibility will be informed

by the ESIA base line information. In developing this plan all Project Affected People will be invited to register during a 3 month planning period and an assessment of each case will be undertaken. Project affected people have identified a strong preference for livelihoods compensation to be provided in the form of employment by the new cement plant. This will be taken into account in case assessments. A compensation framework document accompanies the ESIA and sets out the principles which will guide the final plan.

A major benefit of the project will be both the increase in finance available for the Kruja municipal budget and the increase in employment in the area. The current budget for Kruja municipality is circa ALL100 million, or €0.813 million. Local business tax is based on the area of land occupied. It is anticipated that new tax revenue from the cement works and quarries will generate an additional ALL60 million/year or €0.49 million /year to the municipal budget of Kruja.

A total of 400 new jobs are expected to be generated when the quarries and plant become operational. Of these, 43% (including 70 jobs for HGV drivers) are expected be subcontracted and 57% will be as direct employment. Of the 400 jobs, approximately 42% may match the needs of the local population. Approximately 60% of the work will require shift working. It is expected that women may account for 12% of the positions and approximately 95% of positions will be for Albanian nationals and at least initially 5% are expected to be filled by expatriates. It is expected that this will encourage further secondary or induced employment.

The new road which is to be constructed between the cement plant and the Tirana –Shkodra highway is expected to generate a number of impacts. A small amount of private land will be purchased and a compensation mechanism is discussed in the ESIA. It is expected that the road will improve local communications and improve commercial opportunities. This it is believed will be reflected in higher land values, particular for those with land by the road.

A risk assessment of the route has been undertaken and has identified inconvenience and health and safety issues to stakeholders. The study was undertaken by Atkins Highways and Transportation Team in Athens, Greece. It encompassed the proposed roads between the Antea Cement Plant Site and the National Highway Fushe Kruje – Lezhe (NH-PS Road) and between the Flysch Quarry and the Cement Plant Site (FQ-PS Road). The assessment was conducted according to the Methodology for Road Safety Assessment, November 2007, approved by ANTEA CEMENT S.A. Company and the EBRD-IFC. The assessment was conducted to UK Highway Agency and Department of Transport approved standards. The report identified high risk issues associated with preliminary design and therefore has been used to provide additional safety measures into the road design process. High risk issues and their associated mitigation measures can be summarised as follows:

- The use of cuttings into steep sided slopes will induce instability: Appropriate measures such as wire fencing will be incorporated into the design to ensure that no falling rocks or ground will cause accidents.
- The preliminary design did not indicate appropriate facilities for pedestrian walkways or crossings. These will be implemented into the design at the locations where potential problems may arise. Areas where such problems may arise have been identified as intersections, major access / egress locations such as the cemetery and the pilgrimage site and the bridge situated along the route of the road to the Flysch Quarry.
- Lighting not included in the preliminary design that could lead to accidents, particularly at intersections. Lighting is proposed particularly at intersections.
- Lack of planned access to cemetery and pilgrimage sites. The revised design will include improved access facilities to both sites and parking at the pilgrimage site.

In addition measures to manage cyclists and equestrians shall be incorporated. Risk of accident shall be reduced by implementation of education (road safety awareness) programmes and liaison with the local communities as well as driver training programmes and implementation of near-miss/accident reporting procedures. As part of the exercise proposed closed silo lorry lease agreements and contractual terms should be reviewed. The Commune is to consider need for any additional safety bylaws or regulations for local business activities near roads.

Impact Summary

In summary the main potential environmental effects resulting from the development are likely to be associated with the following:

- Loss of local habitat. Potentially, with appropriate management of the surrounding area, an improvement to the local ecological conditions could be made.
- Visual impact of the construction and operation of the cement plant and local quarries.
- Local noise impacts will dominate particularly during the construction phase. The noise impact of the plant during operation is likely to be negligible. Noise impacts of the quarries, particularly the limestone quarry blasting could be intermittently significant but unlikely to lead to nuisance. Increased transport may have an effect in some local areas along the route of the new roadways but is unlikely to be significant on the main highways.
- Emissions to air both in respect to local air emissions and international greenhouse gas emissions.

- Releases to ground, surface water and groundwater. The development will not have any routine discharges. However, emissions to ground, surface water and groundwater may occur in the absence of proper controls during all phases of the development (construction, operation and decommissioning).
- It is anticipated that the traffic generated by the construction phase will not have significant impact on current volumes of traffic that use the main arterial highways and the main effect will be the impact on the traffic along the local routes. However, the level of disruption is not expected to be significant and it should be noted that most of the heavy transportation connected with groundworks will not leave the plant, as excavation material will be stored within the limits of the site area.
- Socio-economic impacts on the local and regional area, both positive and negative.

A summary of these effects, the mitigation measures and the environmental monitoring plans are found in the tables below.

Summary of Construction Phase Impacts and Proposed Mitigation Measures

AIR			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Air quality - dust emissions during construction and ground works	Development of procedures for : - water spraying roads and dusty materials stockpiles - sheeting vehicles carrying dusty materials on leaving the site to prevent materials being blown from the vehicles - speed limits on unmade surfaces on site to limit dust	Dust propagation will be limited to construction area and will not influence local community. However workers should be supplied with dust masks especially in dry days.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Importation of pollutants already present within the materials to be used for filling and site levelling operations	Ensure that pollutants are not present in materials imported onto the site by appropriate selection of source material and chemical analysis if required	Potential for importation of pollutants in the material will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground, especially in the construction lay-down area, during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater to ground and groundwater from the workers camp	Sanitary waste will not be discharged to the ground	None	Negligible/Nil
Contamination of local water ways from proposed effluent plant discharge	Ensure that the plant complies with local and international standards and guidelines. Final effluent should have no significant negative impact on the receiving water. The plant should be designed so as to be able to cope with	Potential for release of harmful of effluent if the facility is underspecified or not managed correctly.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	the load of the full construction camp.		
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse
Increase of sediment load in natural aquatic receptors resulted from direct runoff disposal	Minimisation of excavations face during construction Temporary drainage grooves and sedimentation ponds for surface runoff collection	None	Negligible
Natural aquatic receptors degradation due to direct disposal of domestic type wastewater	Construction of appropriate sewage system and wastewater treatment facility.	None	Negligible
Groundwater contamination from leakage of polluting substances	Usage of non-hazardous construction materials for human health and environmental protection. Storage of potential polluting materials in appropriate areas, including secondary containment. Any contaminated land occurred during construction will be directly removed and disposed off in hazardous waste landfill sites.	None	Negligible

MATERIALS USE AND WASTE MANAGEMENT			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Waste generation	Reuse of soil Introduction of waste storage and control procedures Segregation and recycling of waste	Waste for disposal will be disposed of through the municipality	Minor adverse

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Loss of vegetation on site clearance	- Translocate soil and some vegetation to help restore neighbouring eroded areas - Habitat Restoration Programme including “Habitat Survey and Management Study” (especially of neighbouring areas, to be defined, and in close co-ordination with local ecologists and communities); Seed Gathering; Nursery Establishment - Propagation of threatened species (Albanian Red List) such as <i>Quercus ilex</i>, <i>Salvia officinalis</i> to be included. - Survey and Ecological Method Statement for Access Road Construction (Appoint Project Ecologist)	Vegetation loss cannot be avoided but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation	Severe adverse (Flysch site) to moderate adverse (Limestone site) and Moderate to substantial beneficial (neighbouring restoration areas)
Further land take (habitat loss) for temporary Construction Camp	Build temporary construction camp on land that will in due course be required for quarrying	No additional impact since land take would occur anyway at quarry site	Negligible / Nil
Destruction of fauna and habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates)	Further ecological/fauna survey at appropriate seasons and translocations monitored by the company specialist	Moving fauna to neighbouring sites may help short-term survival, but not medium-term if these sites are already occupied. In long-term populations may recover on restored sites	Minor adverse

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increase in exploitative pressures on habitats neighbouring the sites	Conduct and implement "Habitat Survey and Management Study", in close consultation with local communities	With co-operation of local community and project providing alternative source of income, habitats should be improved.	Moderate to substantial beneficial
On ecology of surrounding area by temporary foreign workforce as a result of removal of vegetation (for firewood, medicine) and the capture of wildlife	Education, monitoring and enforcement programme. Adequate waste management and sanitation facilities.	Implementation may be difficult and some impact can be expected	Minor to moderate adverse (depending on implementation)

LANDSCAPE & VISUAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Sensitive planning of site works and compound Advance structure planting Minimise lighting and night time workings	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

NOISE AND VIBRATION (incorporating Transport)			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Noise from construction of new plant/quarry and link roads	Good site management; Appropriate choice of machinery; Methods of working; Hours of working;	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A

NOISE AND VIBRATION (incorporating Transport)			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Efficient material handling;		
Noise from traffic relating to construction using existing roads through local residential areas	Define access routes to the site with the smallest number of properties in proximity to it. Keep vehicle movements to a minimum. Once link roads are completed, all construction traffic to/from the site should only use the link roads.	There may be noise increases at residential properties in proximity to the chosen access route, and then from the link roads once completed.	Minor adverse

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Foreign worker health problems may impact on work and wage payment	Specification by CBMI of reasonable sickness benefits and sick leave with pay	Sickness over specified period will affect earnings. Early return to work may damage health.	Minor adverse
Worker - industrial emergency	Contracted quality curative treatment in Tirana for all emergencies.	Depends on nature of emergency	Minor adverse
Foreign worker living conditions and quality of life. Utility and service provision impacts on local villages.	CBMI to provide Antea with detailed specification of camp layout, facilities, and utility provision (and disposal) in accordance with identified international standards. Antea to monitor health and safety and terms and conditions of employment. To do this a Chinese speaker should be part of the team	Depends on individual worker susceptibility. If conditions are poor multitude of issues could arise in camp and spill into local communities.	Minor / Moderate adverse
Disturbance and conflict in camp	In- camp codes of conduct and enforcement of key behaviours and reasonable use of alcohol	None identified	Minor adverse
Disturbance and /or conflict with local population	Camp code of conduct upheld by workers and enforced by camp. Provision of employment and opportunities to local population to minimise hostility. Liaison committee to identify early issues and their resolution	Some residual impact expected but scale limited by worker free time, and local interaction with camp	Minor / Moderate adverse
Opportunities for local procurement	Titan /Antea to arrange initial contacts and encourage CMB to maximise local procurement	Unless Antea provide financial incentives or contractual requirements to CMBI this may be unlikely to happen	May vary from negligible to moderate beneficial depending on the effort and incentives

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Antea should provide a trained facilitator to examine business opportunities and issues from CMBI and local provider points of view. Antea should provide consultant to support business development initiatives and ensure projects are financially sustainable Provision of support by Antea and /or concessionary terms (not subsidies) by CBMI to assist new supply businesses.	Poor community relations if community sees no commercial benefits from the camp	provided by all parties.
Potential for increased incidence of sexually transferable disease (STD) in local populations and amongst workers	Preventative health awareness campaigns for STDs provided to foreign workers and targeted at key urban locations / groups. Provision of free condoms in pharmacies and toilets or similar common access facility.	Difficult to identify cause or source of such disease as this is commonly hidden and poorly reported. However some disease may be spread and curative treatment may be required for the different diseases, in case of HIV this would be of a long term nature.	Moderate (possibly severe) adverse -

Summary of Operational Phase Impacts and Proposed Mitigation Measures

AIR QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Release of combustion gas emissions from the kiln stack	Primary operational management control techniques.	Local air quality will be well within the EU limits and WHO guidelines specified for the protection of human health at all relevant locations. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.	Not significant
Release of particulate emissions from the kiln, the clinker cooler, the coal mill and the cement mill.	Bag filters – dust abatement.	Local air quality will be virtually unaffected in Burizana and will remain well within the EU limits and WHO guidelines specified for the protection of human health.	Negligible
Release of dust emissions from the quarry operations.	Use of best practice management techniques during extraction and loading.	It is unlikely that there would be any discernable adverse effect due to dust deposition at any residential properties.	Negligible
Release of combustion emissions from transport associated with transport of materials to and from the site.	Use of new, efficient vehicles, driver training to minimise emissions (e.g. prevention of over revving, shut off engines when vehicles not in use), rationalisation of traffic management system to optimise transport efficiency.	Localised minor effects on air quality at properties very close to certain roads, but increments a very small fraction of air quality criteria.	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increase of sediment content in surface waters due to fugitive dust dispersion.	<u>For cement plant:</u> Stormwater management through ditches and/or gutters and settlement ponds. <u>For quarries:</u> Quarrying face will be kept minimal. Gradual rehabilitation (through landscaping and planting) of the locations where extraction works have been completed. Stormwater management through peripheral ditches and settlement pond.	None	Negligible
Degradation of surface waters quality due to process water direct disposal or leakage of polluting materials.	<u>For cement plant:</u> Process water circulation is closed circuit including settlement tank for treatment. Storage of fuels for cement production in enclosed storage area. Tidying the plant on regular basis with mechanical sweepers removing dust collected on the streets and gutters. Thorough washing of surfaces in case of polluting materials spillages and further processing of collected washings as special waste. <u>For quarries:</u>	None	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Appropriate collection and transportation of potential polluting materials (e.g. spent oils, lubricants, etc.)		
Pollution of surface water due to release of harmful/untreated sewage.	The sewage treatment system will be peak for peak demand during construction phase and therefore will cope with the demands during operational phase. No hazardous liquids will be released in to the sewage treatment system. The provision of a large balancing tank before final release will act as a storage unit in the event of accidental release into the sewage system.	None	Negligible
Soil Erosion	<u>For cement plant:</u> N/A <u>For quarries:</u> Gradual rehabilitation of locations where extraction works have been completed.	Soil erosion will be limited on-site the quarries.	Minor adverse
Ground and Groundwater contamination.	<u>For cement plant and quarries:</u> Secondary containment for potential polluting materials. Any contaminated land removal and disposal to appropriate hazardous waste sites.	Potential contamination will be limited on-site.	Minor adverse

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Groundwater depletion.	<u>For cement plant and quarries:</u> Surface water abstraction to cover process water demand is not viewed as an option, as existing groundwater reserves are considered adequate. Controlled water abstraction either through boreholes located on-site or through boreholes located towards Burizana plains.	Existing groundwater reserves exploitation rate for water supply and irrigation purposes, exceeds by far water requirements for cement production.	Negligible

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater and wastewater to ground	Sanitary wastewater will not be discharged to the ground Wastewater sumps and pits will be newly constructed. Pipework will be inspected periodically	None	Negligible/Nil
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse

ENERGY AND GREENHOUSE GAS BALANCE			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Use of solid fuels and direct and indirect greenhouse gas emissions	Ensure that combustion and processing is as efficient as possible by appropriate maintenance activities.	Emissions of greenhouse gases	Moderate adverse

MATERIALS USE AND WASTE MANAGEMENT			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Storage of solid and liquid wastes	Inspection of all waste storage areas to ensure appropriate segregation and containment	Potential releases into the environment.	Minor adverse
Waste management	Arrangement of all solid waste management licences and permits Establishment of waste management disposal/recycling techniques and appropriate choice of contractor Establishment of filter dust handling procedures and choice of the contractors Hazardous waste disposal techniques to be established Review of waste minimisation and recycling options for all wastes	Waste management will be covered by internal procedures and will be regulated through local state regulations. Increased quantity of waste will be disposed of off site. Increase in recycling/reuse of waste generated	Minor adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Dust deposition on leaves leading to loss of vegetation productivity and health	Belts of trees to provide local screening Reduce dust emissions at source	Some dust emissions at the quarry sites, associated with blasting etc, are inevitable, but emissions and impacts can be kept to an acceptable level by use of latest technologies and best working practices	Minor Adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Productivity and quality of vegetation for herbivores reduced	Asphalt quarry access roads	Some impact is probably inevitable.	Minor Adverse.
Disturbance of wildlife by noise	Reduce at source	There should be some habituation to lower reduced noise levels by some wildlife, but more sensitive species may avoid the project areas	Minor Adverse
Disturbance of wildlife by human presence and activities	Environmental educational programme On-site ecologist	Full compliance is unlikely and some illegal hunting and gathering can be expected. There should be some habituation to human presence by some wildlife, but more sensitive species may avoid the project areas	Minor to Moderate Adverse
Wildlife "Road-Kills" along access roads	Ecological Survey Ecological Method Statement Road Warning Signs Driver Briefings	With compliance, road-kills should be reduced but some are still inevitable	Minor Adverse

LANDSCAPE AND VISUAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Cut off light sources and minimise night time workings Sensitive colouration of plant and vehicles Minimise the window between working and restoration phase of quarry	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

LANDSCAPE AND VISUAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	operations		

TRAFFIC AND TRANSPORT			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increased heavy vehicles traffic both locally and nationally	Maximise the use of the rail network for bulk deliveries and abnormal loads. Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion; Heavy construction traffic will be subject to a traffic management plan, as necessary.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis. However, the transport study indicates that there will not be a significant impact.	Minor Adverse

NOISE AND VIBRATION			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Noise from cement plant	None recommended unless the plant and various installations differ significantly from similar established plants used as a reference.	None expected	Nil
Noise from quarrying activities	Good site management; Appropriate choice of machinery; Methods of working; Hours of working; Efficient material handling; Construction of noise barrier or baffle	There may be noise increases at residential properties in proximity to the quarry site boundary.	Minor Adverse

NOISE AND VIBRATION			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	mound;		
Noise from increases in traffic on the local and wider road networks	None recommended on existing roads due to no predicted perceptible increases in noise levels due to the extra traffic.	None expected on existing roads. Noise level increase possible for residential properties in proximity to the new link roads.	Nil
Noise from traffic on new link roads	A possible need for noise barriers on the new link roads depending upon their proximity to residential properties and the number of properties likely to be negatively affected.	There may be noise increases at residential properties in proximity to the link roads alignments.	Minor Adverse

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increased Employment (positive change)	Measures to maximise local employment and improve local skill base recommended. - Local recruitment of young people currently being trained outside the area - Enhanced apprenticeship / training for some local people whose skills could be improved - Positive selection and prioritisation of employment of PAP's - Identification of targets of local people to be employed by skills level - Publication of local employment	This depends on skills of the young people and interest to return to home area, and on the opportunity offered by Antea and targets set.	Major beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	targets in local newsletter. Recruitment policy to extend in future to limited sponsorship BSc (or equivalent) for workers / local people children		
Increased municipal tax and budget (positive change)	Assistance to villages to formulate projects and strengthen advocacy if requested by Liaison committee. Money from improved budget can be used to realise these objectives. Antea cement may be prevailed on to offer skills training for improved planning and project formulation	Increased municipal budget for Kruja district Residual impact will depend on effectiveness of allocation process in favour of affected villages. A poor process would cause conflict / discontent	Major beneficial
Electric and other infrastructure improvements (neutral or positive if realised)	None identified. This will be a “windfall” benefit (or benefit external to the project) if it occurs.	Potential impact on amenity through visual impact.	Neutral / Minor beneficial
Loss or reduction of livelihoods for: Lime Producers (negligible / minor adverse) Herb Gatherers (medium adverse) Graziers (minor adverse)	Confirmation of potential impact on animal nutrition and impacts on production and budgetary implications’ by grassland specialist/livestock productionist following pasture (and livestock) inspection and assessment of stocking density and energy requirements. Confirmation of earnings from herbs to be obtained from wholesaler records, or by base line study. Prioritisation of employment or other	PAP’s have in the main identified a preference for employment rather than other forms of compensation. No household will loose their livelihood, and the income from employment (full or part time) of one or more household members, or alternative compensation, should be sufficient to compensate for expected reductions in the affected activities.	Neutral / minor beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	appropriate form of compensation for each affected household (identified in the confidential Appendix (See Appendix 2) and confirmed by the measures above). Antea to consider feasibility of job share schemes, and gender sensitive arrangements (e.g. for child care arrangements). Annual monitoring of change in activities and incomes related to herb gathering, lime burning and grazing herds as well as other dynamic changes in activities and incomes from employment by Antea cement to be monitored annually during construction and in the first years of operation. Reporting to investors and via CSR report and Liaison forum. Specific attention to be given to vulnerable households.		
Extended and Improved Road and implications for local economy (minor/moderate beneficial)	Regulations relating to roadside and commercial activities to be adhered to by business persons and enforced by Commune. Monitoring of health, road safety issues. Curative and preventive action to be taken if issues identified by monitoring.	Improved opportunities should be seen in increased opportunities and wealth of village. It may be difficult to apportion this only to the new road or cement works given the current increasingly dynamic economic environment. Residual impacts of noise and dust for local residents near the road and indirectly affected.	Minor (/moderate) beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Loss of land and property for 4 -9 households and compensation (minor beneficial / minor adverse)	An appropriate compensation plan should be developed and agreed. See separate compensation plan framework document.	No negative residual impact should be incurred by PAP's. The assessment should include <u>all</u> applicable entitlements Monitoring process to review and report.	Negligible / minor beneficial
Hazards associated with development of new roads from main intersection to the cement plant and from the flysch quarry to the cement plant.	With regards to identified 'high' risks: - Design measures to ensure landslips/falling rocks do not cause accidents - Inclusions of pedestrian walkways and crossings - Lighting, particularly at intersections. - Planned access and parking, specifically in relation to the cemetery and pilgrimage site. In addition measures to manage cyclists and equestrians shall be incorporated. Risk of accident shall be reduced by implementation of education (road safety awareness) programmes and liaison with the local communities as well as driver training programmes and implementation of near-miss/accident reporting procedures. As part of the exercise proposed closed silo lorry lease agreements and	Some residual impact is expected but should be limited by implementation of aforementioned mitigation measures.	Moderate adverse – possibly severe adverse if there is disregarded for safety issues by the road users.

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	contractual terms should be reviewed. Commune to consider need for any additional safety bi laws or regulations for local business activities near roads.		
Roadside residents health and quality of life	Risk assessment to cover these aspects and identify mitigation. Health records of dust related disease to be maintained by local health workers. Quality of life questionnaire to monitor noise and disturbance Further mitigation to be decided on basis of noted impacts via monitoring.	Depends on both cases a) effectiveness of monitoring undertaken b) corrective measures taken – depends on severity of case e.g. treatment may not solve the problem – extreme health issue may require re housing However numbers involved are expected to be no more than 20 households at most though consequences for individuals may be severe.	Minor/ moderate adverse
Cultural and heritage site: Boke e kuge (positive impact)	The pilgrim site Boke e Kuge will be more easily accessible by motorised transport. However the road should not pass next to the site, but allow for a connecting access road / drive.	Improved easier and faster access	Minor beneficial

Summary of Site Closure Impacts and Mitigation Measures

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Emission prevention	Development of Site Closure Plan	Updated information on risks and requirements is available at site closure	Minor Beneficial
Dust emissions during ground works	Water spraying roads Sheeting vehicles carrying dusty materials Speed limits on unmade surfaces Dust emission monitoring in selected points	Dust propagation will be limited to demolition area and will not influence local community. However, workers should be supplied with dust masks especially in dry days	Minor adverse
Discharge of silty and contaminated storm water to surface water. Ground contamination by leakages from machines	Potentially polluting materials will be stored in dedicated storage areas Machines and equipment technical condition will be reviewed periodically Machines and equipment will be sited on hard surfaces All storm water will go via sedimentation ponds and oil separation Procedures for finding contaminated material during excavations will be established Covering and damping of excavated materials Appropriate storage of contaminated material if found	Ground contamination and storm water contamination will be limited on site by proper handling and storage of materials and equipment. Storm water will be treated in sedimentation ponds, the impacts on overall quality of discharge wastewater will be minor	Minor adverse

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Disturbance of bats or birds that may have colonised the cement plant structures	Survey, translocation, demolition at appropriate times of year	Some disruption of breeding still possible while adapting to new sites	Minor Adverse
Some loss of flora and fauna that are re-colonising quarry	Some loss of flora and fauna that are re-colonising quarry	Quarry Restoration Plan incorporating habitat creation and use of native species	Depending on proposed future use of quarry, habitat creation could lead to significant improvement for biodiversity over value when used as an active quarry
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Restoration of the plant and quarry sites including a reforestation programme.	Return of the sites to existing to better than existing condition	Minor beneficial
Solid waste generation	Segregation and recycling of waste and proper storage in isolation from the ground	Solid waste will be managed by local waste contractors and disposed according to their permits and in compliance with local regulations.	Minor adverse
Noise and emissions generated by vehicles	Traffic management plan Use of rail traffic for bulk transportation for abnormal loads	Local traffic congestions problems avoided.	Moderate adverse
Noise from decommissioning of plant and quarry	Good site management; Good choice of machinery; Methods of working, including sequential blasting; Hours of working; Efficient material handling; Construction of noise barrier or baffle	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	mound; Maximising separation distances		
Emergency situations during construction works	Local fire and emergency squads available on-site Availability of Antea and contractors inspectors on site	Procedures for prevention of handling with emergency situations will be implemented. Proper training and equipment need to be delivered to the staff.	Minor adverse
Social impacts There will be job losses	An exit strategy should be devised to minimise losses and assist redeployment. It should include options for retraining / early retirement / assistance in job searches and positioning / identification of jobs within the group and possible relocation assistance.	Plans to re-deploy workers will be developed	Moderate adverse

Construction Phase Environmental and Social Monitoring Plan

Items	Measures	Responsibility	Schedule
Noise/vibration from construction traffic	Ensure construction traffic only uses pre-determined routes to access the sites until completion of the link roads. Once link roads are completed, all construction traffic to/from the site should only use the link roads.	Contractor	During construction phase
Dust	Constant visual vigilance of dust issues throughout the construction phase is necessary. All activities should be assessed for the potential for dust creation prior to their undertaking. Observation of the weather conditions is particularly important.	Contractor/ Antea	Throughout the construction phase but particularly when undertaking activities or handling materials which may lead to dust creation problems.
Communications	Compile and maintain register of environmental and social communications including complaints. These can be made through the existing grievance mechanism.	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Accidents and Incidents	Compile and maintain register of environmental accidents and incidents	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Waste	Visual inspection of waste storage, collection and disposal areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required
Waste Effluent	Ensure that the proposed effluent treatment plant is of an appropriate specification to prevent significant impact to the receiving water way. When details of the effluent treatment plant are available the operator is required to submit full details of the water treatment plant (including its	Antea	As soon as the design of the effluent treatment plant is available and before it is commissioned for use during the construction phase of the rest of the development.

Items	Measures	Responsibility	Schedule
	management requirements) the expected loads, the quality of emissions, the emission point, the quality of the receiving water and the potential impact on that water.		
Storage areas	Visual inspection of all materials (including fuel) storage areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required
Ecology Terrestrial	Belts of trees to provide local screening Environmental educational programme Access Road Wildlife Monitoring Quarry site monitoring Monitoring of Habitat Restoration Programs	Antea/Titan Specialist Drivers Specialist	Every 2 weeks Every 2 weeks Every 2 weeks and prior to clearance Monthly with annual reports
Ecology – Marine (Port)	Monitoring of vessels (waste disposal practices) Monitoring of shore-based solid and liquid waste disposal facilities	Antea/Titan	Routine review of documentation and spot checks Every 6 months and occasional spot checks
Socio-Economic: Camp planning	Provision of camp specification and plans against international “norms” Review of specification and identification of amendments Codes of conduct developed /agreed and provided for information to Liaison Forum	CBMI Antea to review with advice from Liaison forum CBMI	Prior to development of camp Prior to development of camp Prior to development of camp
Socio-Economic: Standard of Construction worker accommodation	Worker questionnaire and inspection	Antea	Quarterly

Items	Measures	Responsibility	Schedule
Socio-Economic: Standard of Construction worker catering	Worker questionnaire and inspection	Antea	Quarterly
Socio-Economic: Construction worker quality of life	Worker questionnaire, Site visit This and other questionnaires to be undertaken Chinese speaker trained and experienced in labour standards and issues.	Antea	Quarterly
Socio-Economic: Construction worker quality of life	Construction worker accommodation suggestion box	Titan /Antea and CBMI contractor	On-going
Socio-Economic: Resident quality of life	Liaison forum or committee to be formed. Members to include: community representatives, local authority and health representatives and Antea and CBMI camp representative(s). To monitor a list of potential issues /concerns (including road accidents, local transport availability, health aspects, potential conflict and others issues) on a regular basis, identify early preventative measures and emergency actions.	Antea and CBMI contractor and Mayor of Kruja and Chairman Thumana	Monthly
Socio-Economic: Health monitoring	Identify indicators and provide statistics of worker health	Camp Doctor	Monthly
Road Safety Measures	Implementation of physical measures proposed in Road Safety Study to minimise road safety issues. Implement awareness campaign of road safety issues. Resident comments to be included and considered in the final design/safety issues;	Antea	Design and construction of roads, before operation.

Items	Measures	Responsibility	Schedule
	Ensure driver contracts are contiguous with responsible driving. Implement road safety awareness/training to drivers prior to operation.		
Socio-Economic: New Road PAP's compensation process	Verification that: Entitlement leaflet Process statement AVF valuation document Entitlement table Produced, with adequate detail and distributed to all stakeholders Grievance processes – number of complaints / issues identified and their status Monitoring of compensation transaction process to be undertaken by Commune. Report to be provided to Antea for annual reporting to investors and to local inhabitants	Chairman and lawyer of Thumana council. Chairman Reporting to Commune council & Forum Director of Services Department, and Lawyer Thumana Commune	At times specified for information production in Section 6 – 10 of this report. Monthly till end of construction. On dates agreed in compensation process.

Operational Environmental and Social Monitoring Plan

Items	Measures	Responsibility	Schedule
Emissions to air from main stack	Constant monitoring of the key parameters and spot sampling of secondary parameters. Monitoring equipment and methods shall be in accordance with: ➤ National Albanian requirements ➤ The EU BAT Reference Document for Cement and Lime Manufacturing Industries. ➤ The guidelines set out in the IFC's EHS Guidelines for Cement and Lime Manufacturing.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
	The daily averaged air emissions from the main stack shall not exceed the following primary limits (mg/Nm³): ➤ Particulate Matter: 30 ➤ SO₂: 400 ➤ NO_x: 600 The operator shall also observe the limits for secondary parameters (HCl, hydrogen fluoride, dioxins-furans etc) as stated in the IFC's EHS Guidelines.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.

Items	Measures	Responsibility	Schedule
	Consideration of the necessity for installation of abatement equipment significant emissions from the cement plant. The operator is required to present a report which considers the emissions from the installation against the benchmarks, the potential reduction of local air quality as a result of the emissions and the impact on sensitive receptors. The assessment should also take into consideration the proposed future operations of the plant, particularly the main fuel to be used.	Antea	The report should be submitted to the IFC and EBRD within three years of start up of the cement plant.
Emissions from other parts of the installation	Dust Emissions from clinker cooling, cement grinding etc shall not exceed 50 mg/Nm ³	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
Fugitive emissions to air	Constant vigilance and regular visual assessment of dust emissions.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
Operational Noise – Health & Safety	Noise Monitoring programme. Noise levels in operational areas of the plant should be measured, and the risk of damage to hearing arising from high noise levels. Staff working in areas of high noise levels should undergo training and regular hearing checks.	Antea	High Noise Levels areas should be identified when expected noise levels are available, and verified once the plant is operational. Staff training and hearing checks should be ongoing.
Protection of ground and groundwater	Fuels, chemicals, liquid wastes and potentially hazardous materials will be kept in designated storage areas. Refuelling will be effected with a mobile bowser with suitable secondary containment and spill protection equipment.	Antea	Secondary containment for all storage tanks and containers above 20-litres in total capacity (including loading areas) must be used. These must have impervious surfaces, free of voids; gaps, cracks and the material used must be compatible with the materials contained. The total bund capacity must be at least 110 % of the volume of the largest container or tank in the

Items	Measures	Responsibility	Schedule
	Plant maintenance and plant/vehicle washing will be carried out in dedicated areas with spill containment		storage area; Proper maintenance of the secondary containment must be undertaken to keep debris, vegetation, leaked hazardous materials and storm water from accumulating; Roofs or covers should be constructed over transfer areas to minimize contact with surface water; All storage areas should be located in areas away from main construction activities and heavily trafficked routes; Areas must be kept dry and free of combustible materials; entrances, exits and aisles must be clear and unobstructed; Adequate lighting and ventilation must be provided; The areas must be secure from unauthorized access; All spills and leaks must be cleaned up promptly; Hazardous materials should be stored away from other storage areas. Suitable spill kits should be provided at all storage areas and at other suitable locations across the site. Workers should be trained in their use. All storage areas must be visually inspected at least monthly and the inspections recorded.
Landscape and Visual	Monitor soil erosion and establish a planting scheme, including advance planting with the aim to reduce erosion due to deforestation Monitor the establishment of on and off site planting with a permissible failure rate of with no	Antea	To be agreed

Items	Measures	Responsibility	Schedule
	more than 10% per year Manage access via the proposed access roads to reduce illegal stone mining Phase the quarry works and localised restoration to minimise the extent of exposed quarry face and window between extraction to restoration Monitor biodiversity enhancement through annual surveys		
	Monitor the impacts of lighting through night time surveys	Antea	To be agreed
Waste	For all waste streams (solid and liquid) data should be kept of: Waste quantities Physical form and containers used/packaging Disposal/treatment route Final disposal point Recycled/reused quantities All in house waste disposal/treatment facilities suitable monitoring/inspection in accordance with the relevant permit/license and legislation. Any breaches of legal requirements, including permits must be reported immediately.	Antea	Monitoring data and a statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders.
Waste waters	Regular inspection of drainage and all waste storage tanks (including domestic) will be included in the wastewater monitoring plan.	Antea	Frequency and methods will be determined before the beginning of the work of the plant. Monitoring data and a statement on compliance with this

Items	Measures	Responsibility	Schedule
			EMP shall be reported in the Annual Monitoring Report to Lenders
Energy	Regular internal energy inspections on the plant; testing and tuning of burners, boilers etc and so on will be undertaken annually by competent experts. Ensure that energy management is as efficient as possible. Undertake detailed study of the plant efficiency once the plant is operational to assess whether waste heat recovery for power generation or any other purpose is viable.	Antea	Monitoring data and statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders Recommended that this assessment be undertaken and submitted two years after the plant has become fully operational.

Item/ Performance Criteria	Measures	Responsibility	Schedule
Determination of impacts on PAP's	Monitor vulnerable household cash income over process of construction and operation Livestock production expert to identify key questions and monitor Monitor herd productivity and cash sales during construction and operation identifying any reasons other than the project affecting this. Grievance mechanism or early indicator system to be established via forum and village representative member.	Antea Antea to employ production specialist Specialist Liaison Forum	Bi annual Quarterly Base line questions and information collected at initial herd/pasture determination of impacts visit then Quarterly Quarterly report – more frequent if identified by representative
Employment and other compensatory measures	Monitor local employment and skill levels against established targets Employment of PAP's, any reasons for non-employment to be given and alternative solution reported. Forum to arbitrate if contacted by PAP.	Antea, Liaison Forum Antea to monitor and report to Liaison forum	Annual Monthly until all PAP's employed,
Communication policies and stakeholder engagement	Satisfaction and use questionnaire to all attending. Activities identified on communications to be completed and summarised by forum and questionnaire results to be reported in Titan CSR activities and appropriate Antea reports	Liaison Forum /Antea	To be agreed
New Road	Health of residents near road in relation to dust and associated diseases. No. of visits and no. cases diagnosed. By age group	Director, Health Centre, Thumana reporting to Liaison committee	Quarterly

Item/ Performance Criteria	Measures	Responsibility	Schedule
	Quality of life of road side residents (noise and disturbance) Questionnaire (developed by independent specialist) Asked and analysed and recommendations by independent organization paid by Antea. Monitor the number of near misses / incidents associated with transport to and from the site on both roads. Identify accident/potential accident hotspots Detail measures undertaken to make further improvements to road safety.	Antea / Commune Thumana to instigate. Reporting to Liaison Forum to consider action Antea H&S/EHS Co-ordinator	Annually

1. INTRODUCTION & BACKGROUND

GENERAL INTRODUCTION

- 1.1 This report presents the findings, conclusions and recommendations arising from an Environmental and Social Impact Assessment (ESIA) of a proposed cement production facility and associated quarries ("the Project"), to be located in Albania. The proposed development will be sited approximately 1 km east of the village of Burizana, 2 km north of Fushe Kruja, 25 km north east of the city of Tirana and 30 km east of the port of Durres.
- 1.2 The ESIA has been prepared by Atkins on behalf of Antea's parent company Titan, according to the policies of The European Bank for Reconstruction and Development (EBRD) and International Finance Corporation (IFC). These bodies are examining the possibility of participating in the Project. This report will also support the EIA which has been prepared to satisfy local Albanian requirements for development permissions and operating permits. Note that these development permissions and permits have already been granted by the local and national regulatory bodies, based on the earlier submissions. The ESIA is accompanied by a stand-alone Public Consultation and Disclosure Plan (PCDP) which is available at the World Bank Group Info Shop: (www.worldbank.org) or at the EBRD Business Information Centre in London and Resident Office in Tirana, on the EBRD website (www.ebrd.com) and also on the project sponsor's site (www.titan.gr).

PROJECT BACKGROUND

- 1.3 The proposed cement production facility and associated quarries described in this Statement will be owned and operated by Antea Cement, part of the Titan Group. Titan is a large, Greek owned company that produces, delivers and trades in cement, aggregate, concrete for mixture and similar products for the construction industry.
- 1.4 Titan has an excellent reputation for upholding the laws of the countries within which it operates and where possible extends its environmental performance beyond the requirements of those laws. Many of the company's operations are located within the EU where there are similarly stringent environmental performance controls and Titan uses these performance controls as a benchmark for all of their operations.

- 1.5 Titan was the first Greek company to sign the United Nations Global Compact Initiative that aims to protect human, labour rights and environment custody. Titan is also a founder member of the Hellenic Net of Social Responsibility and a member of two international initiatives (World Business Council on Sustainable Development and the Cement Sustainability Initiative).
- 1.6 Titan wishes to grow its international business in Albania and has created Antea to operate the proposed facility.
- 1.7 Antea Cement has been duly established and organized according to Albanian Legislation (commercial register No.36120/7-7-2006). The registered address of the company is Rruga Luigj Gurakuqi, Pallati 89, section A, 10th floor, Tirana, Albania.
- 1.8 The proposed facility includes:
- The opening of a limestone quarry and a flysch (silica-aluminate) quarry to supply the major raw materials for the production process.
 - An integrated 3, 300 tpd clinker production line and cement production facility involving the development of an area approximately 250, 000 m²
 - The clinker will be used for the manufacture of cement, according to Albanian and / or European norms;
 - Coal and/or petroleum coke will be used as main fuels.
- 1.9 The limestone quarry area will cover approximately 1,000,000 m², the flysch quarry area approximately 600,000 m². The cement plant area will cover approximately 250,000 m². However, a total area of approximately 500,000 m² will be available to allow for future development of the plant area.
- 1.10 The cement plant could be located adjacent to either quarry. The ESIA will consider the environmental impacts associated with these two locations as well as the broader economic and operational impacts.

SITE DEVELOPMENT PROGRAMME

- 1.11 In line with the accepted planning proposal and permits and in the absence of unforeseen delays, it is proposed that the construction programme will start during the last quarter of 2007 and will run for approximately 3 years. According to this timetable it is anticipated that the facility should be operational by 2010.

NEED FOR THE DEVELOPMENT

- 1.12 The Albanian economy is growing and it is predicted that there will be an increase in the national building and infrastructure programme. Antea wish to develop a new facility to help meet the expected demand for cement. The preferred plant location is rich in the raw materials necessary for cement manufacture and is also within a short distance of the major population of Tirana and the major ports.
- 1.13 The main benefits that will be derived from the project are:
- A reduction in the necessity for the country to import cement from overseas.
 - A source of raw materials near a suitable site of cement production.
 - The ability to export surplus quantities of cement generating foreign revenue.
 - Improvements in the local infrastructure and contribution to the local economy.

ALTERNATIVES SITES

- 1.14 Antea initially considered two locations for the proposed facility; one in northern Albania near Torovice and one near Burizana (to the north east of Tirana).
- 1.15 The criteria used for the site selection process were:
- Close proximity of appropriate reserves of limestone and flysch to each other.
 - Close proximity of the cement manufacturing facility to major population centres.
 - Close proximity of the cement manufacturing facility to major ports.
 - Suitability of the proposed development area away from sensitive habitats and people who may be significantly adversely affected by such a development.
- 1.16 The Torovice location has appropriate reserves of limestone and flysch but this location was dropped early in the assessment process due to the greater need to create new transport links and the sensitivity of the local habitat.

1.17 Having settled on the Burizana area as the preferred location, the company then considered the two main alternatives for the location of the cement plant itself against the present baseline conditions:

- Location of the plant alongside the limestone quarry
- Location of the plant alongside the flysch quarry.

1.18 Table 1.1 provides a summary of the project alternatives:

Table 1.1 - Project Alternatives

Option	Description	Comments
1	Do nothing (Baseline)	Maintain the local and regional environment in its present state.
		Do not contribute to development of the local and regional economy from this industrial development.
		Potentially, seek alternative forms of local and regional development, such as those associated with amenity and tourism.
		Continue to import materials from abroad for infrastructure development.
		Do not make contribution to the country balance of payments through this development.
2	Cement Plant and associated quarries with plant adjacent to flysch quarry	Siting of the cement plant will result in more significant industrial development in the quieter Picrraga valley, including greater development of infrastructure for transport routing.
		Greater volumes of materials to be transported from limestone quarry because of the large volume of limestone needed in the process.
3	Cement Plant and associated quarries with plant adjacent to limestone quarry	Most convenient location with regards to supply of the bulk raw material, limestone.
		Relatively easy access to the main arterial road running north of Burizana. New access road from cement plant to main road proposed, running, north east of Burizana.
		Location not significantly important to local people for grazing or other activities.
		Habitat poorer than within the Picrraga valley.
		Situation high above the agricultural plain and also seen from some viewing points in Kruja.

- 1.19 The initial outcome of this qualitative assessment suggests that the preferred site of the cement production plant will be alongside the limestone quarry. This preferred location has been used as the basis of the ESIA.
- 1.20 Within the plant design there is also scope for the consideration of design alternatives in order to eliminate or mitigate environmental impacts. For example:
- The footprint of the plant
 - The use of abatement technologies.
- 1.21 The appropriateness of the proposed design and management techniques is discussed BAT Assessment in Chapter 4. Chapter 6 reviews the potential impacts of the proposed project during operation.
- 1.22 The location of the proposed project is a key aspect concerning the potential for impact. There are many ways in which the choice of location can alter the impact of the proposed project and these are discussed more fully in Chapters 6 – 8 a major task of this ESIA.

OVERVIEW OF THE PREFERRED LOCATION

- 1.23 The site of the proposed cement plant and associated quarries lies within a region comprising fields, the less hilly, western sectors of Zall-Luz-Derven-Burizana and Thumana-Shperdheth and hilly areas to the mountains in the east.
- 1.24 The proposed location of the quarries and cement production facility is rural in nature. There are a number of small residential communities within 10km of the sites, including the large community of Burizana, approximately 1 km from cement plant area and Picrraga, approximately 0.5 km from the flysch quarry.
- 1.25 The central co-ordinates (System: WGS84 UTM Zone 34N) for each main part of the development are:
- Cement Plant: 393769 , 4600219
 - Limestone Quarry 394413 , 4600297
 - Flysch Quarry 396541 , 4600646
- 1.26 The location of the areas for development is illustrated in the Figures 1.1 – 1.3, below.

1.27 The effective and efficient transportation of materials is crucial to a project of this size and nature. Key transport issues are:

- The transport of materials between the quarries and cement plant.
- Transportation links beyond the immediate vicinity for delivery of fuel and secondary raw materials and export of product from the plant. An effective link to the major road networks and ports is necessary for this to take place. For this purpose a new road is proposed to link the cement plant with the arterial highway. The proposed route of this road is illustrated in Figure 1.3, below.
- Transportation of fuel and raw materials into the country and product out of the country. This will most likely be undertaken through the port of Durres. The port is the oldest in the country and is the largest. It is involved in processing 90% of international marine trade in the country. The port is both a passengers and freight port: 300,000 passengers and 5 million tonnes of freight pass through Durres every year.

Figure 1.1 - Location of Proposed Project: National Scale Overview



Figure 1.2 - Location of Proposed Project: Local Scale Overview

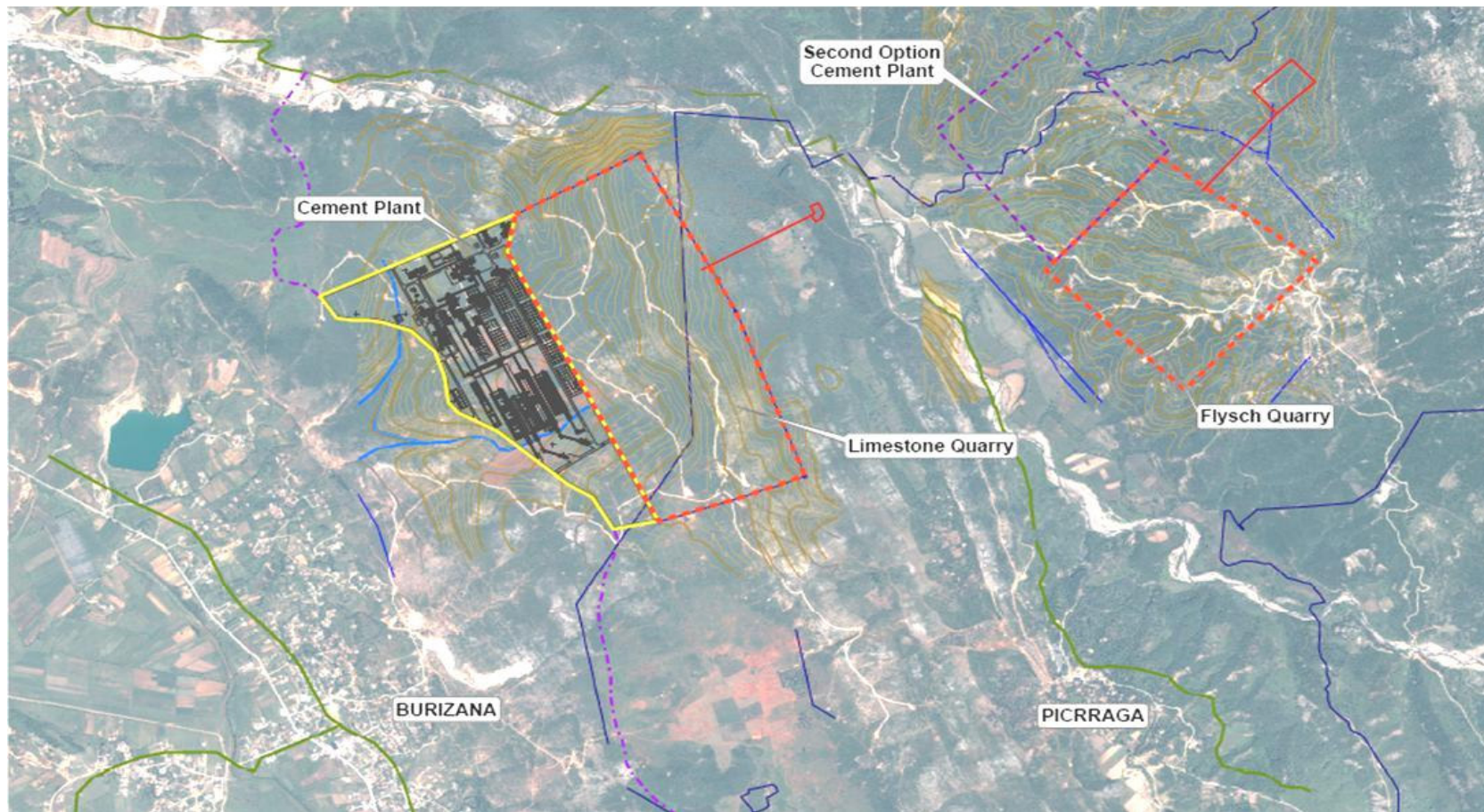


Figure 1.3 - Location of Proposed Roadway to the Cement Plant



GENERAL GEOGRAPHY

- 1.28 The proposed project areas lie within a region comprising fields, the less hilly, western sectors of Zall-Luz-Derven-Burizana and Thumana and hilly areas to the mountains in the east. This latter area comprises limestone and subordinate dolomite, above which is the tectonic plateau of Bokes se Kuqe, hills of Piccraçe and field of Rryqi. This plateau is approximately 3 to 4km long, 400 to 600m wide and has an incline of 3 to 5° from the north.
- 1.29 Levels are relatively flat in the east of the plateau at an altitude of approximately 350 to 450m, with a ridge in the south, formed by the hills of Piccraçe, Pingles and Kraste.
- 1.30 Altitudes to the east and northeast are relatively low, at 110 to 150m. The canyon of the River Droje, in the northeast part of the region, forms a narrow valley connecting Droje with Shperdhë and the field in the west.
- 1.31 The proposed location of the quarries and the cement plant is an area of open ground which is predominated by low lying scrub vegetation. The area is considered to be of low ecological value.
- 1.32 In both areas there is no evidence of sites of archaeological or cultural importance, an observation supported by local officials, academics, NGOs and other interested parties.

PRESENT LAND USE AND SETTLEMENT PATTERNS

- 1.33 The area surrounding the proposed plant location is rural in nature with moderately sized communities in the near vicinity, the nearest being the community of Burizana situated 1 km to the west of the limestone quarry area and the community of Piccraça situated 0.5 km to the south of the flysch quarry area. The location of these communities is illustrated in Figure 1.3, above.
- 1.34 Whilst the area is considered to be rural the quality of the existing landscape has been significantly degraded due to the extensive deforestation and unmanaged use of the land. No protected zones have been identified in the vicinity of the proposed quarries and associated cement plant. The area has been designated an area for industrial development.
- 1.35 In order to provide income, the local communities undertake exploitation of the land in the following ways:

- Rearing of grazing animals
 - Small scale exploitation of limestone reserves (unlicensed)
 - Cutting down of trees for fuel (unlicensed)
 - Cultivation of Olive Plantations in the locality (but not at any of the proposed locations).
- 1.36 The first three of these activities have had a detrimental impact of the area which is predominated by rough scrub, characterised by a thin soil layer.
- 1.37 There are no existing large scale industrial facilities in the near vicinity of the proposed plant. A small limestone quarry exists to the east of the town of Burizana on the present approach road to the limestone quarry which Antea plans to exploit and one of the areas where the location of the cement plant is proposed. This quarry is outside the development area proposed. The existing quarry is a relatively small operation but well established. It is thought that it does not operate with the full range of permits for this type of operation.
- 1.38 In the area surrounding the limestone quarry, there are several pits which have been used for the exploitation of the limestone by local people. Although these operations are illegal (un-licensed) they have been conducted for a considerable length of time and it is apparent that for some local people this activity is potentially an important source of revenue.
- 1.39 A cement plant and large limestone quarry exists approximately 6 km to the south, of the proposed plant, near the historical city of Kruja. The city is situated on an isolated spur of the limestone mountain-wall of the Kruja mountain range, overlooking agricultural plains. The cement plant is situated on the plain (Fusche Kruja) and is of a similar scale to the plant proposed by Antea. The cement plant is not situated near the quarry but instead a few kilometres away from it. The entrance to the quarry is situated adjacent to the one of the main approach roads to Kruja. The plant is situated on the plain below Kruja and is visible for many miles in all nearly all directions.
- 1.40 A detailed assessment of the quality of the existing environment is presented in Chapter 4 of this document.

PURPOSE OF THE ESIA

- 1.41 The European Bank for Reconstruction and Development (EBRD) and the International Finance Corporation (IFC) have been invited to invest in the

development of the facility. As the EBRD and IFC are considering this request to participate in the business of the construction and operation of the new facility, their Environmental Policy and Procedures dictate that an Environmental and Social Impact Assessment ("ESIA") is undertaken of the proposed development. The summary of the findings of the ESIA are detailed in this Environmental Statement (ES).

1.42 The purpose of the ESIA was to:

- Determine the environmental and social changes, both positive and negative, that may result from the construction, operation and decommissioning of the proposed project;
- Identify relevant environmental laws and regulations and European Union (EU) environmental standards (i.e. BAT as described by EU BREF), and assess how these can be applied within the framework of the proposed investment programme;
- Assure compliance with local Albanian requirements for development permissions and operating permits (see the section on Legal and Institutional Framework in Chapter 2 of this Statement);
- Identify suitable engineering, management, and institutional mitigation measures which could eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels during implementation and operation of the Project; and,
- Develop an Environmental Management Plan (EMP) for the Project based upon the identified mitigation measures, appropriate monitoring proposals, and any local permit conditions.

FINDINGS OF THE SCOPING STUDY

1.43 In line with the environmental procedures of the investment banks, a Scoping Study was undertaken for this project. The purpose of the Scoping Study was to identify all of the key issues that would be considered within the full ESIA. In this way the balance of work undertaken within the ESIA will reflect the relative importance of each environmental issue.

1.44 In line with the requirements of the investment banks, the Scoping Study included consultation with stakeholders that might be affected by the proposed development (please refer to the PCDP and Chapter 10 of this Statement for more detail).

- 1.45 As a result of the Scoping study it was concluded that the main issues to be addressed in the EIA would be:
- Process Design and Application of BAT
 - Air Quality
 - Energy and Greenhouse Gas Balance
 - Land and Groundwater Quality
 - Surface Water and Effluent
 - Ecology
 - Landscape and Visual Impact
 - Traffic and Transport
 - Noise and Vibration
 - Socio-Economic Effects
- 1.46 Whilst emphasis was placed upon these issues the assessment considered the full range of potential environmental impacts.
- 1.47 Due to the importance of the air quality issues an air dispersion modelling study was considered to be essential.
- 1.48 The Scoping Study concluded that Archaeology and Heritage issues would not be significant and therefore a detailed assessment of this topic has not been included within the ESIA.

APPROACH TO THE ESIA

- 1.49 It is Atkins intention that different issues associated with the development will receive different levels of assessment depending on their importance. For ease of reference the level of assessment has been split into three, as follows:
- Level I: Detailed Assessment – Undertaken on important environmental and social issues in relation to the part of the development receiving direct investment from the banks, namely the cement plant.
 - Level II: Indicative Assessment – Undertaken on important environmental and social issues in relation to the activities and infrastructure development and use that is closely associated with the cement plant development. Indicative assessments will also be undertaken where there is no information and / or data available to undertake detailed assessments. Also, issues associated

with the development where is detailed assessment is not necessary because the potential impact has been screened out. These assessments will be undertaken using information provided by Antea as well information we hold based on similar operations.

- Level III: Cursory Assessment – Undertaken on potentially important environmental and social issues as a result of the development, that occur beyond the vicinity of the installation. Also, issues associated with the development that does not require a detailed or indicative assessment because the impact has been screened out during the early stages of assessment.

1.50 In addition, the influence of the development has been divided in to three zones:

- The central zone of the development is the cement plant and the associated quarries. This is the main focus of the assessment. Therefore, where relevant, detailed assessments of the issues arising within this zone are undertaken. In particular, this includes issues related to the cement plant. However, where combined impacts of the cement plant and quarries may be significant, these will also be investigated in detail.
- The middle zone of influence of the development relates to the area immediately surrounding the development, the local area up to the point at which the vehicles travelling to and from the site, meet the main arterial transport routes. Assessment carried out within this zone is detailed only where relevant information is available and where key impacts have been identified.
- The outer zone of influence of the development related to all areas including the main arterial transport routes and beyond this includes national impacts of the development as well as impacts on the ports and the marine environment. Cursory assessments of the issues within this zone are undertaken since it refers to major infrastructure issues that are managed by state.

1.51 This ESIA study has been based upon the following activities:

- A visit by Atkins to the head office and an operational facility of the Titan Group in Athens, Greece November 2006.
- A visit by the Project Manager for this project and the Atkins Socio-economic expert assigned to this project, December 2006, to the proposed site locations. Incorporating a meeting with key personnel involved with the

project as well as some local stakeholders and the national regulatory authorities.

- An assessment of the site area by an Atkins ecologist, an Atkins landscape/visual impact expert and a local botanical expert in March 2007.
- Field work undertaken by a local social specialist April to July 2007.
- A visit by the Atkins socio-economic expert to the surrounding areas July 2007.
- A transport assessment undertaken by WS Atkins International Limited (Athens) March 2007.
- Information from Antea and its representatives. This includes details of the proposed plant design, details of the emissions from similar plant already operational, studies previously undertaken in and around the quarry areas for the purpose of submission to the local regulatory authorities and details of the public disclosure process undertaken so far.
- Searches conducted by Atkins of available information concerning the site, its surroundings and the potential impacts of the proposed facility.
- Discussions with relevant environmental authorities, Antea's representatives and other stakeholders;
- A review of Project design data as supplied by Antea;

1.52 The authors of the report gratefully acknowledge the cooperation of all of those mentioned above in the process of gathering information required for the preparation of this Statement (also referred to as the "report").

LAYOUT OF THE STATEMENT

1.53 This document is set out as follows:

- Chapter 2 details the ESIA Framework, introduces the world class standards to which the project is to be constructed and operated and provides an overview of the Albanian Regulations.
- Chapter 3 describes the locations of the proposed project and the context of the development, as well as providing an overview of the project during construction, operation and decommissioning.

- Chapter 4 provides an assessment of the cement plant and quarry operations against the known Best Available Techniques, to ascertain whether the project achieves the appropriate international standards.
- Chapter 5 provides a description of the existing site area and its immediate environs, including a description of the natural, physical and socio-economic conditions within the Project area, and wider area;
- Chapter 6 provides an assessment of impacts associated with the construction of the Project;
- Chapter 7 provides an assessment of impacts associated with the operation of the Project;
- Chapter 8 provides an assessment of impacts associated with the closure and de-commissioning of the Project;
- Chapter 9 outlines the suggested Environmental Management Plan and Monitoring Programme for the Project; and,
- Chapter 10 summarises the public consultation programme.

2. ESIA FRAMEWORK AND ALBANIAN REGULATIONS

- 2.1 The ESIA undertaken by Atkins followed the requirements of the EU EIA Directive as well as the protocols and procedures laid down by the EBRD and the IFC.

EU EIA REQUIREMENTS

- 2.2 The European Union Council Directive 97/11/EC amends Directive 85/337/EEC on the Assessment of Certain Public and Private Projects requires competent authorities in member states to require an environmental impact assessment (EIA) to be carried out for projects that are likely to have a significant impact on the environment. The EIA is to be carried out before consent is granted, so that the decision on whether to grant consent can be made in full knowledge of the projects' likely effect on the environment. The Directives provide a list of projects that will require an EIA in all cases (Annex 1) and a list of projects that may require an EIA (Annex 2), depending on an assessment of their likely impacts, or threshold criteria set by individual member states. The current proposal is considered likely to be an Annex 2 project.
- 2.3 The Directives requires that "the EIA shall identify, describe and assess in an appropriate manner....the direct and indirect effects of a project on the following factors":
- human beings, flora and fauna;
 - soil, water, climate and the landscape;
 - material assets and cultural heritage; and
 - the interaction between the above factors.
- 2.4 Further information to be contained in an EIA is listed in Annex IV of Directive 97/11/EC. This includes:
- a description of the project;
 - an outline of the main alternatives considered;

- a description of the aspects of the environment likely to be significantly affected by the project, including population, fauna, flora, soil, water, air, climatic factors, material assets, landscape and the interrelationship between the above;
 - a description of the likely significant effects of the project arising from the existence of the project, the use of natural resources, the emission of pollutants, creation of nuisances and the elimination of wastes;
 - a description of the measures envisaged to prevent, reduce and where possible off-set and significant adverse effects on the environment; and
 - a non-technical summary of the information provided.
- 2.5 Directive 97/11/EC (as amended by Directive 2003/35/EC following the signature by the Community on 25 June 1998 of the Aarhus Convention on public participation in decision-making and access to justice in environmental matters) also provides for public consultation on the proposal, environmental information gathered, in order to give the public concerned an opportunity to express an opinion before the development consent is decided. The level of consultation required by the Directive is reflected in EBRD Guidance.

EBRD AND IFC EIA REQUIREMENTS

- 2.6 This project is categorised as 'A' by the EBRD and the IFC. Projects in category A require an Environmental Assessment (including social assessment) to ensure that they are environmentally and socially sound and sustainable. A full Environmental and Social Impact Assessment (ESIA) must undergo public consultation for a minimum of 60 days prior to loan approval. It should be disclosed in the World Bank Group Info Shop¹ (and the EBRD Business Information Centre in London and Resident Office in Tirana. EBRD will also post a notification on its website (www.ebrd.com) and link to the ESIA on the project sponsor's site (www.Titan.gr).
- 2.7 In addition the IFC has performance standards (PS)² those which are especially applicable to this project include:
- PS 1: Social and Environmental Assessment and Management Systems. This requires the client to maintain a Social and Environmental Management System appropriate to the nature and scale of the project and commensurate

¹ www.worldbank.org/WBSITE/EXTERNAL/PUBLICATION/INFOSHOP1

² see <http://www.ifc.org/ifcext/enviro.nsf/Content/PerformanceStandards>

with the level of social and environmental risks and impacts. The Management System should incorporate:

(i) Social and Environmental Assessment; (ii) management program; (iii) organizational capacity; (iv) training; (v) community engagement; (vi) monitoring; and (vii) reporting. This standard also specifies the need to prepare an action plan when specific mitigation measures and actions are required to ensure the project complies with applicable laws and regulations and meets the requirements of the Performance Standards. The Action Plan may range from a brief description of routine mitigation measures to a series of specific plans³.

- PS 2: Labour and Working Conditions;
- PS 3: Pollution Prevention and Abatement;
- PS 4: Community Health, Safety and Security which aims to avoid or minimize risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances. It can include and consider issues such as temporary or permanent immigration of workers;
- PS 5: Land Acquisition and Involuntary Resettlement in which clients are required to demonstrate a transparent and satisfactory process of land acquisition, where people are no worse off than prior to the project. In particular, it is important to note that this requirement affects people not only relocated physically, but also those whose livelihoods are significantly affected by the project;
- PS 6: Biodiversity Conservation and Sustainable Natural Resource Management;
- PS 8: Cultural Heritage.

2.8 EBRD standards on social aspects relating to project practices and responsibilities are the more stringent of EU and national standards. It uses World Bank Operational Directives (OD) on resettlement (OD 4.30), and management of cultural property (OP 11.03)⁴. In relation to standards on labour and working practices, the EBRD uses

³ The Action Plan should: (i) describe the actions necessary to implement the various sets of mitigation measures or corrective actions to be undertaken; (ii) prioritize these actions; (iii) include the time-line for their implementation; (iv) be disclosed to the affected communities; and (v) describe the schedule and mechanism for external reporting on the client's implementation of the Action Plan

⁴ <http://www.ebrd.com/enviro/policy/standard.htm>

ILO conventions relating to forced labour, child labour, equal remuneration and discrimination.

ALBANIAN EIA LEGISLATION

- 2.9 The cement facility must comply with the requirements of Albanian legislation to obtain an operating permit. The applications for development and operation of the quarries and cement plant have already been completed in compliance with Albanian legislation. At the time of the ESIA, Antea already hold the relevant licences to begin exploitation of the quarries and develop the cement plant.
- 2.10 The current legal framework within Albania has been reviewed and discussions held with a representative from the Albanian Ministry of the Environment. From the information obtained, there are two key pieces of Albanian environmental legislation that will apply to the development and operation of the proposed cement facility, these are:

Law 8934 (05/09/2002) on Environmental Protection

- This law provides the necessary legal framework under Albanian legislation to enable the control of impact on the environment as a result of industrial activities to ensure that the constitutional right of an ecologically sound environment is achieved.
- In reference to industrial development projects, the law details that protection of the environment will be maintained by a process of EIA (Chapter IV of the law) as well as the Permitting of Activities that Affect the Environment (Chapter V of the law). It is understood from this law that environmental protection is maintained by two separate processes, the first for development control and the second for process permitting. This is in line with the European model of legislative control for development and operational control of industrial facilities.

Law 8990 (23/01/2003) on Environmental Impact Assessment.

- This is the main regulation describing the requirements of persons involved with proposed industrial and other developments to report potential impacts on the environment.
- The law includes details on the types of project that may require an EIA and provides guidelines concerning the detail of the EIA.

- Those activities that are likely to have a severe impact are detailed in Appendix 1 of Law 8990 and require a 'profound' impact assessment. Those projects that are detailed in Appendix 2 of the law require a summary assessment first to be undertaken by the regional environmental agency in order to make a decision of whether the development requires a profound assessment or not.
 - Proposals which fall under Appendix 1 or 2, both require an initial review by the regional environmental agency.
 - The EIA is produced by the agents of the persons proposing the development and is reviewed by competent persons.
 - The law details the persons who shall be involved with undertaking the EIA and the details information required in order to submit a satisfactory EIA.
- 2.11 The proposal for the development of the cement manufacturing facility is categorised as 'profound' under the law because it involves the 'production of cement in rotary furnaces (burning and drying) with a production capacity exceeding 300 tonnes per day'.
- 2.12 The proposal for the development of the quarrying areas is also categorised as 'profound' under the law because it involves the 'mining of stones and open mines of aggregate (Note: The English version of the legislation states 'argyle', this is probably an incorrect translation of the word 'aggregate') where the site surface is larger than 5 hectares'. As stated previously, assessments and EIA reports for both quarries and the cement plant have been submitted to the Albanian authorities, have been deemed appropriate, and the necessary licences have been obtained.

DEVELOPMENT LEGAL CONTROLS AND GUIDING PRINCIPLES

- 2.13 The main methods of developmental control and guiding principles can be listed as follows:
- Law concerning the obtaining licences for activities which may have an impact on the environment
 - The protection of resources, habitats and species under law.
 - Controls relating to emissions to the environment

- Key principles of design in order that the plant is designed and operated according to the Best Available Techniques (BAT);
- Health and Safety Law

2.14 These are described below.

Environmental Licence

2.15 The granting of licences to undertaken activities which may have an impact on the environment is controlled under the council of ministers decision No. 249 dated 24. 04. 2003 Concerning The Endorsement Of Applications For Environmental Licences.

2.16 The system involves the submission of documentation (an application) in order to satisfy the requirements of Annex 1 of the said minister decision. The requirements include:

- Location of the project
- Outline of the project activities
- Identification of potential impacts
- Measures to alleviate impacts on the environment.

2.17 Antea has received the appropriate licences in respect to the cement plant and quarries.

Protected Resources, Habitats and Species

2.18 The legal system in Albania provides for protection of environmental resources, habitats and species, based on democratic principles, first set in 1991. The early laws were concerned primarily with the conservation of the environment and ensuring that the constitutional right of the people of Albania is to live in an ecologically sound environment. Laws which are pertinent to this project are Law on Hunting and Wildlife Protection (1994), Law on Environmental Protection (2002), Law on Protected Areas (2002) and Law on Environmental Impact Assessment (2003).

2.19 Under Albanian Law there is legal protection of mammals including all bat species, carnivores (except stone marten, red fox and wolf), the chamois, roe deer and the Mediterranean monk seal. The law on the 'Protection of the Wild Fauna and Hunting' lists all protected species. Hunting of protected species is allowed under special permission by the ministry of Agriculture.

DESIGN REQUIREMENTS AGAINST THE BEST AVAILABLE TECHNIQUES

- 2.20 The design requirements for the installation are discussed in detail Section 4, a short introductory summary is presented below.
- 2.21 On April 30, 2007, new versions of the World Bank Group Environmental, Health, and Safety Guidelines (known as the 'EHS Guidelines') were issued, superseding the The World Bank Pollution Prevention and Abatement Handbook. The new guidelines set out the requirements for the design and operation of industrial facilities and include guidelines for the cement industry. EHS Guidelines are used across the world as indicative standards for industrial processes. The guidelines are adopted by the IFC investment partner.
- 2.22 The European Union, under its Directive on the control of pollution (Integrated Pollution Prevention and Control (96/61/EC)) has established a standard for design and performance of industrial activities. The standard relates to all main aspects of industrial design and operation and sets out what is termed the Best Available Techniques (BAT) for prevention and control of pollution. The BAT is described for each major industrial activity in a series of documents called the EU BAT Reference (BREF) notes, published by the EU. There is a specific BREF note for the production of cement, which details the suitable design and operational standard for this industrial sector ("Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries 2001"), referred to as the "Cement BREF" in this Statement. The EU BREF provides more detailed descriptions of the design requirements than the World Bank guidelines. This is also the main standard adopted by the EBRD.
- 2.23 The BREF notes are intended to provide guidance on the determination of BAT for each installation ("indicative BAT"). It should be recognised that the two sets of guidance are mainly complementary, with the exception that the EU BREF has more stringent limits for emissions to air. However, there is flexibility on the behalf of the operator to set out how they will intend to comply with BAT, i.e. BAT for the proposed facility or "installation BAT".
- 2.24 In line with Antea's corporate policy it has been agreed that the design of the proposed facility will be benchmarked against the Cement BREF and the IFC EHS Guidelines for the Cement Industry.
- 2.25 Whilst there is BREF and World Bank guidance for cement manufacture there is no corresponding integrated guidance for the management of limestone and flysch quarries. However, guidelines have been produced in relation to:
- planning control and prevention of emissions to air by various legal agencies.

- design and operational guidelines produced from within the industry.
- 2.26 As with the cement plant the investment partners, the EBRD and IFC, expect the same level of operational management of the quarries as would be expected were the development to be taking place in Europe or North America. For the purpose of assessing whether the proposed design and operation of the quarries is to a standard that is appropriate (i.e. the BAT), guidelines have been drawn from a number of documents issued from Europe. A key document used in this respect was entitled Good Environmental Practice in The European Extractive Industry: A Reference Guide, produced on behalf of the European Union.
- 2.27 An assessment of the proposed design against the appropriate design requirements is present in Chapter 4 of this report.

Emissions to the Environment

Air Emissions

- 2.28 Modern cement facilities generally achieve the desired emission characteristics with a combination of production technology, the way the facility is operated and the abatement equipment installed. The final selection of technology and abatement equipment (termed primary and secondary techniques) is based upon the type and quality of the raw materials, fuel and final product specification.
- 2.29 As described above, there are a number of performance standards that could be applied to the proposed facility. As a minimum the facility must comply with Albanian emission limits but Antea intend to design the facility to perform to a higher standard than this. All limits are expressed at standard 'dry conditions, unless other wise stated.
- 2.30 The Cement BREF note includes Emission Limit Values (ELV's) associated with each technique. The benchmark ELV's (as daily averages) for new installations as described within the Cement BREF are as follows:
- Particulates < 50 mg/m³ (20-30 mg/m³ for plant using EP's or bag filters)
 - Oxides of Nitrogen (as NO₂) < 500 mg NOx/m³ for plant using staged combustion *and* selective non-catalytic reduction).
 - Sulphur Dioxide 200-400 mg/m³
 - Fugitive Emissions from storage and handling materials - "no visible dust" criteria is normally appropriate

- 2.31 The Cement BREF provides ranges of ELV's to allow the operators flexibility in process design to meet local conditions, the physical constraints of the site and the financial capacity of the operating company, i.e. "installation BAT".
- 2.32 The limits for emissions to air stated as BAT in the Cement BREF are similar to the requirements of the World Bank, adopted by the IFC. These are detailed in the World Bank's EHS Guidelines for Cement Manufacturing. The limits for the key emission parameters are as follows:
- Particulates (Dust) < 50 mg/m³
 - Oxides of Nitrogen < 600 mg/m³.
 - Sulphur Dioxide < 400 mg/m³
- 2.33 The limits for cement manufacturing as stated under Albanian law (Decision of Council of Ministers "On the temporary norms of air emissions" no 248, dated 2003, Appendix 2, Section 3.3. The Production of Non-Metal Minerals – Cement Production) are as follows:
- Solid Substances: 50 mg/m³
 - Nitrogen oxides as NO₂: 800 mg/m³ (wet)
 - Sulphur Dioxide SO₂: 400 mg/m³
- 2.34 Based on the aforementioned guidelines, Antea have committed to designing and operating the installation to ensure compliance with the emission benchmarks set out in the IFC EHS Guidelines for Cement Manufacturing. The key emission limits to air are as follows:
- Particulates 30 mg/Nm³
 - Oxides of Nitrogen (NO_x) 600 mg
 - Oxides of Sulphur (SO_x) 400 mg
- 2.35 Controls on all other pollutants also have to adhere to the guidelines laid out in the aforementioned documentation. For all pollutants the maximum concentrations have to be achieved without dilution (i.e. main stack to contain only process gases), at least 95% of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours.

EU Directive Limit and Guide Values

- 2.36 The first European Community (EC) air pollution limit values were introduced in the 1980s. These contained limit values that must be attained and more stringent, but

non-obligatory, guide values. In 1996, the European Union adopted a Directive on ambient air quality assessment and management and later supporting pollutant specific Daughter Directives were prepared.

- 2.37 The first Daughter Directive set legally binding limit values for concentrations of sulphur dioxide, nitrogen dioxide, particles and lead in air which must be complied with by 1st January 2005 or, in the case of nitrogen dioxide, 2010. The Daughter Directive limit values will supersede previous EC Directives on their achievement date (i.e. 1st January 2005 or 1st January 2010).
- 2.38 A second Daughter Directive set limit values for concentrations of benzene and carbon monoxide to be complied with by 2010 and 2005, respectively. A third Daughter Directive for ozone has been agreed by the EU Member States and a fourth Daughter Directive for polycyclic aromatic hydrocarbons and heavy metals has recently been adopted.

WHO Guidelines

- 2.39 The WHO Air Quality Guidelines – Global Update 2005 are summarised in the table below.

Table 2.1 - Updated WHO Air Quality Guideline Values, $\mu\text{g}/\text{m}^3$

Pollutant	Averaging Time	Guideline Value, $\mu\text{g}/\text{m}^3$
Particulate matter		
PM _{2.5}	1 year	10
	24 hour (99 th percentile)	25
PM ₁₀	1 year	20
	24 hour (99 th percentile)	50
Nitrogen dioxide, NO ₂	1 year	40
	1 hour	200
Sulphur dioxide, SO ₂	24 hour	20
	10 minute	500

Emissions to Ground and Water

- 2.40 The first piece of environmental legislation produced under Albanian law for the protection of the environment was Law no 7501 (1991) 'Concerning the Land'. This legislation sets out the intentions of the government to protect land quality and makes provision to deal with persons who damage this resource. There also other laws which have been drafted in order to set up appropriate agencies to implement this law and police the environment.
- 2.41 The law concerning the protection of Pastures and Meadows (No 7917, 1995) may also be applicable to this project since the available information indicates that the areas where the proposed plant may be situated are used as pasture.
- 2.42 Water resources are primarily protected under Law 8093 (1996) 'On Water Sources'. This law in part aims to 'ensure protection of water reservoirs from pollution, abasement and over consumption beyond the actual needs'. This law and amendments to it have provided the means by which this law is enforced and penalties for its infringement are set.

OCCUPATIONAL, HEALTH AND SAFETY LAW

- 2.43 IFC Performance Standard 2 (PS2) relates to labour and working conditions. One of the key objectives of PS2 is to promote safe and healthy working conditions, and to protect and promote the health of workers.
- 2.44 Areas specifically addressed include the: identification of potential hazards to workers, particularly those that may be life-threatening; provision of preventive and protective measures, including modification, substitution, or elimination of hazardous

conditions or substances; training of workers; documentation and reporting of occupational accidents, diseases, and incidents; and emergency prevention, preparedness and response arrangements. PS2 recognises that most countries have occupational health and safety (OHS) laws and requires these are complied with. Requirements specifically mentioned and key points include:

- Training for all workers on relevant aspects of OHS associated with their work, including emergency arrangements and reporting.
- The reporting or raising concerns about occupational health and safety conditions should not result in adverse reactions or treatments.
- Occupational injuries and illnesses, including those to the public should be reported. Worker monitoring data (such as exposure levels and health testing) should be retained.
- Clients OHS requirements should be extended to contracted workers and to any other workers who provide project-related services on the client's premises or work sites. Contract specifications for contractors providing workers on the client's premises or work sites should include provisions to ensure that they meet the OHS requirements of the client

2.45 The Albanian Constitution, Article 59, clause 1a asserts that, "The state, within its constitutional powers and the means at its disposal, aims to supplement private initiative and responsibility with employment under suitable conditions for all persons who are able to work.⁵

2.46 All legal acts must be in compliance with the Constitution, including those associated with occupational, health and safety. International treaties and conventions ratified by Parliament prevail in case of inconsistency with Albanian legislation. Legal acts, according to the type of act, are issued and approved by the respective organizations as follows:

- Laws are proposed by the Council of Ministers, approved by Parliament of the Republic of Albania and proclaimed by the President of the Republic;
- A law, after approved by Parliament, is promulgated by the President of the Republic, and enters into force 15 days after its publication in the Official Gazette;
- Parliament decisions are issued by Parliament;

⁵ <http://www.ipls.org/services/constitution/const98/cp2.html>

- Decrees are issued by the President of the Republic;
 - Normative acts, decisions, instructions, regulations and orders are issued by the Council of Ministers;
 - Instructions, regulations and orders are issued by each Ministry; and
 - Court Decisions are issued by the Constitutional Court and the Supreme Court.
- 2.47 Act No.7961 of 12 July 1995 adopting the Labour Code of the Republic of Albania covers a range of issues relating labour law. Chapter VIII of the law concerns eight sections relating to protection of safety and health:
- Section 1. Working room Article 45-47
 - Section 2. Work environment Article 48-50
 - Section 3. Dangerous machines Article 51-53
 - Section 4. Postures of work and loads Article 54-55
 - Section 5. Circulation, falls Article 56-62
 - Section 6. Fires, explosions Article 63-68
 - Section 7. Drinks and Meals Article 69-70
 - Section 8. Cloakrooms, sanitary facilities Article 71-75
- 2.48 Chapter X concerns the special protection of women and young people.
- 2.49 Other Albanian legislation that is related to occupational al health and safety include (Adapted from: <http://www.ilo.org>):
- Decree n° 788 of December 14, 2005 on the definition of the industrial accidents or related to work. Fletorja zyrtare, 2005-12-23, n° 98, p. 3153 Regarding industrial accidents or dependent on work, all body lesions occurring during work, and temporary or permanent incapacities or death from work. Date of entry into force: 2005-12-24
 - Decree n° 742 of bearing November 6, 2003 complements and amendments with the decree n° 692 of December 13, 2001 relating to the particular measures of safety and protection of health at the work. Fletorja zyrtare, 2003-11-18, n° 94, pp. 4151-4152. Modifications relating to the provisions on operation of the service of occupational medicine. Specifies in particular the tasks of workplace doctors. Date of entry into force: 2003-11-18

- Law n° 8921 of July 11, 2002 relating to the ratification of Convention n° 174 of ILO on the prevention of the major industrial accidents, 1993. Fletorja Zyrtare, 2002-07, n° 40, pp. 1183-1191 Standard Related ILO:Prevention of Major Industrial Accidents Convention, 1993
- Decree No 207 of May 9, 2002 relating to the designation of difficult and dangerous work. Fletorja Zyrtare, 2002-06-02, No 21, pp. 681-683. Contains a list of the various types of work considered as difficult and dangerous for the life and the health of workers. Expects that the employers must create high conditions of safety and hygiene. Date of entry into force: 2002-06-02
- Decree n° 692 of December 13, 2001 of the Council of Ministers relating to the particular measures of safety and protection of health at the work. Fletorja zyrtare, 2001-12-31, No 61, pp. 1907-1908. The application by the employer of necessary measurements to ensure the life and the health of workers and to prevent occupational hazards with work. Date of entry into force: 2001-12-31
- Decree No 461 of July 22, 1998 relating to the register held by the employer on the industrial accidents and the occupational diseases. Fletorja zyrtare, 2003-09-18, extra No XI, pp. 18-19. Date of entry into force: 2003-09-18
- Decree No 205 of May 9, 2002 modifying the decree No 384 of May 20, 1996 on the protection of the minors to work. Fletorja zyrtare, 2002-05-17, n° 18, pp. 587-589. Classifies dangerous exposure to physical agents, biological and chemical of young people of less than 18 years. A list of difficult and dangerous work for minors included.
- Decree No 459 of July 22, 1998 on the dangerous substances. Fletorja zyrtare, 2003-09-18, extra No XI, pp. 14-17. Defines substances considered as dangerous and lists sanctions if they are used. Lists 141 dangerous substances. Date of entry into force: 2003-09-18
- Law n° 8938 of September 12, 2002 relating to the ratification of the Convention of ILO n° 176 over safety and health in the mines, 1995. Fletorja Zyrtare, 2002-10-17, n° 61, pp. 1706-1714.

2.50 The Ministry of Labour, Social Affairs, and Equal Opportunity is responsible for enforcing government occupational health and safety standards and regulations.

3. DESCRIPTION OF THE PROJECT

LAYOUT OF THE PROPOSED PROJECT

- 3.1 The location and extent of the proposed cement plant and associated quarries is illustrated in Figure 2.3 of Chapter 2. As described in Chapter 2, the most likely site of the cement plant is adjacent to the limestone quarry, because limestone is the principle raw material.
- 3.2 All plant associated with the processing of raw materials leading to the production of cement will be located in the main processing area, adjacent to the limestone quarry. The layout of this installation is illustrated in Appendix 1. The technical details of the installation are discussed in the below, following a discussion of the construction phase of the development.

OVERVIEW OF THE PROJECT

- 3.3 The following sections summarise the available information concerning the development of the cement plant, associated quarries and supporting infrastructure.

Infrastructure

- 3.4 The development of infrastructure associated with the cement plant will include:
- Development of new and existing road ways to provide access to the plant for workers and to transport materials to and from the plant.
 - Connection to the Albanian national electrical supply. The new line is an activity associated with the development, but at present there are no detailed proposals of the route. The construction of the line will be a strategic development for the country and will be partly owned by the service providers KESH (Korporata Elektroenergjetike Shqiptare – Albanian Power Utility) or OST (Transmission Company). Any assessment of the route and impact of the line shall be undertaken at a sufficiently detailed level. Such an assessment is presently beyond the scope of this report. However, as with all activities associated with this development, appropriate measures shall be incorporated into the design and construction so as to minimise impact and

mitigate any negative impacts that do arise on both the natural environment and people. The procedures of assessment, as well as the design, construction and operation of the power line shall be in accordance with international standards, specifically those adopted by the EBRD and IFC.

3.5 With regards to new road ways there will be two significant developments.

- A new roadway will be created to transfer material from the flysch quarry to the cement plant. The route of the road is presently being finalised but is expected to follow the route of an existing old road.
- Another road development significant in the development and operation of the cement plant will be the road linking the cement plant with the main arterial route running north of Burizana. The proposed route of this road is illustrated in Figure 1.3, Chapter 1.

3.6 It will also be necessary to make improvements to the local road network to facilitate the movement of a large number of heavy goods vehicles associated with the cement plant. These improvements will allow access to the national road network.

3.7 The connection to the Albanian national electrical supply will be relatively straight forward and it is anticipated will not cause disruption to other local power supplies.

Quarries

3.8 The production of cement requires considerable quantities of limestone and flysch. Antea have acquired land and regulatory approval for the development of two quarries to the north east of Tirana. These quarries will be the prime source of raw materials for the proposed facility.

3.9 Approximately 80% of the raw material feedstock for the cement facility is limestone. Based on the capacity of the proposed plant, it is calculated that the annual process requirements will be in the order of 1.4 million tonnes of limestone per annum.

3.10 In order for the construction and operation of a cement plant to be viable, sufficient reserves of the key raw material must be locally available. This avoids expensive and potentially environmentally damaging transportation of significant quantities of raw materials. Antea and its agents have undertaken studies of the potential reserves and have concluded there are workable reserves of limestone in the order of 70 million tonnes. From the information available, the quarry has sufficient potential to support the productive activity of cement production for 50 years.

- 3.11 The flysch quarry will be much smaller and will be used to make up the majority of the remaining 20-25% of the materials necessary for the production of cement. Other materials will be blended with the limestone and the flysch to produce the necessary cement quality and these materials will be delivered to the cement plant by road.
- 3.12 The quarries are not 'constructed' in the same sense of the word as the cement plant will be. 'Construction' in this case will be the opening up and preparation of the land in order that the quarrying activities can take place. There will also be construction of basic site amenities for the site workers, particularly in the case of the flysch quarry which will be remote from the main installation. There will also be construction of road infrastructure as described in the section of this report, above.
- 3.13 The limestone and flysch quarries will be developed in stages, dependent on the reserves available in each exposed section and the quality requirements of the cement production process. The manufacturing process will require feed materials which are defined within narrow quality limits. It is not likely that the materials contained within the quarry are suitably homogenous. Therefore, several areas will be tapped simultaneously and homogenised before feeding into the production process.
- 3.14 Briefly, the development of the quarry will incorporate:
- (i) Construction of suitable access roads.
 - (ii) Identification of suitable work areas and method of quarry working. The variability of the quality of the limestone across the quarry site will affect the way that the quarry is worked. It will be necessary to work several areas at any one time to ensure a suitable blend of raw materials can be fed into the process.
 - (iii) Clearance of the vegetation and ground-layers prior to works being undertaken. The cleared ground-layers may be used to provide screening.
 - (iv) Blasting (limestone only)
 - (v) Transport of quarried materials to cement plant area.
- 3.15 The initial 'construction' phase of the quarries in order to develop the upper quarry benches, will commence 1 year earlier than the actual/efficient and productive mining schedule.
- 3.16 The initial phase will be covered by the same personnel and equipment as the main program of 50-year horizon of operations but will be supplemented by extra-auxiliary

mobile equipment (bulldozers, motor grader with ripper, hydraulic excavators equipped with bucket and hydraulic hammer) because of the more demanding requirements of this stage of the process.

- 3.17 More details of how the quarries will be worked is provided in the section below under the heading Operational Activities.

Cement Plant

- 3.18 The building programme for the Project includes the following main stages, to be completed by 2010. Information presented at the time of writing indicates that site preparation is to start in February 2008:

- Site Preparation and Levelling
- Handing over the construction site
- Basic engineering, duration 8 months.
- Detailed engineering incl. architecture and foundations, duration 12 months.
- Procurement, manufacturing and shipment of mechanical and electrical equipment, duration 24 months.
- Civil works, excavation and possibly soil improvement, duration 18 months.
- Structural steel construction, duration 12 months.
- Erection of platforms, piping and mechanical equipment, duration 12 months.
- Installation of cables, pipelines and other infrastructure, duration 8 months.
- Tests and commissioning, duration 1 month.

- 3.19 The main operational equipment is specialised (e.g. the pre-heater/calcliner, kiln, mills, and bagging plant) and will be supplied as a vendor packages that will be manufactured off-site and delivered to site on large road vehicles.

- 3.20 Due to the size and nature of many of the major plant items it will be necessary to provide relatively substantial foundations but the buildings themselves are likely to be little more than weather protective cladding.

- 3.21 As is typical of this type of process there will be a significant conveyance of materials in and around the installation. Most of the systems involved in these processes will be fabricated on site.

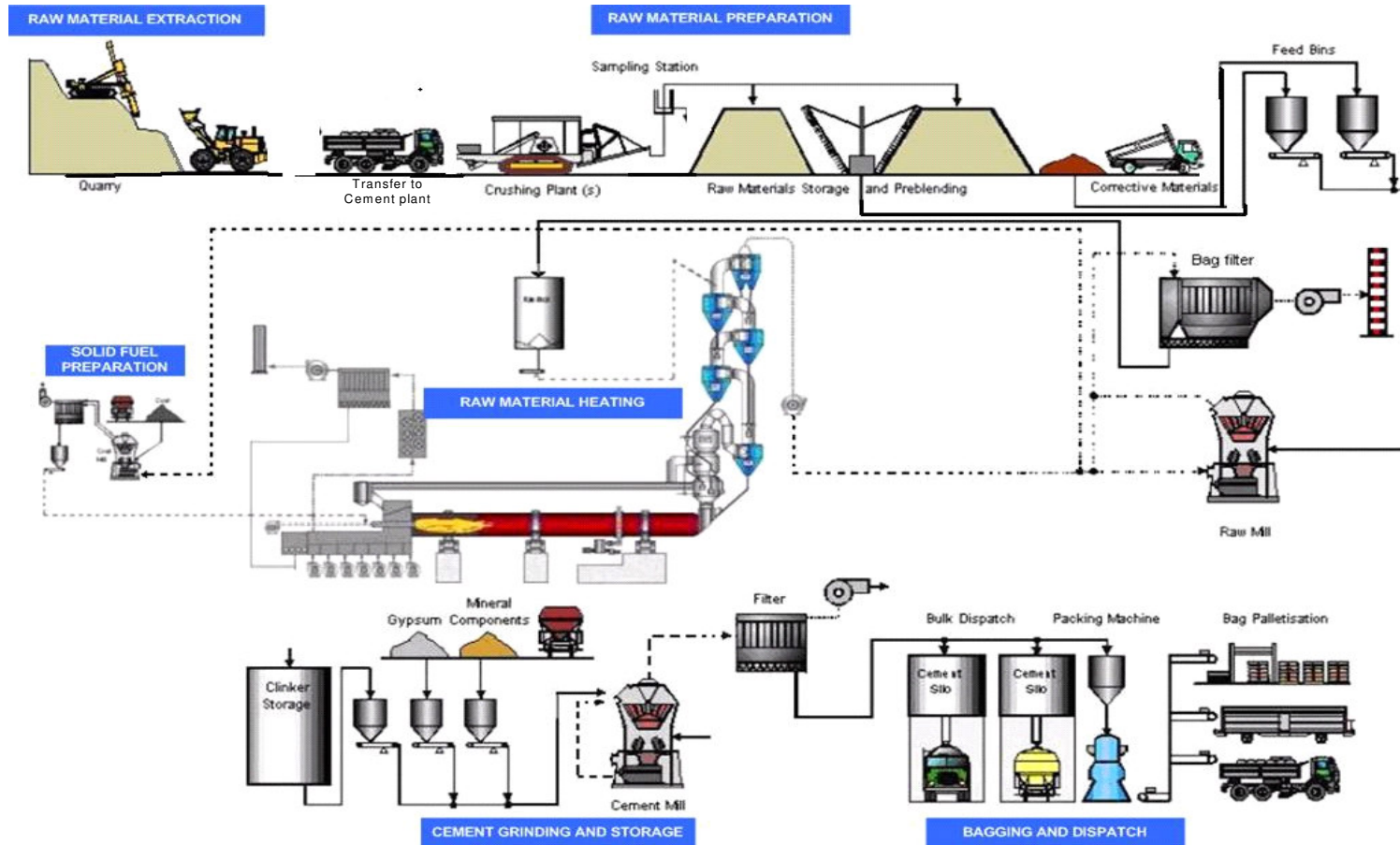
OPERATIONAL ACTIVITIES

3.22 The process has been divided into the following stages:

- Quarry Operations (Raw Material Extraction)
- Raw Material Preparation;
- Solid Fuel Preparation
- Single Kiln Line (Raw Material Heating);
- Cement Grinding and Storage
- Bagging Dispatch

3.23 A process flow diagram of the entire manufacturing process is illustrated over the page. This is followed by a detailed description of each stage of the production process.

Figure 3.1 - Process Flow: Cement Production and Associated Activities



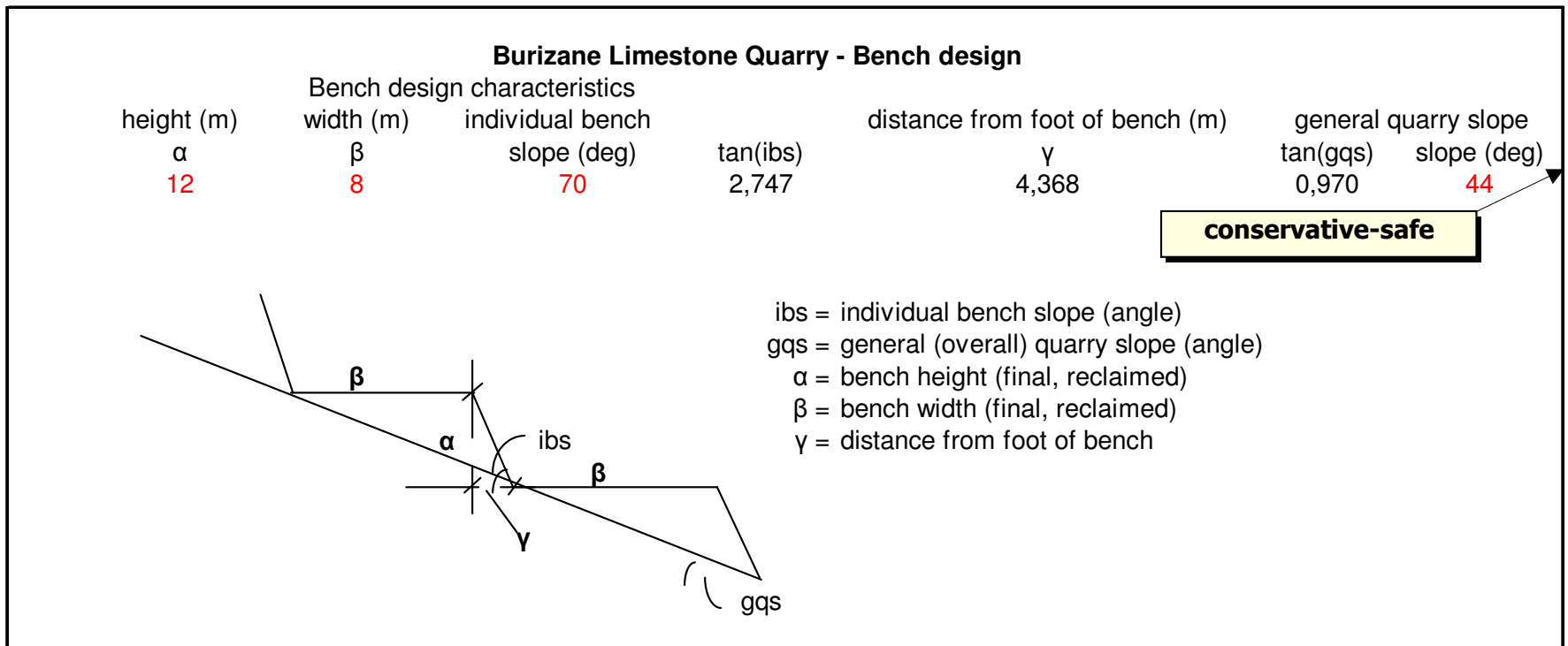
Quarry Operations

- 3.24 Limestone and silica-aluminate (flysch) raw materials are extracted from their respected quarries and transported to the cement plant for processing and storage.
- 3.25 An EIA/Evaluation Report of Environmental Influence for both the Limestone and Flysch quarries has already been submitted to the Albanian authorities by an independent consultant in Tirana (Silva Studio, July 2006). As a result Antea has received the appropriate licences for development and extraction. The following information of the quarry operations are taken from the aforementioned reports.

Limestone Quarry

- 3.26 The main working characteristics of the limestone quarry are:
- Blasting, for the extraction of the limestone.
 - There will be a bench height maximum of 12m during all quarry operations and at the final depletion stage of the quarry as well,
 - There will be a bench width minimum 12m, during excavation and the development of all quarry operations where machinery will need to access the benches,
 - There will be a bench width minimum 8m, at the final depletion stage of the quarry,
 - Overall quarry slope ~44 degrees, during all quarry operations and at the final depletion stage as well,
 - There will be open benches (10 benches above natural surface) until the elevation of the final plateau of 218m a.s.l.
 - Safety distance of all operating and final-depleted benches from the existing houses (to the north-northeast and south-southeast) was set at 500m; the same regulation applies for the development of quarries in Greece (Rulebook published in 1985)
- 3.27 A schematic cross section of the quarry is illustrated below.

Figure 3.2 - Schematic Layout of the Quarry Bench Design for Limestone Quarry



- The estimated annual volume of limestone extracted for the requirement of the cement plant process will be 1.4 million tons.
- In order to achieve the rate of extraction required the operations will be one 8 hour shift per day (07:00 - 15:00), 5 days per week (Monday – Friday), 11 months per year (one month per year excluded due to planned shutdown of the Cement Plant for routine maintenance).

3.28 The blasting regime will incorporate excavation by means of drilling blast holes, charging/loading with explosives and detonation of the blast holes in a controlled manner. Further details of this process are:

- At least 8 blast holes will be drilled per shift. Detailed calculations have been undertaken concerning the drilling of blast holes and have been produced as part of the submissions to the Albanian authorities. These have been undertaken in order to maximise the efficiency of the blasting regime.
- The total blasted mass (loose) per shift will be approximately 5,785 tons in order to supply the needs to the Cement Plant.
- The use of a Down-the-Hole (DTH) hydraulic hammer is considered necessary for the drilling. Using this drill set up, the productive/efficient time of drilling has been calculated to be 5.1 hours per shift or equivalently 6.1 hours per shift counting for 1 hour of time losses due to necessary moving of the drill rig.
- In order to have adequate back-up and increased safety of the operations the quarry will be equipped with two similar drill rigs, each of enough drilling capacity to support all needs. In practice, one rig will be used for production drilling while the other may work for supporting functions as opening/developing new access roads and benches, as well as kept as “reserve” equipment in case of a major breakdown, planned maintenance etc.
- Detailed calculations have been undertaken concerning the explosive requirements and submitted as part of the submissions to the Albanian authorities.
- The main explosives in use will be ANFO (mix of ammonium nitrate and fuel oil at the approximate ratio of 94%/6%), loaded bulk into the holes. ANFO will be purchased in 30-Kg bags and transported to the site of the quarry by a certified supplier and inside a certified, special-type of truck, according to the Albanian Legislation related to explosives and in line with the international standards.

- Loading of the blast holes is expected to be a manual work for the first 3-5 years of the quarry development and until the solution of an ANFO-production truck is employed on site. The bottom of the blast holes will be charged by ammonite (acting as a “primer” or “booster”), with 2% NGL (nitroglycerine) content, loaded in cartridges.
- The total charge of each hole will reach 189 Kg and the total specific consumption of explosives will be about 680 gr/m³ of excavated rock in situ or equivalently: ~260 gr/ton of limestone in situ.
- The above total charge (load of explosives) per blast hole is considered “safe”, based on the safety distance of at least 500m between the closest houses and the future operating benches of the quarry, provided that a special detonating program/system will always be followed for all blasting needs.

3.29 In order to control blasting and minimise noise and vibration, the following blasting methodology will be undertaken in line with internationally accepted good practice:

- Connection & detonation of blast holes: The preferred method/system of detonation will be NONEL (non-electric), by applying a “double-decking” of the column charge of the blast holes. This operation will be undertaken through the careful arrangement of the explosive charge in two equal parts, upper and lower, with an intermediate layer of inert material.
- The detonation of the 2 parts shall take place by NONEL detonators of different delay times (difference of at least 17 msec).
- The set up will ensure adequate delay time between any two consecutive blast holes and any two “decks” (parts) of column charge.
- The use of NONEL in all blasting operations will ensure:
 - Minimized impact due to blast-induced vibrations (as measured by special devices for vibrations monitoring),
 - Elimination of the impact due to noise and the risks of damages due to the “air blast” (localized air-pressure phenomena, that are usually associated to the use of electric fuses and electric caps on surface) and
 - Optimized blast control and blasting efficiency (overall “quality of blasting”).

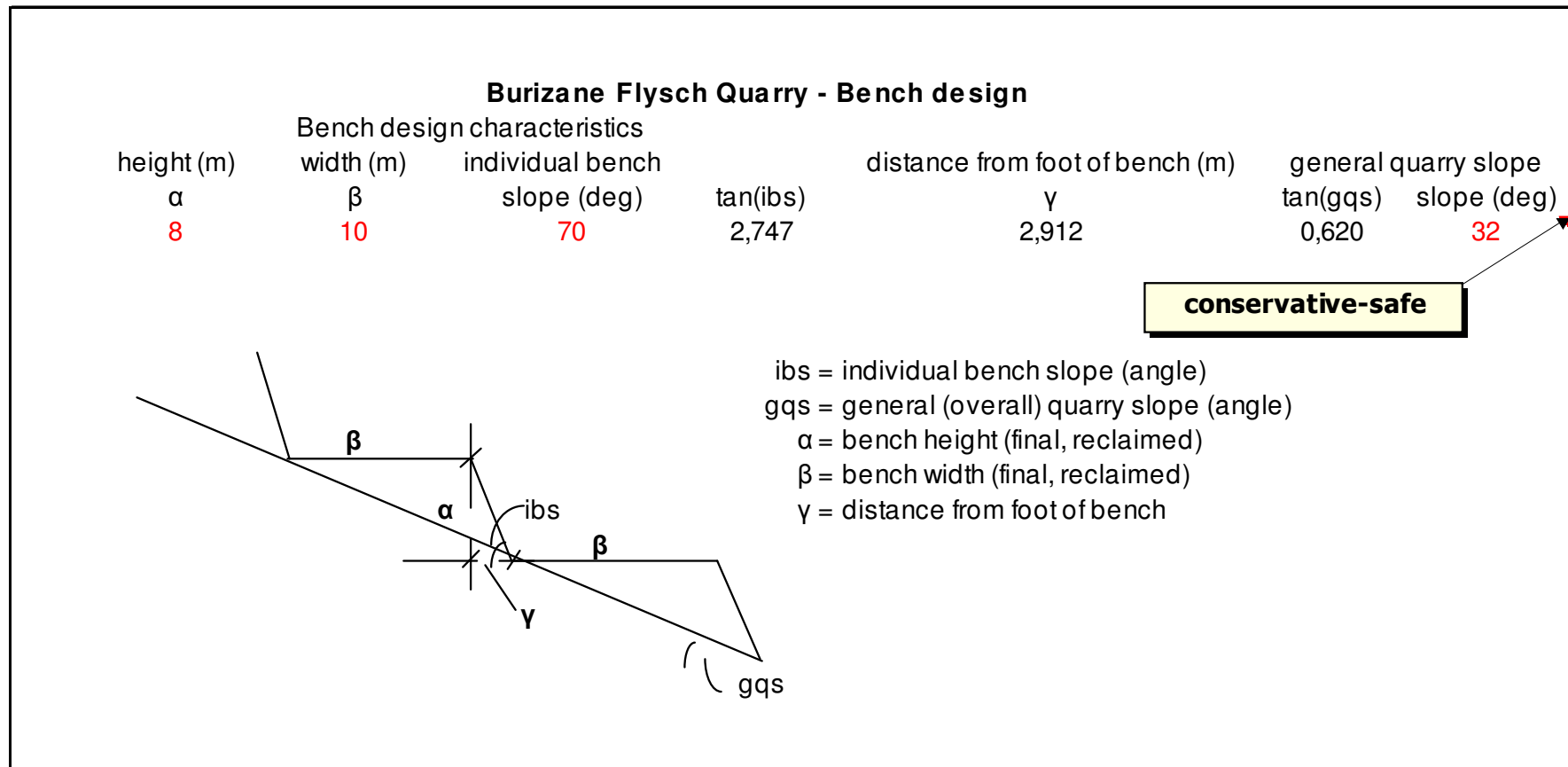
Flysch Quarry

3.30 The main working characteristics of the flysch quarry are:

- The method of mining as an open-pit quarry with “open” (above natural surface benches and excavation by mechanical means only and without the use of explosives.
- Bench height maximum 8m during all quarry operations and at the final depletion stage of the quarry as well,
- Bench width minimum 12m, during excavation and the development of all quarry operations where machinery will need to access the benches,
- Bench width minimum 10m, at the final depletion stage of the quarry,
- Overall quarry slope ~32 degrees, during all quarry operations and at the final depletion stage as well and
- Open benches (9 benches above natural surface) until the elevation of the final plateau of 196m a.s.l.
- Safety distance of all operating and final-depleted benches from the existing houses (to the east-southeast and north-northeast and south-southeast) was set at 250m at least; the same regulation applies for the development of quarries in Greece (Rulebook published in 1985). However, there is an exception to the above in that there is a single dwelling >150 m to the west of the future quarry limits. It is expected that due to the nature of the activities at this quarry (excavation only) there will not be a significant impact on those inhabiting the dwelling.

3.31 A schematic cross section of the quarry is illustrated in the figure below

Figure 3.3 - Schematic Layout of the Quarry Bench Design for Flysch Quarry



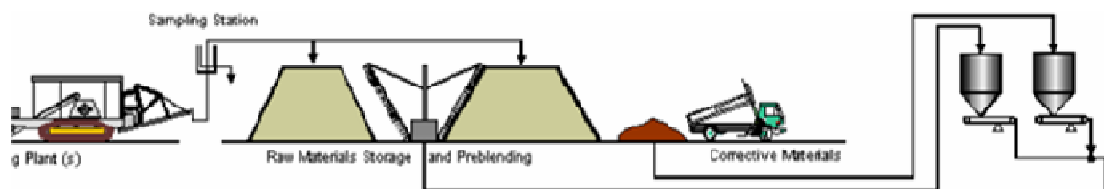
- 3.32 The estimated annual volume of flysch extracted for the requirement of the cement plant process will be 423,000 tons.
- 3.33 In order to achieve the rate of extraction required the operations will be the same as the limestone quarry. That is, one 8 hour shift per day (07:00 - 15:00), 5 days per week (Monday – Friday), 11 months per year (one month per year excluded due to planned shutdown of the Cement Plant for routine maintenance).

Raw Material Preparation

- 3.34 Limestone and flysch will be extracted from the separate quarries as described above. At each quarry there will be stockpiles of materials ready to feed to the cement plant. These will be limited quantities of safety stocks of the blasted limestone/carbonate materials and excavated flysch/silica-aluminates material. These will be stored at the respective quarry benches and operating plateaus, ready for loading. The stockpiles serve the purpose of supplying the cement plant with all necessary quantity and appropriate quality of the raw materials, under sufficient quality control and safe operating conditions.
- 3.35 Stockpiles at the quarries will be in the order of approximately 1 month reserves for the limestone (up to 130k tons) and approximately 2 weeks reserves for flysch (up to 20k tons). In addition, a stockpile of approximately 1 – 2 mega tons of clay material will be created in the limestone quarry from the excavations in the plant area and will be gradually fed to the production line within the first 2-3 years of cement plant operations.
- 3.36 None of the stockpiles at either quarry will be crushed in situ. All quarried materials will be transferred to the cement plant for crushing under controlled conditions. This will prevent escape of dust emissions from the operations. Materials will be transported from both quarries by bulk road transporters. Since the materials will not have been crushed, the potential for dust emissions during transport will be limited. However, in the event of potential dust emissions, damping down of materials and if necessary of roadways will be undertaken.
- 3.37 At the cement plant the materials will undergo their initial stage of preparation of crushing and storage. In order to minimise dust emissions at crusher inlets, water curtains will be used. The raw materials are crushed and mixed (separately) so that their quality is constant. This is important to maintain control of the process and the cement produced from it. Crushing will take place in dedicated buildings where dust will be extracted to bag filters and noise reduced by enclosure of the crushing equipment within the building.

- 3.38 All stock piles will be stored undercover. No crushed materials will be stored outdoors. Stock piles will constitute two piles of about 22.500t each for limestone and two piles of about 7.500t each for flysch.
- 3.39 An iron source and bauxite are also required to make cement and these will be delivered to site from external sources and stored in silos. These materials will be needed in relatively small quantities.
- 3.40 The Raw Material Preparation department will be equipped with all the necessary data logging (belt scales between reclaimers and hoppers, running times, availability of equipment, electrical consumption, etc.) required for plant operation.
- 3.41 From the stock piles the materials are transported by conveyor to separate feed bins. The combined action of stacking and reclaiming achieves raw material pre-blending.
- 3.42 The raw material pre-blending and storage stage is summarised in the figure below:

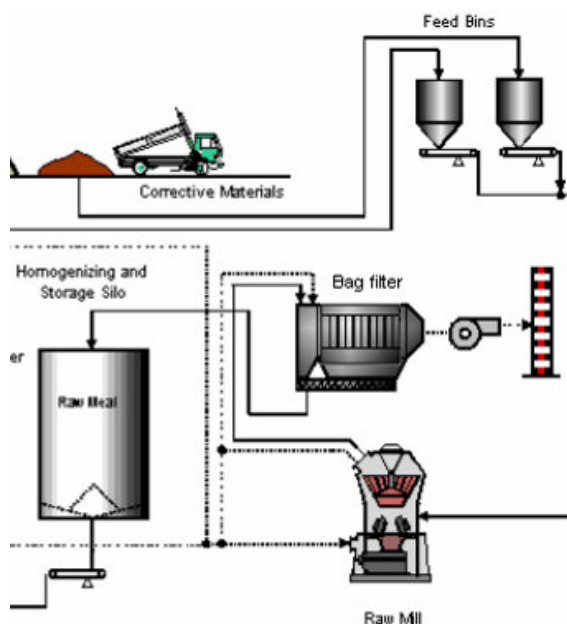
Figure 3.4 - Raw Material Pre-blending and Storage



- 3.43 From the feed bins, the raw materials will be fed to the raw mill, where they will be ground to a powder. Before entering the raw mill, each material is weighed to adjust the chemistry of the raw mix.
- 3.44 Underneath each feed bin, belt weigh feeders will be installed to adjust the raw mix composition. A common belt conveyor will transport the raw mix to the raw mill. The belt will also be equipped with a magnetic separator and detector. The feed bins and the extraction will be de-dusted.
- 3.45 A software system will control the operation of the weigh feeders and the quality of the raw mix. The ratio of the feed component quantities will be adjusted by the mixture controller so that the raw mix will comply with the specified quality set-points.
- 3.46 The mill, will be a Loesche mill (LM 48.4) and will be of suitable capacity to cope with the production of the new line. The proposed mill capacity is about 260 tons per hour (tph), based on a material fineness of less than 12% residue on 90 micron sieve. An automatic sampling system will be installed before the next stage of the process.

- 3.47 The ground raw materials (the raw meal) will then be transported to the homogenization silo before it is fed to the kiln/pre-heater, where they will be blended further. The correct feedstock mix is obtained by balancing the quantities of materials extracted from the raw mill feed bins and the blending ratio will be guaranteed.
- 3.48 The raw meal shall be fed evenly into the silo via the distributor on the top of the silo. By means of vertical and horizontal directional gravity mixing, it will be homogenized during discharge.
- 3.49 The silo will be equipped with all required de-dusting and level indication sensors on the silo top. The fluidization / extraction air will be provided by positive displacement blowers. Extraction from the bottom of the silo will be via air slides and dosing valves, which will feed the kiln feed bin.
- 3.50 The raw material preparation storage stage is summarised in the figure below:

Figure 3.5 - Raw Materials Preparation

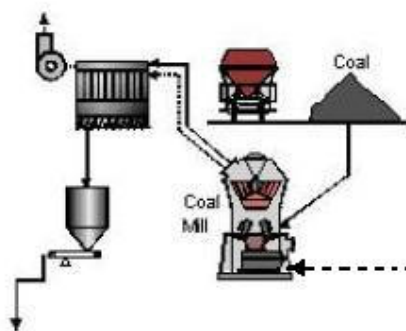


Solid Fuel Preparation

- 3.51 The solid fuels, i.e. coal and petroleum coke are stored inside a covered storage. A vertical roller mill is used for grinding the solid fuel at the required fineness. The mill capacity will be approximately 35tph for coal and about 20tph for petroleum coke.

- 3.52 It is expected an annual thermal energy consumption of 919.800Gcal/y (1.069GWh) which is equivalent to 131.400t of coal with a net calorific value of 7.000kcal/kg.
- 3.53 It is expected that the specific energy consumption of clinker production to be 2900-3200MJ/t of clinker which is according to the cement industry benchmark and the theoretical heat of reaction (1700-1800 MJ/tonne of clinker) which is about 50-60% of the heat consumed in an efficient modern kiln with preheater and calciner.
- 3.54 Bag filters are used for the de-dusting of the vertical coal mill as well as the pulverized fuel silos. The mill system is equipped with explosion relief devices. A summary of this stage of the process is illustrated below.

Figure 3.6 - Solid Fuel Preparation



Single Kiln Line (Raw Materials Heating)

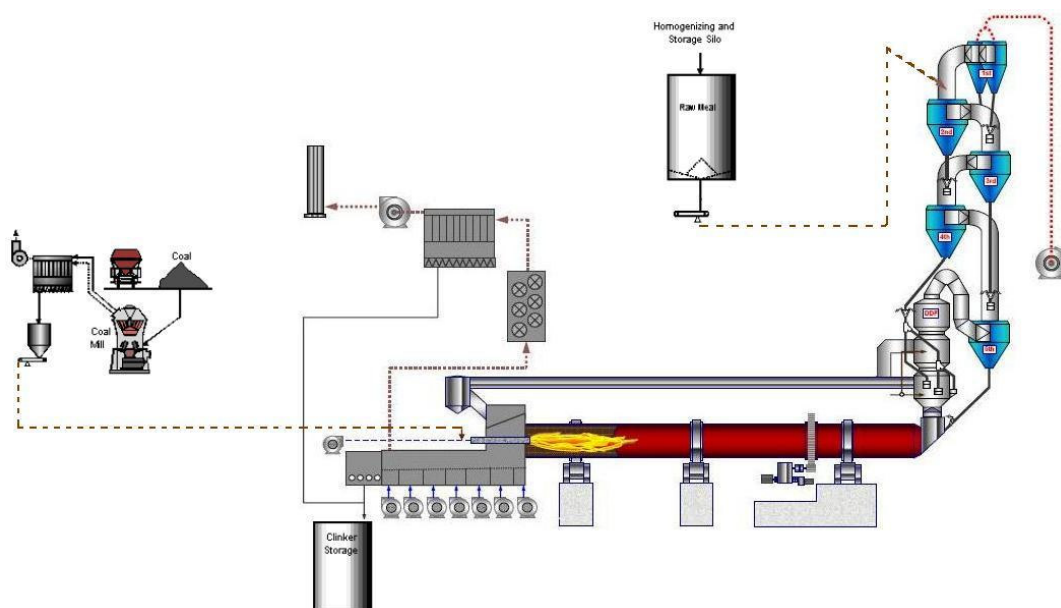
- 3.55 From the homogenization silo, the raw meal is fed to the top of the preheater and from there to the kiln. The pre-heater equipped with precalciner will be designed for a clinker capacity of 3 300 tpd.
- 3.56 The kiln feeding system will consist of a kiln feed bin on load cells which will normally be kept at a constant weight level, a bin extraction system, a kiln feed gravimetric metering system and a bucket elevator to transport the raw meal to the pre-heater feed inlets.
- 3.57 Adequate de-dusting will be provided for the homo silo extraction system and kiln feeding system. Care will be taken to ensure that dust removed before the metering system will be returned to the upstream section and dust removed after the metering system will be returned to the downstream section of the feeding system.
- 3.58 The feeding point(s) into the pre-heater will be equipped with isolating gates to prevent excessive heat entering these points during kiln pre-heating.

- 3.59 Access to all equipment, measuring and maintenance points will be provided as well as any required lifting gear (hoists, etc) for heavy equipment and maintenance (for example hoist for the top part of the bucket elevator).
- 3.60 The preheater comprises a series of 5 cyclone stages, single string of modern concept, designed for low pressure loss. The raw meal is gradually heated up in the cyclones using hot exhaust gases from the kiln. By the time the raw meal reaches the lowest cyclone and before entering the kiln, its temperature exceeds 900°C.
- 3.61 The top stage cyclone efficiency will not be lower than 95%. The precalciner will be designed to burn a variety of fuels e.g. petroleum coke, coal, lignite, heavy fuel oil, or fuel mixture. Furthermore, it will allow sufficiently long burnout time to ensure good combustion conditions.
- 3.62 The pre-heater will be provided with all necessary measuring equipment, poke holes, man holes, and a gas analyzer for measuring O₂, CO, and NO_x at the outlet of cyclone 5. Specifically, all pre-heater vessels will be provided with top and bottom temperature and pressure measurements. All equipment and measuring points will be readily accessible and poke holes and man holes will have sufficient head room to ensure safe working conditions.
- 3.63 The pre-heater structure will be either of steel or concrete or of mixed design and will be provided with a staircase and a service elevator. Gas analyzing equipment will be installed in an enclosed and air conditioned room within the pre-heater.
- 3.64 The precalciner is the section of the preheater where more than half of the fuel will be burned. The remaining fuel is burned at the other end of the kiln, where the product (i.e. clinker) exits the kiln.
- 3.65 A rotary kiln with a capacity of 3 300tpd of clinker will be provided. The tertiary air duct, taken from the kiln hood and designed for low dust extraction, will be installed along the kiln.
- 3.66 Kiln shell cooling air fans will be situated along the kiln burning zone to enhance coating formation. This can be achieved either with many separate fans or one or two fans with air distribution nozzles. A kiln shell scanner with live ring migration measurements will be provided. The kiln drive motor will be of variable frequency. Care shall be taken to provide efficient and maintenance free kiln inlet - and outlet seals.

- 3.67 A gas analyzing system with an independent closed circuit cooling system will be provided for gas analysis at the kiln inlet. Gases to be measured are O₂, CO and NO_x.
- 3.68 Similar to the precalciner, the kiln burner will be designed to use a variety of fuels, e.g. petroleum coke, coal, lignite, heavy fuel oil or fuel mixture. The burners will be of modern design and be provided with adequate facilities for flame adjustment. The burner is to be equipped with a motorized trolley. Inside the kiln, the material and gas temperatures will be at a temperature of 1400°C - 2000°C.
- 3.69 A TV camera (coloured) with integrated clinker burning zone temperature measurement will be installed in the kiln hood in such a manner as not to interfere with operation of the kiln hood door(s).
- 3.70 After the kiln, the hot clinker enters the clinker cooler, where the clinker will be rapidly cooled from about 1400°C to about 150°C, by blowing air. The clinker cooler will be fitted with a heat exchanger to recover some of the heat from the hot clinker.
- 3.71 The clinker cooler will be equipped with a clinker crusher. The cooling air fans will be equipped with silencers.
- 3.72 A colour, closed circuit TV camera will be installed in the cooler so as to be able to observe the clinker bed. A sampling point for clinker will be included after the crusher.
- 3.73 Attention will be paid to allow easy access to all equipment and measuring sensors. Lifting gear will be installed, where required, to lift heavy equipment in order to facilitate maintenance. Manholes and inspection windows will be designed for safe use.
- 3.74 A metallic pan-conveyor will transport the clinker after the cooler to the clinker storage. Provision will be made to feed the clinker storage or the off specification clinker silo. The filters on top of the clinker storage and the off-specification clinker silo will be adequately sized.
- 3.75 All other transfer points will be adequately de-dusted. Special care will be taken in the design of clinker chutes so as to avoid abrasion and dust (stone box, reduced slope, wear liners, no free fall, etc).
- 3.76 The clinker storage will have a live capacity of 40,000t to accommodate fluctuations in market conditions. The storage will be provided with extraction galleries and pan conveyors.

- 3.77 The off-specification clinker silo will be provided with an extraction point to feed the off-specification clinker into one of the pan conveyors in a controlled manner, as well as with an alternative point for loading the clinker to trucks. Adequate de-dusting will be provided for the extraction points, loading point and transfer point to the pan conveyor, to limit fugitive dust, following Titan best practices.
- 3.78 This stage of the process is illustrated below.

Figure 3.7 - Single Kiln Line - Preheater / kiln with Precalciner and Clinker Cooler

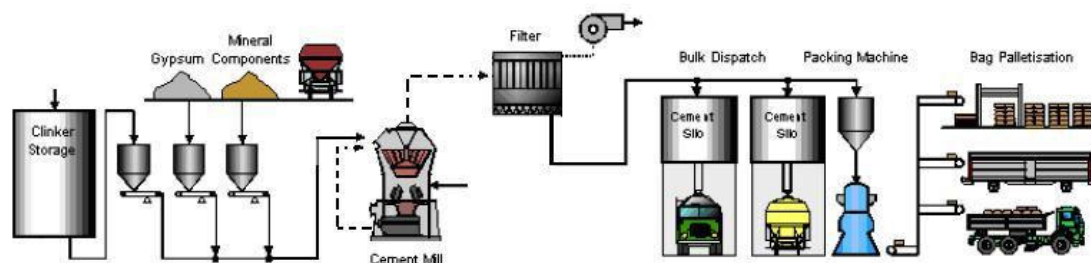


Cement Grinding and Cement Dispatch (Bulk Loading and Packing)

- 3.79 From the clinker storage, clinker will be transported to silo(s) to feed the cement mill. All transfer points will be adequately de-dusted.
- 3.80 Cement, which is the final product, is produced by grinding clinker with gypsum and other additives, e.g. limestone, fly ash, pozzolan, etc. In order to avoid fugitive dust emission, the cement additives will be stored inside a covered storage, in separate piles for gypsum (3 000t), pozzolan, wet or dry fly ash (5000t) and limestone (1000t). From the stock piles, the raw materials will be transported via conveyor belts to the three cement additive silos (feed bins) of the cement mill. The feed bins will be on load cells, while the capacity of each one will be about 60m³ (~100t). The silo feeding and extraction will be adequately de-dusted. Magnetic separators and detectors will be installed along the conveyor of the cement mill. A sampler will be included for product quality control.

- 3.81 A Loesche vertical mill with a capacity of 200t/h (OPC: 95% clinker, 5% gypsum according to Albanian and/or European norms @3600blaine) shall be installed. The cement mill package also includes all the necessary conveying, utilities, civil, electrical and control. Blended and slag cement would also be produced.
- 3.82 The cement grinding facility is de-dusted by bag filters.
- 3.83 Following grinding, the various cement types are stored in one of four air and water tight silos. Each silo will have a capacity of 6000t. Adequate de-dusting will be provided for the extraction and loading points of all silos. Each silo will be equipped with bulk loading facility and weighbridge for loading silo trucks. The bulk loading capacity will be 250tph.
- 3.84 Part of the production is sold in bulk, while the rest is packaged in 25kg and 50kg bags, palletized and then dispatched to the customer.
- 3.85 Cement packing includes:
- The implementation of one packing machine.
 - The implementation of one palletizer.
 - The necessary conveying, utilities, civil, electrical and control.
 - A 12-spout rotary packing machine with a capacity of 150 tph, fitted with electronic calibration devices for bag weight control, will be installed underneath the bagged cement silo.
- 3.86 The packing machine will feed the palletizer, via a conveyor belt. The palletizer will have a capacity of approximately 3000bags/hour for 50 kg bags and 4 000bags/hour for 25 kg bags. A stretch hood will be applied on top of each pallet.
- 3.87 Packing and palletizing requires the erection of a building and also the necessary extension of electrical cabinets and utilities.
- 3.88 The packing and palletizing machines will be delivered with their own control systems according to the machine manufacturer's standards. All other pieces of equipment will be delivered with electrical and control in accordance with state of the art specifications. All the equipment will allow production data logging. Necessary electrical cabinets and utilities will be included.
- 3.89 A summary of this stage of the process is illustrated below.

Figure 3.8 - Cement Grinding and Cement Dispatch (Bulk Loading and Packing)



Emissions Control and Abatement

Emissions to air of Particulate Matter and Dust

- 3.90 Equipment will be designed to avoid or eliminate any material spillage and all material transfer points shall be de-dusted. This includes where there will be tipping of raw materials into the crushing equipment. If necessary, this will be de-dusted using water sprays.
- 3.91 High efficiency bag filters will be used to de-dust the raw mill, pre-heater kiln and clinker cooler. The dust collected in the filter(s) will be re-circulated back into the production line. Electrostatic precipitators will not be used. The bag filters will be designed with an air to cloth ratio of not more than 1 m/min for operation with the raw mill. The bag filter fans will be operated so as to keep the suction after the ID fan constant. All bag filters will be designed to keep particulate emissions below 30 mg/Nm³, as per the industry standard.
- 3.92 The solid fuel mill system will include a high efficiency classifier and bag filter, all equipped with explosion relief devices. The pulverized fuel will be transported to silos, which will be de-dusted by bag filters.

Emissions to air of Oxides of Nitrogen (NO_x)

- 3.93 Antea are proposing the use of primary techniques to reduce NO_x levels to below the national Albanian limit of 800 mg/Nm³ and 600 mg/Nm³ in accordance with the IFC limit, when using coal as the main fuel. Sufficient space will be available for the installation of an secondary plant abatement (Selective Non-Catalytic Reduction) to cope with the higher NO_x emissions, should this be necessary at a later date.

Emissions to air of Sulphur Dioxide (SO₂)

- 3.94 SO₂ emissions from cement plants are primarily determined by the content of the volatile sulphur in the raw materials. Kilns that use raw materials with little or no volatile sulphur have SO₂ emission levels well below this level without using abatement techniques. This will be the case for the Antea cement facility since analysis has indicated that content of volatile sulphur in the raw materials is low.

Effluent and Surface Water Management

- 3.95 Due to the nature of the process, significant volumes of contaminated industrial liquid effluent will not be an issue. Occasional effluents may arise during routine maintenance. These will be stored separately and removed from site by an appropriate waste contractor to an appropriate waste management facility.
- 3.96 The most likely source of effluent is as a result of washing down of surfaces which can produce an alkali effluent that may be harmful if released directly into surface water. Design information indicates that all surface water which may contain harmful materials will be directed to drainage basins for sediment to settle before being released to the local surface water. The drainage basins will be designed to accommodate appropriate storm conditions and likely surface water run off volumes. The drainage basins will release clear water into the local surface water drainage regime.
- 3.97 The operator has indicated that the design will include means to control highly contaminating liquids (such as in the case of a liquid fuel leak). These will be contained in the process area before being cleaned up and disposed of appropriately.
- 3.98 Due to the presence of a considerable number of construction and operational management staff that will be situated at the site, appropriate waste water management facilities will need to be provided. Since, the area where the plant will be situated will not be connected to a public drainage system, it will be necessary to construct a domestic wastewater management and treatment plant. The design of these facilities is presently being undertaken by the main contractor.
- 3.99 The contractors have estimated that the domestic sewage requirement will be 135 m³/d. This requirement comes from washdown water, laboratory test waste and domestic water use. All effluent will be biochemically. The treated effluent will be sent to a 80 m³ balancing tank before being released, possibly to a local water course.

- 3.100 It has been proposed that the treatment will be in line with the requirements of Integrated wastewater discharge standard GB8978—1996. Details of the design, operation, performance and impact will be submitted as part of the management programme.

Noise Emissions

- 3.101 Noise emissions from the plant are not expected to be a significant issue; the full details of the noise impact and reduction measures have not been included in this chapter but are included in Sections 6,7 and 8. Noise reduction (e.g. silencers) will be installed where necessary and have been included in the vendor contracts. Crushing equipment will be installed within concrete buildings in order to reduce the noise impact.

Waste Emissions

- 3.102 During construction, it is anticipated that solid domestic waste will be handled by the local municipalities, upon agreement.
- 3.103 Hazardous waste, mainly incidental plant maintenance waste, during construction will be managed by a certified contractor from a neighbouring country in the absence of local facilities.
- 3.104 During operation, all waste will be disposed of by licensed waste contractors with the exception of waste refractories and dust from bag filters which will be recycled. These will be collected, crushed (where necessary) and fed back into the process.
- 3.105 Chapter 7 discusses the volumes of waste that are likely to be generated and the potential environmental impacts of waste disposal.
- 3.106 At the time of writing, a waste contractor(s) to dispose of waste produced during operation had not been chosen. A waste management plan will be written and contractors assigned, prior to commissioning.

Ancillary Plant and Services

Monitoring Equipment

- 3.107 All monitoring of the installation operations will be undertaken from a central control building. This includes the use of thermocouples, cameras and on-line analysers to ensure that the process is operating within the appropriate parameters.

- 3.108 The fan outlet will be ducted to a steel stack, which is to be equipped with a dust emission monitoring device, complete with access and platform. The location of the dust emission monitor will comply with environmental regulations to ensure accuracy in the measurements.
- 3.109 A gas analyzer will be installed that will measure O₂, NO_x, SO_x and CO. A review of the emissions from the installation is presented in Chapter 7 of this report.

Services Engineering

- 3.110 Engineering services are presently being finalized but will comply with the company's own internal standards as well as international standards. The engineering services programme includes:
- General plant layout
 - All arrangement drawings for the installation
 - Flow sheets and P&I diagrams
 - Detailed general arrangement drawings
 - Arrangement drawings for each equipment
 - All load data
 - All civil guide drawings
 - All concrete and structural steel construction drawings
 - Fabrication/workshop drawings for all supplied/constructed items
 - Complete cable engineering (list, sizing, routing, lay-out)
 - Complete power (MV, LV) distribution and protections
 - Earthing, lighting and lightning protections
 - Complete plant automation and operation software.
 - Complete engineering for utilities e.g. power, water and compressed air within the battery limits.
 - Architectural treatment of all construction.

Inertisation

- 3.111 A CO₂ inerting plant will ensure adequate supply of CO₂ to the entire solid fuel grinding facility. Gas analysers will continuously monitor O₂ and CO concentration at various points of the mill system and a continuous dust emission monitoring device will be installed at the stack.

Back-up fuel supply

- 3.112 Heavy fuel-oil (HFO) will be used as back-up fuel for emergency power generation and all the necessary equipment for fuel-oil feeding of the power generators will be included. In addition, HFO will be used as a start-up fuel whenever the kiln restarts.

Civil Engineering

- 3.113 The civil works of the Project will comply with the Albanian National Building Code.
- Establishment of the civil and structural design, analysis and execution documents and drawings for all production/process buildings and facilities.
 - Engineering and construction of all foundations below ground level.
 - Engineering and construction of all civil works for all buildings and support structures and facilities below and above ground, including concrete and structural steel works.
- 3.114 The civil and structural design, analysis, execution documents and drawings for the following infrastructures works, will be established, as well as execution of all civil works:
- roads, access for maintenance, general paving
 - drainage runoff from the plant site area
 - sewage systems
 - storm water drainage
 - area lighting
 - fire water loop
 - industrial water
 - fence systems
 - utilities on the site

Electrical Supplies

- 3.115 The electrical supply specifications are being finalized at the time of writing. The main specification set for all suppliers and contractors is that the supply and services will meet international quality standards. The specifications are not binding to any specific manufacturers.

- 3.116 As far as concerning the annual electrical energy consumption it is expected to be 145GWh. The installation will be connected to a 220kV line of the Albanian high voltage national grid. The power requirement of the new plant is estimated to be approximately 30 MW. A substation owned by the plant will transform the high voltage to the medium voltage level for the internal power distribution. It is noted that the facility will be provided with a dedicated 6.3kVA power supply.
- 3.117 Discussions between the operator and the power supplier have indicated that there are presently no concerns about disruptions to the local power supply as a result of the demand caused by the cement plant. Energy will be imported via the existing European 220 kVA grid and also a new line running through northern Albania.
- 3.118 A key objective of the design is to maximise energy efficiency of the equipment considered and as a result the developer has indicated that only highly efficient equipment will be used.
- 3.119 For optimizing the energy performance of the plant, expert systems will be employed for controlling and adjusting the operational parameters of the rotary kiln, raw mill and cement mill. Additionally a modern quality control system will ensure stable chemical properties of intermediate and final products ensuring smooth and efficient operation of the energy consuming equipment.

Management Techniques

- 3.120 The process will be operated by a highly qualified and training management team according to the requirements of a certified environmental standard (ISO14001).
- 3.121 In order to prevent accidental releases, the mechanical equipment will have a high reliability and ease of maintenance to achieve a long economical life cycle. All major plant will be incorporated into a routine maintenance programme. This will be facilitated by external contractors as well as the onsite maintenance engineers.
- 3.122 The project will include a staff training program to assure a well functioning plant from the commissioning onwards.
- 3.123 Equipment and workshops will be equipped with appropriate safety notices to ensure that the staff and visitors are aware of the environmental and health and safety issues that are pertinent to the area they are within.
- 3.124 During initial start up, all key staff will be experienced in quarrying techniques and the manufacture of cement using similar plant. The company will where possible employ local people. It is intended that the role of people sourced from the surrounding

areas will increase over time as young people with the appropriate skills are recruited into the business through a training programme.

- 3.125 The operator's key experience is in operating cement production plant and therefore emergency scenarios are well known and appropriate systems will be in place. The sensitivity of the receiving environment in respect to potential emergency scenarios and the management structures to respond to the potential scenarios will be partly informed by the ESIA process.
- 3.126 Chapter 4 of this report includes a BAT assessment of the environmental management techniques that have been proposed by Antea for the installation.

4. BEST AVAILABLE TECHNIQUES (BAT) ASSESSMENT

INTRODUCTION

- 4.1 The concept of ‘best available techniques’ or BAT is a widely adopted benchmark for plant design and performance in many areas of the world. It is particularly useful when evaluating the environmental impact of heavy industrial processes such as cement manufacture and has been used as the basis of the process appraisal for this project. BAT as described by the EU includes consideration of the latest engineering designs, emission standards and management techniques.
- 4.2 The term “best available techniques” is defined in Article 2(11) of the Integrated Pollution Prevention and Control (96/61/EC). The articles states BAT as:
- “the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.”
- 4.3 Further, in breaking down each element of the phrase, the following definitions have been stated in the directive:
- “best” means most effective in achieving a high general level of protection of the environment as a whole;
 - “available” techniques are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;
 - “techniques” includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

- 4.4 Annex IV of the Directive contains a list of “considerations to be taken into account generally or in specific cases when determining best available techniques ... bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention”. These considerations include the information published by the Commission pursuant to Article 16(2).

LAYOUT AND SCOPE OF THE ASSESSMENT

- 4.5 This section of the Environmental Statement describes BAT for cement manufacture as set out by EU guidance. The plant design proposed by Antea has then been compared with this EU benchmark.
- 4.6 At the end of each section of this assessment there are BAT summary tables for both cement plant and quarry.
- 4.7 For the purpose of this assessment the quarry operations and plant operations have been separated. There is presently no information available concerning the details of the building techniques of the cement plant. Therefore, this has not been included within the scope of this assessment. The cement plant design, maintenance and operation are the main focus of this assessment rather than the quarry operations for the following reasons:
- The main purpose of this ESIA is to assess the impact of the cement plant, the quarries are the secondary focus;
 - The cement plant has an established and well defined BAT;
 - The issues arising from the cement plant are more complex than the quarry.
- 4.8 For ease of reference, the assessment of the cement plant is divided into process stages, in order to reflect the layout of the BREF and other documentation. Similarly, the quarry assessment is broken down into environmental issue (noise, air, water etc) in order to reflect the layout of the guidance appertaining to quarry operations and management.
- 4.9 The decommissioning aspects of this installation have not been addressed in depth because there are not expected to be any significant issues. Issues associated with plant design to ensure ease of decommissioning have therefore been screened out of this assessment. An assessment of the potential impacts of decommissioning has been undertaken in Chapter 8.

- 4.10 As discussed in Chapter 1 of this Statement, the supporting infrastructure (including electrical connections, roads and ports) is considered to be outside the scope of the current ESIA.
- 4.11 This assessment does not specifically include a review of health and safety issues. However, discussion with the operator indicates that they are acutely aware of health and safety issues and have a good health and safety record. The aspects of maintenance, safety and environment, i.e. hoists where needed, noise reduction (e.g. silencers) where necessary, drive guards and all other devices contributing to this topic, will be incorporated.

DEFINITION OF BAT

- 4.12 The key guidance's upon which the BAT assessment for the cement plant has been based are as follows:
- European Commission Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries. December 2001.
 - Environment Agency Sector Guidance Note IPPC S3.01 Guidance on Cement and Lime Sector. April 2001.
 - IFC Environmental, Health, and Safety Guidelines for Cement and Lime Manufacturing, April 2007.
- 4.13 The most detailed of these documents is the EU BAT Reference (BREF) document for Cement and Lime Manufacturing Industries. The BREF covers the following aspects of the cement production process:
- Raw materials storage and preparation.
 - Fuels storage and preparation.
 - Kiln systems.
 - Products preparation and storage.
 - Packing and dispatch.
- 4.14 The BREF document is dated 2001 and an update was originally timetabled for 2005. No update has been published at the time of writing, although there is evidence that the European Environment Agency is engaged in correspondence with the industry to produce a revised version sometime in the future. A recent communiqué (June 2007) has been produced by The European Cement Association concerning NOx control

and release concentrations that could be considered as a revision to BAT. This is discussed further in the appropriate section below.

- 4.15 The UK Environment Agency (EA) guidance has also been produced in response to the requirements of IPPC. It has been used for the purposes of this assessment, to provide BAT guidance on the wider aspects of the installation such as decommissioning, where they are not detailed in the BREF.
- 4.16 The World Bank guidelines for the cement industry published in the IFC's EHS Guidelines. These supersed the guidelines previously published by the World Bank encompassed in the Pollution Prevention and Abatement Handbook (1997), although benchmarks remain the same as the 1997 guidelines. The main differences between the EHS Guidelines and BREF Notes are that the EHS Guidelines are not as prescriptive as the BREF notes and the requirements for emission limits are not as stringent as the BREF. The EHS Guidelines state that a limit of NO_x of 600 mg/Nm³ is considered an appropriate release concentration compared with 200-500 mg/Nm³ as detailed in the BREF.
- 4.17 With regards to quarry design and operations there are no specific EU, EA or IFC guidance notes. Therefore, the quarry BAT assessment has been drawn from the following documents:
- Good Environmental Practice In The European Extractive Industry: A Reference Guide (Brodkom) Centre Terre Et Pierre – Belgium. A Study For Cembureau, Cerame-Unie, Eula, Eurogypsum, Euro-Roc, Ima-Europe, Uepg, With The Support Of The Enterprise Directorate General Of The European Commission. 2000
 - Process Guidance Note 3/8 (04) UK Secretary of State's Guidance for Quarry Processes. Environment Agency's Local Authority Unit. June 2004
 - Environmental Management Guidelines: Environmental Management in the Extractive Industry. Environmental Protection Agency (Ireland) 2006.
 - Minerals Planning Guidance 11: The control of noise at surface mineral workings. Department for Communities and Local Government. May 2006.

BAT ASSESSMENT: CEMENT PRODUCTION

Table 4.1 - BAT Assessment: Main Plant and Process

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Materials Selection	Raw materials are suitable for purpose and do lead to unnecessarily high emission levels. In particular this should ensure appropriate controls of SO ₂ from the process.	Full compliance	Detailed assessment of the raw materials sources has been made. Variations in raw material quality will be minimised by sourcing materials across the quarries. The raw materials will not lead to high levels of SO ₂ .
Raw and solid fuel storage and handling	Raw materials and solid fuels should be stored and handled so as to prevent emissions to the environment. Fuel silos have to be of the mass flow extraction type and have to be equipped with explosion/fire prevention and standard safety devices (explosion relief, control air temperatures, prevention of accumulation of fine material in dead spots exposed to heat).	Full compliance	All main storage of raw solid fuel will take place in fully closed storage sheds. All storage of pulverized fuel will take place in fully contained silos. The appropriate silos will be used. Appropriate measures to prevent fire explosion/fire and safety (explosion relief) devices will be in place.
Raw material preparation	Methods are in place to ensure that the raw material fed to a kiln system is as chemically homogeneous as practicable, methods include: • Pre-blending • Grinding • Monitoring of particle size • Metering of feed materials	Full compliance	Full range of operations and equipment will be in place to ensure the accurate preparation of raw materials for feeding in to the process.

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Fuel (coal or petcoke) use and preparation	Fuel of consistent ash (silica and alumina) content. Reliable fuel metering and presentation allowing easy and complete combustion (allows control of oxygen levels, minimises heat losses). Presentation of fuel in appropriate (easily combustible) form.	Full compliance	Fuel from a well known source will be used and regularly tested to ensure that the specification is appropriate. On site all appropriate operations and equipment are included in the design to ensure that the process is BAT.
Kiln Line	Five cyclone preheater stages and precalciner with a heat balance value of 3000 MJ/tonne of clinker. Kiln charge temperatures of between 1400 to 1500 °C and gas temperatures of about 2000 °C.	Full Compliance	The design is standard BAT design for dry processes.
Clinker Cooler and Storage	Recover as much heat as possible to return it to the process Reduce the clinker temperature to a level suitable for the equipment downstream as quickly as possible. Storage methods should prevent dust formation.	Full compliance	Design incorporates heat exchanger to return heat to the system. Air blowers ensure that the appropriate temperature is achieved. The rapid cooling fixes the mineralogical composition of the clinker to improve the grindability and optimise cement reactivity. Clinker will be stored in silos.
Cement Milling and Storage	Accurate and reliable metering and proportioning of the mill feed components by weight. The most appropriate grinding system is used for the job with air separator. Storage methods should prevent dust formation	Full compliance	Design all necessary measures to ensure appropriate conveyance and metering of the cement to ensure accurate milling. A vertical roller mill will be used in order to provide a higher drying capacity. Cement will be stored in silos.
Packing and Dispatch	Packing and dispatch should be undertaken so as to prevent dust formation	Full compliance	The system incorporates direct feed to bulk transporters. Bagging is undertaken in an enclosed environment.

Table 4.2 - BAT Assessment: Ancillary Plant and Equipment Process

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Monitoring	Continuous monitoring would be expected where the releases are significant and where it is needed to maintain good control.	Full compliance	Main dust filters will be equipped with a dust emission monitoring device. The main kiln line stack will have continuous monitoring of O₂, NO_x, SO_x and CO.
Energy Supply Techniques	Energy is from a secure source and that where necessary back up arrangements are made.	Full compliance	The coal supply will be secure and is considered the best and established source of energy for this type of plant. The supply of electrical power will be reasonably secure using imported electricity through the national transmission network as well as a new power line. Back-up diesel generators will be used to ensure appropriate control in event of a power failure.
Energy Efficiency	Use of most energy efficient process for cement production - dry with multistage preheating and pre-calcination is BAT. Optimisation of process using appropriate control techniques (use of expert control systems etc). Use of Blended Cements: Reducing the clinker content in cement products reduces energy use per unit mass of cement product. Use of Appropriate Power Management Systems and Energy Efficient Equipment.	Present information indicates compliance	The process is dry with multistage preheating and precalcining. Information indicates that a core requirement of the design is optimisation of processes using expert control systems and maximisation of heat recovery at all opportunities. The cement will be blended at 78% clinker for the first three years, after which it will be blended at 68% clinker. Core design of the process is the use of appropriate power systems to maximise energy efficiency (soft starter motors and variable speed drives where appropriate).

	Heat recovery from exhaust gases: utilization of waste heat for drying of raw material, coal or intergrinding matter. Consideration of use of exhaust gases to generate electricity.		Where appropriate exhaust gases will be recovered for reuse in the process. This is a key element of the design protocol. The operator has considered the recovery of heat from exhaust gases for generation of electricity. Present information indicates that this may not be economically viable. The operator has committed to undertake further assessments when the plant is operational to ensure that heat recovery for power generation or for use for any other means is not viable.

Table 4.3 - BAT Assessment: Emissions Control and Abatement

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Control of dust emissions	Fabric filters should be used for new plant in all necessary areas. The design should include: Multiple compartments, in case of bag failure. Bag burst detectors Explosion venting (to protect filter system) in pulverised fuel systems where fire detection and automatic suppression are also necessary.	Full compliance	Only bag filters will be used, no electrostatic precipitators. The filters will be used in all key areas as well as when ever there are process drops. The design will be multiple compartment and will include burst detectors and explosion venting where necessary.
Control of oxides of nitrogen – primary measures	Use of low NO_x kiln technology – providing NO_x reducing zones in the lower section of a pre-calciner chamber - excess CO is oxidised in the upper sections of calciner chambers Measures to ensure careful kiln control by minimising oxygen (reduces NO_x emissions) – has to be balances against increases in CO and SO₂ at lower oxygen levels Grinding of solid fuels to a fine to ensure that there are no hotspots – reduced thermal NO_x evolution. Low NOX (or low primary air) burners – reduces localised hot spots by the use of induced gas swirl and low primary air rates.	Full compliance	The kiln is low NO_x technology. The design includes state of the art expert process control which will minimise emissions of NO_x to levels below the Albanian statutory limits (800 mg/m³) and the IFC EHS Guidelines of 600 mg/m³. Solid fuels will be ground using a suitable system. Low NO_x burners will be included in the design.

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Control of oxides of nitrogen – secondary measures	Selective non catalytic reduction (SNCR) - Injection of NH_2 -X compounds into kiln systems reduces NO_x formation by chemically reducing it to nitrogen and water.	Not Compliant (in terms of strict compliance with the terms indicated in the BREF.	Although, the use of secondary measures will not be implemented, the operations will comply with the in country limit of 800 mg/m^3 and the IFC benchmark of 600 mg/m^3 . Therefore, by the use of primary measures, the operators propose to deliver the appropriate emissions limits. The operator does not propose to comply with the lower BREF benchmark of 500 mg/m^3 . Therefore, the design will not be compliant with the BAT in this respect. See the Discussion at the end of this chapter and Chapter 7 Air Emissions.
Control of sulphur dioxide.	Sulphur dioxide emissions should be below benchmark levels	Full compliance	Low sulphur content of the raw materials will ensure compliance.
Control of surface water emissions.	Measures should be implemented to minimise contamination risk of process or surface water.	Full compliance as far is known.	Proposed design indicates that all hazardous materials (e.g. back up fuel and chemicals associated with maintenance will be stored in bunded areas). The full details of the drainage system are not yet known. It is not clear whether adequate controls on drainage to prevent release of suspended solids. However, present indications are that the operator is aware of such issues and they will be included within the later stages of the design process. The operator is presently proposing to use an effluent treatment system to treat mainly domestic effluent and washdown water. Information presented by the main contractor indicates that the appropriate measures will be put in place to prevent significant impact of receiving water ways. As part of the management programme the

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
			operator is required to submit the details of the design and management techniques to treat the effluent. An assessment of impact on the receiving water way of the final discharge (if applicable) is also required.
Control of fugitive emissions to air	Key BAT requirements to prevent fugitive emissions to air: Covering of vessels; Use of sprays, binders, stockpile management techniques, windbreaks etc for uncovered stockpiles; Wheel and road cleaning (avoiding transfer of pollution to water and wind blow); Closed conveyors, pneumatic conveying (noting the higher energy needs), minimising drops; Ventilation and collection in suitable abatement equipment; Closed storage with automatic handling system.	Full compliance	Information available from the design and review of existing facilities operated by the company (Thessaloniki, Kamari) indicates that dust fugitive dust emissions are not a problem and that appropriate techniques will be incorporated.

Table 4.4 - BAT Assessment: Management Techniques

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Core management systems	An appropriate system of environmental management should be in place to ensure control of the operations. The BAT is for the system to be based along the lines of ISO14001, EMAS or similar.	Full compliance	The plant will operate under a system based on ISO14001.
Maintenance	Systems should be in place to ensure that the installation functions as intended; to detect faults and unintended operations; to detect slow changes in plant performance to trigger preventative maintenance.	Full compliance	The management system will include a full maintenance programme with scheduled shut downs for major overhaul. Maintenance will be conducted by permanent engineering staff as well as plant and equipment suppliers and independent contractors.
Waste Management	Maximisation of recycling and ensure the best practicable environmental options for waste disposal.	Full compliance	Waste raw materials and product captures in abatement devices will be recycled. This constitutes the majority of the plant waste. Other wastes will be dealt with by suitable contractors.
Water Management	Water-efficient techniques should be used at source where possible, including: - Water should be recycled within the process from which it issues, by treating it first if necessary. - Where this is not practicable, it should be recycled to another part of the process which has a lower water quality requirement.	Full compliance	Where possible water will be recycled within system. Due to the location the water sources are limited to use of groundwater only.
Emergency Control	BAT is to prevent and manage the occurrence of following issues typical for this industry: Releases during substance transfer and vessel overfilling;	Full Compliance	Available information indicates that these measures are being taken into account in the design and proposed management of the installation including security – the site will be surrounded by high security fencing.

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
	• Failure of plant and/or equipment; • Unplanned shutdowns • Mechanical Failures • Failure of containment; • Process control failures; • Ring falls (gypsum, clinker and ash) ; • Process blockages; • Unwanted reactions – e.g. wrong materials entering the pre-heater or kiln; • Vandalism/Site Security.		Review of other installation indicates that the management are full aware of the potential emergency scenarios and have robust systems in place to prevent issues arising and control the impacts when they do.

BAT ASSESSMENT: QUARRY OPERATIONS

Main Plant and Processes

Table 4.5 - Quarry Operations: BAT Assessment Summary:

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
Noise and Vibration	Methods should be employed to reduce noise and vibration during blasting. Screening mounds, low-noise starters.	Full compliance	It is intended that only the limestone quarry will operate using blasting. Blasting will be undertaken in compliance with German Norms [DIN 4150], American (USA) Regulations by USBM (1980) & OSMRE (1983) Swedish Regulations [SS460]. See Chapter 3 Quarry Operations for full details of sequential blasting techniques to minimise noise and vibration issues. Working hours will be limited to one day shift, therefore there will be no noise/vibration outside daylight hours. It is expected that screening mounds will be used. No crushing undertaken within quarry areas.
Air Quality	No dust emissions should arise from the following activities: - loading and unloading - on-site transfer of materials, including conveying - stockpiles - roadways, including haulage roads	Full compliance	Information presented in the design, the EIA for the quarries and visits of quarries presently managed by Titan, indicate that dust emissions are not a significant problem. There will be no crushing activities at site, so there will be no transfer of fine materials from the site.
Visual Impact	Measures should be in place to ensure appropriate screening of the quarry.	Partial compliance	Screening will be used. However, due to the location it will be very difficult to fully screen the

Design Issue/Stage	Indicative BAT	Level of Compliance	Comments
			development. Trees and plants will be used to minimise the visual impact as far as possible.
Surface water management	Measures should be in place to ensure that the management of the quarry takes into account the surface water run off regime and that no hazardous substances will be released into the surface water.	Full compliance	Information gain from other sites managed by Titan indicates that this will not be a significant issue.
Traffic	Processing sites should be situated as close as possible to quarry sites. Transport of quarried materials should involve minimum disruption to other traffic.	Full compliance	The location of the quarries and cement plant has been optimised to ensure minimum disruption. The route of the road transporting flysch to the cement plant will provide minimal disruption. The route is presently little used.
Waste Management, soils and overburden	Quarry waste and over burden should be effectively used to minimise quarry impacts.	Full compliance	As part of the planning process the measures to manage this element have been published and accepted.

DISCUSSION

- 4.18 The BAT assessment indicates that the installation generally complies with the requirements of BAT in all aspects of the proposed design for both cement plant and quarry.
- 4.19 The design achieves the proposed IFC benchmark NO_x emission concentration of 600 mg/m³ as a daily average. This design guarantee emission limit also ensures compliance with the Albanian national limit of 800 mg/Nm³ (daily average).
- 4.20 The main difference between the proposed design and the prescriptive BAT is the decision of the developer not to incorporate abatement for the reduction of NO_x. The NO_x emissions benchmark values stated in the BREF of 200 - 500 mg/Nm³ are achievable by dry “pre-heater” and “precalciner” kilns by a combination of primary measures, staged combustion and selective non-catalytic reduction (SNCR). SNCR has been omitted from the initial design by Antea but sufficient land has been made available should this technology be required in the future.
- 4.21 The discussion of whether 200-500 mg/Nm³ is an appropriate benchmark is not clear cut. In the discussions of what are appropriate BAT for emissions of NO_x from cement plants there was an opposing view in the EU BAT working group that the BAT emission level associated with the use of these techniques is 500-800 mg NO_x/Nm³ (as NO₂).
- 4.22 A recent communiqué produced by The European Cement Association (June 2007) for the revised edition of the BREF has reiterated their opinion of BAT for the cement industry. The communiqué details the measures to control NO_x as:
- Primary measures to control NO_x emissions
 - Flame cooling
 - Low-NO_x burner
 - Staged combustion
 - Selective non-catalytic reduction (SNCR)
- 4.23 The document indicates that a NO_x emission of 350 – 800 mg/Nm³ would be appropriate using the established primary and secondary techniques.
- 4.24 The operator has conducted an assessment of the cost to the project of the implementation of secondary controls. SNCR will have an initial build cost of approximately € 1M and will have an operating cost of €0.5 to 1.0 per ton of clinker.

- 4.25 The results of the air emissions modelling (Chapter 7) indicate that emissions released at a concentration of 600 mg/Nm³ are not likely to lead to ground level concentrations that will have a detrimental effect on human health through exposure. The assessment has taken into consideration the likely background concentrations of pollutants including the potential for combined impact of the proposed cement plant and the present cement plant situated in Kruja.
- 4.26 Consideration of the cost of the installation and operation of SNCR are not justified in terms of reducing the environmental impact of the proposed installation. The extra cost associated with the installation of SNCR does not seem to be proportionate to the benefits (reduced emissions) according to the presently available information.
- 4.27 In respect to potential future increases in emissions from the installation as a result of variations to the process operations (E.g. through the use of other fuels such as petcoke), the installation has been designed so as to allow the retrofitting of secondary abatement at a later date.
- 4.28 The other available technology is Selective Catalytic Reduction (SCR). Antea have investigated the potential to incorporate this technology but have concluded that it is presently not a fully tried and tested abatement measure. They have therefore discounted it as a design option. We agree with this conclusion.

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

OVERVIEW

- 5.1 The proposed location of the quarries and cement production facility is rural in character. There are a number of small residential communities within 10km of the sites, including the large communities of Burizana and Picrraga.
- 5.2 Vehicular access to Burizana is via a small road that winds through the town, past a local school. At present this route is used by a local quarry. This road leads to a rough track which has been opened up to gain access to the proposed limestone quarry area and cement plant. The approach to this area is through a valley bordered by steep mountains across rough ground.
- 5.3 The area of the proposed facility is open scrub land that is used partly for grazing, hunting and as a source of wood for fuel. This wood is also used as a fuel for burning limestone to produce material for whitewashing. Limestone burning is undertaken in dedicated pits which scatter the upland areas of this region. The result, as illustrated in the site pictures, is an area denuded of vegetation other than low lying scrub.
- 5.4 No protected zones have been identified in the vicinity of the proposed plant and the locations to be developed are not considered to be of exceptional ecological value, with habitats of similar composition and quality being found in the surrounding area. Indeed, the area within which the plant is located has been designated as an area for industrial development by the municipal authorities due to the long term impact of local lime burners.
- 5.5 Despite the designation as an industrial area there are no existing facilities in the immediate vicinity of the proposed plant. There is however another, large cement plant and large limestone quarry approximately 6 km to the south, of the proposed plant, near the historic city of Kruja. The cement plant is situated on the plain and is of a similar scale to the plant proposed by Antea. The cement plant is not situated near the quarry but instead a few kilometres away from it. The entrance to the quarry is adjacent to the one of the main approach roads to Kruja. The plant is situated on the plain below Kruja and is visible for many kilometres in all nearly all directions.

- 5.6 A small limestone quarry operates to the east of the town of Burizana. This is owned by a local family and is used to supply local needs. It is expected that the operation of this quarry will be unaffected by the proposed Antea facility.

SOCIO-ECONOMIC AND CULTURAL ISSUES

Introduction

- 5.7 The proposed cement plant, associated quarries and road construction are located in the are of the villages of Picrraga and Brett which belong to Kruja Municipality and Burizana and Thumana villages which are part of Koder Thumaya Commune.
- 5.8 The proposed cement plant and associated quarries are approximately 1.0–2.5 km away from Brett, 2.5-4.5 km from Picrraga, 5.5-8.5 km away from Burizana and 2.5-4.5 from Thumana village.
- 5.9 This section presents baseline information on the socio economic environment of Brett, Picrraga, Thumaya and Burizana. Information is provided on the population, the local economy, land ownership, education, health and local infrastructure. A description of data collection activities undertaken to collect this information and for the impact assessment is provided in Appendix 2.6.

Population, demographics and family structure

- 5.10 The project area has a population of some 7,465 inhabitants, or 1,409 households with household sizes of 5 and 6 people. Approximately 9 percent of the project area population live in Picrraga and Brett while the remaining 91 percent live in Thumaya and Burizana (Table 5.1).

Table 5.1 - Project Population by Village

Item	Picrraga	Brett	Thumaya	Burizana
Number of households	74	35	500	800
Population*	453	212	2,600	4,200

Source of information: individual interviews with village heads, May 2007 and

*Instat office in Kruja; population in December 31, 2005

- 5.11 These villages have similar demographic characteristics to those found throughout the rural area in Kruja district. The population has a high proportion of young people under 15 (30-40%) and a small proportion of people over 65 years (10-15%). The working age population accounts for 45%-60% of the population. Interviews with the village representatives and case studies of household livelihoods in the villages

suggest that approximately 25% of the working age population is involved in seasonal or long term migration for work. This is summarised in the table below.

Table 5.2 - Kruja District Population Structure

Household structure	%
Children < 15 years	35
Adults (16-64years)	55
Adults > 64 years	10

5.12 The villages of Picrraga, Brett, Thumaya and Burizana each have several neighbourhoods. These neighbourhoods are defined by the predominant “fis” (clan)⁶, although neighbourhoods are not exclusive to one particular fis. The members of the fis communally share their pastoral lands. These are almost always located near to the homes of the clan and its surrounding areas.

5.13 The household normally consists of the father, mother, son or sons and their wives and children and any unmarried daughters. On marriage, daughters normally move to live with the husband’s family.

Economic Activity

Land Ownership

5.14 Under Law 7501, (1991) land belonging to the former socialist agriculture cooperatives was redistributed to local inhabitants of the villages. The land includes arable land, fruit orchards, and barren unproductive land mainly used for pasture and the provision of wood for heating and cooking. This is summarised in the table below.

Table 5.3 - Land Ownership

	Picrraga	Brett	Thumaya	Burizana
Households owning agriculture land	100%	100%	100%	70%
Households with user rights only	-	-	-	30%.
Average farm per household (in ha)	1.2-14	1.5-20	1.0-1.2	1.0-1.2
Average arable land per farm (in ha)	0.2-0.4	0.4-0.6	0.5-0.6	0.5-0.6
Average areas with olive trees per farm (in ha)	0.2	0.2-0.3	NA	NA
Small ruminants head /(large flocks)	2540 (8)	600 (3)	NA	NA

Source of information: individual interviews with village heads, May 2007

NA - not available.

⁶ clan members are linked by a common patriarchal ancestor

- 5.15 Antea has completed an agreement with the Albanian government in which all of the land to be used for the quarries and cement works has been leased from the State (see Chapter 7).
- 5.16 A small amount of private land in Thumaya village (0.6ha) is to be purchased by Antea from households for a new access road to the cement plant and quarries. Other land (mainly rural pasture and forest lands) to be used in widening the road belongs to the Commune. This is discussed further in Chapter 7
- 5.17 In Thumaya and Burizana, the market price for land in urban areas is ALL (Albanian Leke) 5500/m² (or €45/m²) meanwhile agriculture land has a price ALL1500–3200/m² (or €12-26/ m²). In Picrraga and Brett land prices vary from ALL1200 to 2000/m² (equivalent to 9.7 –16.3 Euro per m²) according to purpose, land quality, natural resource content, proximity to a road and irrigation availability.
- 5.18 In the hill villages of Brett and Picrraga, farms are disadvantaged by the slope and poor quality of their fragmented plots. There is a shortage of better quality land. A typical holding has a mix of enterprises: livestock, field crop production and vegetable production, a large part of which is for home consumption. The crop rotations include a fodder crop, followed by potato production and vegetables.
- 5.19 Thumaya and Burizana are at lower levels and on the plains. Arable land covers almost 55 percent of agriculture land and 2/3 of this land is under irrigation. Vineyards and tree plantations, mostly with olive trees and plums, make up about 10-15 percent of agricultural land.
- 5.20 Livestock are an important part of the farming system. A household typically owns 1-2 cows and 3-4 small ruminants (sheep and goats), 10-15 hens and a number of beehives. Women typically tend the family livestock, although men are responsible for larger flocks or herds.
- 5.21 In Picrraga there are 2,540 small ruminants belonging mainly to 8 households and in Brett 600 small ruminants belonging mainly to 3 households. Large flocks/herds range from 80 to 160 head of animals.
- 5.22 In Picrraga livestock are pastured in two areas (see Appendix 2.2). The second area overlaps with a part of the proposed project site. In Brett, the flysch quarry area is the most accessible grazing site for the village.

Rural Livelihoods

- 5.23 Picrraga and Brett are considered by local officials as the poorest areas of Kruja municipality. The poverty is related to the level of subsistence agriculture, farm size, low livestock numbers and low returns from off-farm employment (no formal statistics are available at the village level). Farm production is primarily for household subsistence and household livelihoods rely on a variety of alternative and complimentary sources of income including:
- a) Herb collection.
 - b) Lime production and processing activities including the collection of wood, limestone cutting, and lime burning (it is noted that this activity is illegal under Albanian law).
 - c) Long term and seasonal emigration for work.
 - d) Limited local paid employment.
 - e) Grazing herds and flocks of small ruminants.
- 5.24 In Thumaya and Burizana, easier access to the road network and a larger population provide better market opportunities. This as well as the better quality arable land and orchards provide better returns from agriculture.
- 5.25 This is illustrated in Table 5.4 showing village dependence on off-farm activities.

Table 5.4 - Information about Economic Activities by Village

	Picrraga	Brett	Thumaya	Burizana
Total number of households	74	35	500	800
Share of households with agriculture and livestock activity	100%	100%	100%	100%
Number of households whose employment is linked with lime producing activities	29	5-15	-	50
Number of households that collect medicinal and aromatic herbs	52	>25	-	120
Number long term and seasonal migrants	67	25	100	800
Number of households employed in shoe factory, cement factory, Antea project*, construction.	60	27	55	40

Source of information: individual interviews with village heads, May 2007 verified by household case studies and interviews in July 2007

* temporary employment with Antea, during primary raw materials exploring and evaluation phase.

Herb Collection

- 5.26 The collection of medicinal and aromatic herbs is an activity undertaken in particular in Picrraga. It is organised on a family basis. Approximately 70% of households in Picrraga gain annual returns that range from ALL 10,000 to 450,000 (€ 80-3,650)⁷. The collection of herbs is mainly undertaken by women, retired people or children often whilst herding animals. Prices and aromatic herb requirements are agreed in advance with a private entrepreneur settled in Lac town. This individual organises the collection (2 or 3 times a year) and processing of the medicinal and aromatic herbs.
- 5.27 In both Brett and in Picrraga herbs (mainly Sage) are gathered. The main areas are identified in Appendices 2.3 and 2.4). In Picrraga the principal area is away from the project area, although the secondary area borders the project area. In Brett, the quarry area is the main area for the collection of Sage. The secondary area surrounds the village and a number of herbs are gathered here. In both villages the secondary sites, are used by the larger herb collectors, who pick in this area whilst the primary area is left for a 3 week period to allow herbs to recover and produce new growth.
- 5.28 Sage is the herb most collected by both villages. However other herbs “bee herb”, and “snake herb” are also collected. The price trend for sage has been to decrease with time. The prices paid for sage over the last 4 years are shown in Table 5.5.

Table 5.5 - Prices Paid to Gatherers of Sage (in ALL)

	2004	2005	2006	2007
Dried Sage price/ kg	120	110	100	90-100

Source: Interviews with herb gatherers, Brett and Picrraga, July 2007.

- 5.29 For households without an able adult male member, or where the household is elderly and have no sons, herb gathering can be the main source of cash income. In Picrraga, interviews with the community representative and with individual households identified 7 households considered as vulnerable for one of the reasons mentioned and who had collected herbs worth ALL 100,000 (€ 800) or more in 2006⁸. In Brett no households were identified as meeting the criteria above, nor were any households considered vulnerable.

⁷ Exchange rate 1Euro = 123 ALL

⁸ This is identified as the income that can be made from full time employment for 1 person over the main gathering period of 5 months. The main gathering period runs from May-September. Some people, who have a high dependency on this activity, gather over an 11 month period.

Lime Production

- 5.30 Lime production is a process that involves a numbers of components: limestone quarrying, wood cutting and collection, maintenance and loading of the pit, limestone burning and pit unloading. Households engaged in the activity in Picrraga may be involved in building their own pits or may work as hired labour to others.
- 5.31 Local Forest Environment Protection Officials and local producers of lime agree that over the last 6 years lime production in the area has been markedly reduced. This is due to competition from lime producers in other areas, the lack of local road infrastructure, unfavourable prices and earnings for the physically demanding (24 hour) work, and the alternative options of seasonal and long term emigration attractive to young men; and increased government pressure to curb lime burning activities.

Table 5.6 - Percent of Households Brett and Picrraga Working in Lime 1995-2006

	1995	2000	2006
Quarrying stone	80%	80%	40%
Lime Burning	80%	80%	~25-40%

Source: Interviews with lime burners July 2007

- 5.32 This is reflected in the reduction in the numbers of households from Brett and Picrraga involved in lime production (see Table 5.6). This was also confirmed through household interviews on labour use and cash generating activities in these villages. Of six interviews none had a member working in lime production. In households with one or more sons (4 of 6 the households), at least one male member worked as migrant labour in 2006.
- 5.33 Brett no longer undertakes lime burning. Temporary paid employment is mainly in cutting and sale of wood or in lime quarrying. Limestone is widely available in the area.
- 5.34 Most producers in Picrraga work lime from Krasta. This is an area near Kruja, off the main Kruja road and adjacent to Picrraga. This is an important area for small scale quarrying due to the relative ease of access offered by the main Kruja road.
- 5.35 Production in the area of the project site has traditionally been undertaken by a single family of four brothers and their households. The father and eldest son live in the family home, identified as land in Picrraga. This area is away from the village and North of the lime quarry and cement works site (in the valley). The other sons live in Burizana. Two households were interviewed. Both households produced lime in

2006. The pits were located near to the road and are moved (annually) to be next to sources of fuel or wood (low scrub re- growth). Appendix 2.7 provides a case study of labour use and a budget of costs and returns to the activity. Typically earnings from the activity for family producers (as opposed to hired labour) were estimated to be € 7-9 / 8 hour day equivalent in 2006. Impacts of the project on lime producers is discussed in Chapter 7.

Other Employment Opportunities

- 5.36 Long term and seasonal migration for work is widely undertaken and is a prevalent survival strategy, now more widely practised than lime burning. Table 5.4 indicates the estimated number of households with family (mainly male) members living and working abroad in long term or seasonal migration.
- 5.37 Local employment in 2006/07 offered jobs to a mere 182 people, (including the 57 men employed by Antea in preliminary temporary exploration activities). Currently the main sources of employment are a shoe factory in Kruja, the cement factory in Fushe Kruja, and as casual labour, mainly in construction.
- 5.38 The monthly wage of the people employed in the work above is in the order of € 6-8/ day. The salary of a Local Authority employee is equivalent to € 6-10 /day.

Education and Health

- 5.39 Picrraga and Brett both have schools which cater for 65 children between the ages of 6 to 14 years. Picrraga village has a primary school serving 9-14 year olds, and has 55 pupils. Brett has an elementary school (covering four years of education) for 10 children. Children from Brett walk 2 hours to Picrraga to complete the second part of their primary education. As a result, of this and poor availability of facilities, only half the children from Brett complete the second part of their primary education. Half of the pupils finishing the compulsory education in Picrraga enrol for secondary education in one of the vocational schools situated in Kruja town.
- 5.40 Burizana and Thumaya operate two schools catering for children between 6 to 18 years of age with 740 and 800 children respectively.
- 5.41 The public health system in the Kruja district consists of:
 - a) A primary health network with health centres in large villages and health points in small villages and neighbourhoods;

- b) A poly health clinic situated in Kruja, and;
 - c) A hospital situated in Kruja.
- 5.42 Official guidelines indicate the ratios of staff to populations should be 2,500 inhabitants per doctor and 600 inhabitants per nurse. The current ratio in Picrraga and Brett villages is 1,700 inhabitants per doctor and 800 inhabitants per nurse.
- 5.43 In Picrraga village the primary public health centre is staffed full time by a nurse (although it was not open on the day of the visit), and facilities are considered to be limited and in poor condition. A general practitioner from Kruja visits the centre once a week. Brett village has no health service facility and is served by Picrraga. In emergencies, local people travel to Kruja hospital. Part of this 6km journey must be by foot or donkey as the connecting road system is inadequate.
- 5.44 Burizana and Thumaya each have a health centre staffed by two doctors and 6-8 nurses and midwives. Each centre is relatively well equipped to meet basic needs.
- 5.45 Dental treatment and medicines are purchased privately in the main local centres.
- 5.46 No serious or special health problems were identified by health specialists in Kruja or Thumaya commune in relation to these villages. In Burizana the health workers have observed an increased incidence of allergic and pulmonary diseases among children and old age people has been observed by local health experts which they have attributed to dust due to increased traffic on roads passing near the village. Also, the local health experts have observed that ex-workers of Fusche Kruja cement factory and limestone extraction workers seem to have a higher incidence of pulmonary diseases compared with others in the population. These observations may be related to worker's increased exposure to dust from previously used outdated industrial technologies.
- 5.47 The statistical data and information systems in Albania are limited and problematic, in particular in relation to the availability of disaggregated data. The views of the local experts, directors of primary health, in Thumaya and in Kruja⁹ and the local practitioner serving the village provide the best evidence of the local health conditions.

⁹ also the Director of the poly health clinic

Local Utility Infrastructure (Electric, water, sewerage services and roads)

- 5.48 All four villages in the project area are served by the national electrical distribution system. Although available to all households the system suffers low voltage and power cuts throughout the year (up to 12 hours in 24 hours). The communities are not satisfied with the quantity and the quality of electric supply.
- 5.49 The use of home generators is common. For example, half the households of Picrraga use small home diesel generators. Due to the low voltage electric domestic appliances don't function well and voltage adaptors are used for televisions.
- 5.50 Despite the regional reliance on boreholes, the water supply in the area is mainly from local streams. A pipeline system covers 25% of households in Thumaya and Burizana villages, other households depend on water from streams or protected wells. Recently the Albanian Development Fund has financed the reconstruction of the existing pipeline water supply in Thumaya village
- 5.51 In both Brett and Picrraga streams and springs are the main sources of drinking water. In Picrraga the pipeline system exists but is not functional, however works are currently being undertaken to improve water pressure and extend the availability of piped water.
- 5.52 The main problems with the water supply relate to the distance and inconvenience of water collection. Water in Brett and Picrraga is considered to be "safe" and no water related illness or epidemics have been reported. In the lower areas of Thumaya and Burizana villages cases of diarrhoea were reported in the last year, caused mostly by poor quality well water.
- 5.53 Sanitation in all villages is by means of private septic toilets.
- 5.54 Thumaya and Burizana are linked with Lac, Kruja and Tirana through national roads. These are in reasonable condition. However connection among villages and local centres in hilly areas is difficult. Roads are not asphalted and are in bad condition and often not passable except to 4 wheel drive vehicles. As earlier indicated, bad roads have isolated the population of Brett and Picrraga villages, diminishing the access to health, education services and local market for farm produce sales and other goods (including lime sales) and holding back development.

Local Government and Community Structures

- 5.55 Albania has 36 districts, municipal areas are administered by a municipal council, and rural areas are administered through the commune council. Each council has 13

or more councillors depending on the population size of the area. Kruja has 17 councillors. The subdivisions are urban quarters and rural villages, each with locally elected village heads or community representatives.

- 5.56 Municipalities have a Mayor, communes have a Chairman, and they are elected every 3 years. The council Chair and Secretary are elected by the councillors if they receive 33% or more of the vote.
- 5.57 The municipality is responsible for local infrastructure such as street lighting, public transport, water, sewerage and drainage. It also has responsibilities for social services, economic development, protection of natural resources and public order.
- 5.58 Central Government and the Local Authority share responsibility for primary health and school education.
- 5.59 Local Authority services and works are paid for through revenues raised from taxes and charges to local people and local businesses. The revenues are raised to meet the council budget. Investment and budget requirements for different villages in the commune are discussed, prioritised and funding is agreed through the council.
- 5.60 The annual budget of the Kruja Municipality in 2007 was ALL100 million (or € 813,000) of which 40% is a conditional central government grant while the remainder is from the local taxes. The municipality budget devoted to the villages of Brett and Picrraga amounts to 3% of the total budget and mainly consists in social assistance transfers (social assistance for poor families and disability benefits), teacher salaries, school maintenance costs. Due to the isolated nature of some villages, Brett and Picrraga are some distance from an all weather road, communities are often quite isolated.

Titan: Company Policies including Employment, Human Resources, Training and Community Relations

- 5.61 Titan is a Greek firm, internationally known, with cement plants in 6 countries. Titan directly employs 6000 people, of which 45% are unionised. It indirectly employs a further 2025.
- 5.62 In 2002, the Titan Group signed the Global Compact of the U.N. and in 2003 became member of the World Business Council for Sustainable Development, re-confirming, its commitments regarding the application of the principles of Corporate Social Responsibility and Sustainable Development. Titan collaborated with leading global cement groups in the framework of the Cement Sustainability Initiative (C.S.I.), with a view to better defining and quantifying objectives at Group level, improving

measurement systems and adapting its organizational structures to new tasks and goals, in line with internationally accepted standards and best advanced technologies. A new corporate reporting system was launched in 2003 based on the guidelines of the Global Reporting Initiative (G.R.I.)

- 5.63 The company has published (in all languages spoken within the Group) its statement of principles and rules in a manual titled "Titan Group Core Values and Code of Conduct". According to the 2006 CSR and Sustainability Report of Titan Group, there is an average annual staff training rate across the group of 18hours/employee/year (a 30% increase since 2005). Of this 45% of the time invested on training is on health and safety issues and 30% is on the development of technical skills and qualifications. The company aspires to a "zero accident" rate, in 2006, 3 fatalities were incurred (two contractors' employees and one civilian).
- 5.64 Respect for diversity is reflected in Titan Group HR policy and the high percentage of "local origin" managers (92%). A specialised program titled "MENTOR" was initiated in 2003. This is a platform for learning, team-building and sharing best practices in Titan's South Eastern Europe operations, aiming at the transfer of knowledge and expertise to its affiliates in the region.
- 5.65 All employees at Titan are encouraged to express their opinions and ideas and provide feedback in a variety of ways which include surveys, digit vote, open days, feedback cards and focus groups. Comprehensive employee surveys have taken place in US in 2004 and 2006, in Greece since the early 1990's and the most recent at the beginning of 2007, in Egypt in 2006, while in South Eastern European operations are ready to be launched.
- 5.66 Titan is working on community development and social welfare projects with local communities in all areas it is present. Examples are given in its annual CSR and Sustainability Reports.

ARCHAEOLOGY AND CULTURAL HERITAGE

- 5.67 Neither the quarries or plant sites are located in an area of archaeological or cultural importance according to the local officials.
- 5.68 Upon visiting the areas of the proposed quarries and factory development there was no apparent visible evidence of remains of settlements, etc, that could indicate the presence of important archaeological remains.
- 5.69 The new road will pass the cemetery at Thumaya and will pass next to the Pilgrimage point of Boka e Kuge. Independent estimates suggest that as many as 10,000 -

15,000 pilgrims may visit the site of Boka e Kuge, which is at present on a track accessible by foot and mule.

- 5.70 Boka e Koge is associated with St George and is visited by Muslims and Christians alike.¹⁰

LANDSCAPE AND LAND USE

- 5.71 The wider landscape character of the area is of a semi-natural rural landscape of flat agricultural lowland fields contrasting with hilly or mountainous scrubland. The key characteristics are dramatic, deforested ridgelines with areas of soil erosion and scrub cover whose muted colour and rough texture greatly influences the landscape character. Small settlements and individual properties are scattered throughout the region. The predominant land use is agriculture. Hillier areas are used for grazing up to the point at which they become too steep. The historic practice of burning limestone to produce material for whitewashing is still prevalent, and the hillside landscape is strewn with disused burning pits. As a result of the recent survey access tracks constructed to enable testing for the necessary quarry materials, access to the hillside area has been significantly eased and uncontrolled small scale removal of stone for use in the lowland limestone kilns has increased.
- 5.72 The proposed development is sited along a series of three major ridge lines running NNW to SSE. The proposed cement plant location is to an upland depression near the peak of the central ridgeline, (See Appendix 3 Viewpoint 08) with the limestone quarry adjacent. There is no existing development within the depression aside from the dirt access tracks built for the purpose of surveying. The flysch quarry is to be located in the valley to the east formed by the easternmost and central ridges, some 2km apart, with the river Droja at their base. Within this valley lies the settlement of Picrraga together with some smaller groups of dwellings on the valley sides. The third, parallel yet lower ridge line lies some 14km to the west, stretching to the Adriatic coast.
- 5.73 The wider area consists of a landscape of mixed topography; to the west the landscape comprises an extended plateau contained between the two western ridgelines (See Appendix 3 Viewpoint 09) with more dramatically mountainous rises further to the east. The Droja River valley is characterised by large, scrub covered, naturally formed mounds of flysch deposits rising from agricultural fields within the Droja's floodplain at the base of the valley.

¹⁰ The feast day of Saint George, April 23, marks the beginning of summer in Albania, indeed in old times it marked the beginning of the new year, and is associated with numerous popular customs, most of which are designed to ensure growth in children, farm animals and crops. It is the high point of the Christian calendar among the Albanians, at least with relation to popular customs. Saint George's Day is also known as the feast of the gypsies and is identified in the Muslim tradition with Rûz-i hazir, or chidr.

- 5.74 There are a number of small residential settlements and scattered individual residential properties within 10km of the site, including the large communities of Burizana, Kruja and Picrraga. The predominant architectural style of the region is concrete block housing rendered in either a white or the more subtle soft pink or peach finish, roofed with profiled terracotta tiles and timber agricultural buildings. The basic infrastructure of tarmac surfaced roadways which criss-cross the plain give way to stone roads and non-vehicular dirt tracks leading up to the hillside communities. These routes cut conspicuous, sandy coloured paths through the prevalent scrub growth and along the steeper hillsides. The network of roads within the lower plateau greatly range, from the recently built New National Route, a good quality, wide road surface with overtaking provision, to the Old National Route, which has been badly maintained resulting in a very poor quality tarmac surface that winds along the base of the central ridgeline. Overhead utility cables are conspicuous features throughout the area.
- 5.75 The main settlement in the region is Burizana, which lies at the western foot of the central of the three limestone ridges at a distance of some 14.7km to the western Albanian coast to the Adriatic. (See Appendix 3 Viewpoint 15) The capital city, Tirana lies 23km to the SE whilst the port town of Durres lies 35km to the SW, the Italian coast some 150km to the west. The town is spread along the lower slopes on the edge of a extensively farmed plateau stretching north-west, The plain comprises an open landscape divided into small, one hectare, single family sized agricultural fields bounded by access tracks and irrigation ditches.
- 5.76 In contrast to the fertile agricultural land of the plain, the hills are generally a mix of dry, Mediterranean scrub and impoverished grasses with areas of semi-natural woodland and forestation used by the local villages for grazing, hunting and as a source of wood for fuel as well as burning limestone to produce material for whitewashing. The region is characterised by the small, circular limestone burning pits scattered throughout the upland areas, and exposed hillside stripped of vegetation other than low lying scrub. The existing landscape vegetation has suffered considerably from deforestation in recent years, mostly through the 1990s, which has resulted in natural tree cover not exceeding 25 percent.
- 5.77 Though the evidence of human intervention is prevalent, the use of the land is predominantly rural. The settlements contain few prominent incongruous man-made features such as taller buildings or vertical structures. There are no existing industrial facilities in the near vicinity of the proposed plant and the site is presently not industrially developed. A relatively small limestone quarry operation exists to the east of the town of Burizana on the present approach road to the proposed limestone quarry. To the base of the central ridge, spreading south from Burizana along the old national route are several larger built limestone kilns along with other cottage industry limestone processes. A cement plant and large limestone quarry exists

approximately 6 km to the south of the proposed site near the historic city of Kruja. This plant is situated on the plain to the west below Kruja and is visible for many kilometres in nearly all directions. The associated limestone quarry is located high on the western slopes of the ridgeline, with its working face exposed to the wide plateau below and is a prominent incongruous man-made feature within the semi-natural landscape. (See Appendix 3 Viewpoint 18)

- 5.78 Whilst the existing cement works (near Fushe Kruja) and active quarry are major landscape detractors, they are at a considerable distance and are not within the same visual envelope as the sites. The proposed cement plant and limestone quarry location is visible from the plateau below and contributes to the character of the mountainous ridgelines. The proposed flysch quarry location comprises an area of additional interest due to its unique topography and overlooked nature within the Droja valley.
- 5.79 The landscape of the wider area, taking into consideration local and long distance views throughout the region, can be said to be of pleasing scenic value due to its semi-natural character and the harmony and balance of colour and texture throughout, with the added interest of the dramatic ridgeline topography against the lowland plateau. However the evidence of human intervention is prevalent and often detracts from the overall visual amenity. Two small scale rock processing sites are located in the immediate vicinity of the proposed cement plant, along the access track leading from Burizana to the proposed development site; however these features are only visible from the edge of the town.
- 5.80 The proposed sites for the cement plant, limestone quarry and the flysch quarry are visually balanced in terms of colour and visual harmony within the wider area with the characteristic scrub land colour and texture. There are no prominent incongruent on-site man-made visual features, such as overhead utility lines or poles or permanent structures within either site. The proposed cement plant site, though not a feature of particular visual distinctiveness in itself, contributes to the dynamism of the landscape, which is a fundamental contributor to the wider scenic value of the area. The proposed flysch quarry is sited within the overlooked Droja valley, comprising a visually interesting landform in itself, unique yet balanced within the wider landscape and creating an area of pleasing scenery with a strong sense of place.

NATURAL HABITATS

- 5.81 This description is based on:
- a UK desk-based study of relevant literature, legislation and on-line data sources;

- a short field visit to the quarry areas and cement plant sites in March 2007 by an Atkins' ecologist;
- desk and field botanical studies by a highly-qualified Albanian botanist, in the Burizana area as a whole (over many years) and briefly at the proposed project sites.

5.82 A review of the vegetation in the Burizana area, of its significance within a national context and of influencing factors that explain its present condition is presented in Appendix 4.1. The field visit report is presented in Appendix 4.2. Key information from these sources is summarised in the following paragraphs, starting with a review of the national situation with regard to ecology and biodiversity conservation in Albania, which provides the context for this assessment.

Biodiversity in Albania - Status and Trends

5.83 Albania has a rich diversity of ecosystems and habitats. The flora contains 30% of the total European Flora. There have been 85 mammals species recorded (eight threatened species) representing 42% of the European total. Of these, and as listed in Table 5.79, eight species are defined as vulnerable by the IUCN (The World Conservation Union), 15 at lower risk, one (otter *Lutra lutra*) as not evaluated and one Mediterranean monk seal *Monachus monachus* as critically endangered (IUCN 1996 Red List of Endangered Species). There are 193 species of breeding bird (three threatened species), 37 species of reptile (4 threatened species), 16 species of amphibian and 109 species of fish (seven threatened species).

Table 5.7 - List of 48 Mammal Species Occurring in Albania of Conservation Concern¹¹

Species	Scientific Name	Status
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	P, VU A2c
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	P, LR/ cd
Mediterranean horseshoe bat	<i>Rhinolophus Euryale</i>	P, VU A2c
Blasius' horseshoe bat	<i>Rhinolophus blasii</i>	P, LR/ nt
Whiskered bat	<i>Myotis mystacinus</i>	P
Lesser mouse-eared bat	<i>Myotis blythi</i>	P
Greater mouse-eared bat	<i>Myotis myotis</i>	P, LR/nt
Long-fingered bat	<i>Myotis capaccinii</i>	P, VU A2c
Geoffroy's bat	<i>Myotis emarginatus</i>	P, VU A2c
Noctule	<i>Nyctalus leisleri</i>	P
Leisler's bat	<i>Nyctalus leisleri</i>	P, LR/nt
Serotine	<i>Eptesicus serotinus</i>	P
European free-tailed bat	<i>Miniopterus schreibersi</i>	P, LR/ nt
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	P
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	P
Kuhl' pipistrelle	<i>Pipistrellus kuhlii</i>	P
Savi's pipistrelle	<i>Hypsugo savii</i>	P
Brown long-eared bat	<i>Plecotus aritus</i>	P
Grey long-eared bat	<i>Plecotus austriacus</i>	P
European free-tailed bat	<i>Tadarida teniotis</i>	P
Brown Hare	<i>Lepus europaeus</i>	H
Red Squirrel	<i>Sciurus vulgaris</i>	H. LR/ nt
European souslik	<i>Spermophilus citellus</i>	VU A1c
Fat dormouse	<i>Myoxus glis</i>	LR/ nt
Forest dormouse	<i>Dryomys nitedula</i>	LR/ nt
Common dormouse	<i>Muscardinus avellanarius</i>	LR/ nt
Harvest mouse	<i>Micromys minutus</i>	LR/ nt
Lesser mole rat	<i>Spalax leucodon</i>	VU D2
Brown bear	<i>Ursus arctos</i>	P
Golden Jackal	<i>Canis aureus</i>	P
Wolf	<i>Canis lupus</i>	H
Red Fox	<i>Vulpes vulpes</i>	H
Weasel	<i>Mustela nivalis</i>	P

¹¹ Prigioni, C. (1996). Distribution of Mammals in Albania, Hystrix, 8(1-2): 67-73

Species	Scientific Name	Status
Western polecat	<i>Mustela putorius</i>	P
Stone Marten	<i>Martes foina</i>	H
Pine Marten	<i>Martes martes</i>	P
Badger	<i>Meles meles</i>	P
Otter	<i>Lutra lutra</i>	P, NE
Wildcat	<i>Felis silvestris</i>	P
Lynx	<i>Lynx lynx</i>	P
Mediterranean monk seal	<i>Monachus monachus</i>	P, CR C2a
Wild boar	<i>Sus scrofa</i>	H
Chamois	<i>Rupicapra rupicapra</i>	P
Roe deer	<i>Capreolus capreolus</i>	P
Mehely's horseshoe bat*	<i>Rhinolophus rnehelyi</i>	P, VU A2c
Greater noctule*	<i>Nyctalus lasiopterus</i>	P, LR/ nt
Garden dormouse*	<i>Eliomys quercinus</i>	VU A1c
Balkan snow vole*	<i>Dinaromys bogdanovi</i>	LR/ nt

Source: Prigioni (1996) and IUCN (1996) Red List of Threatened Species.

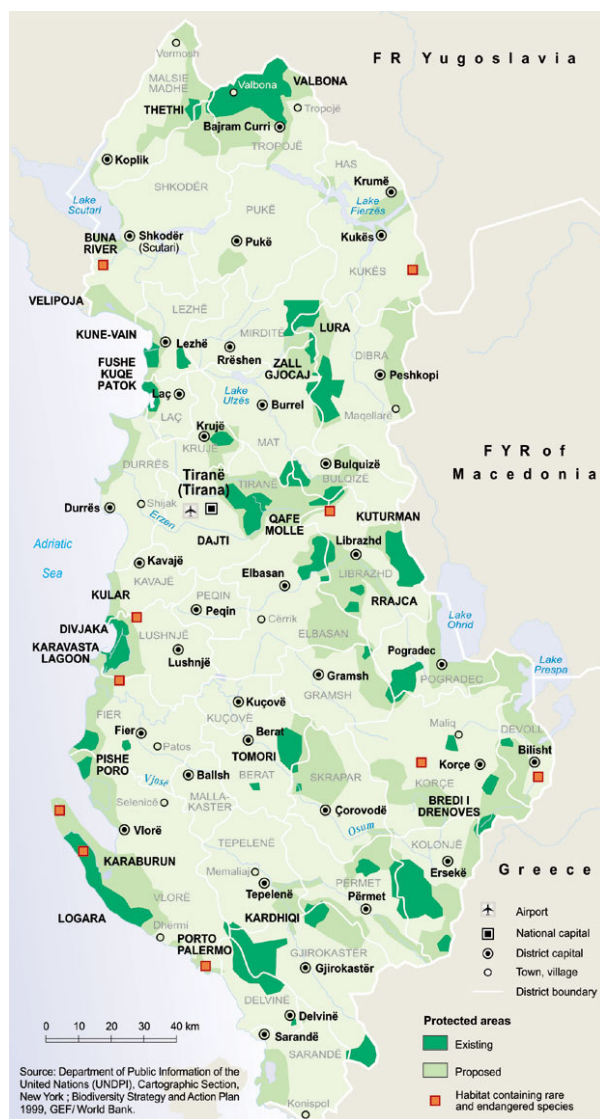
Legal Status in Albania P=Protected, H=Hunted.

VU=Vulnerable, A2c = population decline projected or suspected; A1c = population reduction observed; D2 = very small or restricted species, population is susceptible; LR = Lower Risk, cd = conservation dependent, nt = near threatened; NE = Not Evaluated; CR = Critically Endangered, C2a = Small population size and decline, * = species probably present in Albania

- 5.84 Figure 5.1 shows the protected areas of Albania, the proposed areas for protection and areas with endangered species¹². Within Albania's territory there is great diversity - maritime ecosystems, coastal zones, lakes, rivers, evergreen and broadleaf bushes, broadleaf forests, pine forests, alpine and sub-alpine pastures and meadows, and high mountain ecosystems. The country is rich in forest and pasture resources.

¹² UNEP/GRID-Arendal, 'Protected areas and conservation hotspots in Albania', UNEP/GRID-Arendal Maps and Graphics Library, 2000, <<http://maps.grida.no/go/graphic/protected-areas-and-conservation-hotspots-in-albania>>

Figure 5.1 - Existing and Proposed Protected Areas in Albania



5.85 Despite its richness in biological and landscape diversity Albania is considered to have the highest rate of biodiversity loss in Europe¹³. The number of species included in the Albanian Red Book of threatened and endangered animal species is 422, of which vertebrates comprise 198 species or 47% of the total number. The Albanian Red List of plant species comprises 320 species of flowering plants, 45 species of fungi and 25 species of marine plants.

5.86 The main endangered types of ecosystems and habitats include those at marine, medium and infralittoral level (the lowest parts of the shore only exposed during the lowest portion of the tidal cycle), coastal ecosystems (sand dunes, river deltas,

¹³ Dedej, Z., 2003. Agreement on the Conservation of Populations of European Bats, Albania's National Report on the Implementation of the Agreement 2003/ MoP4

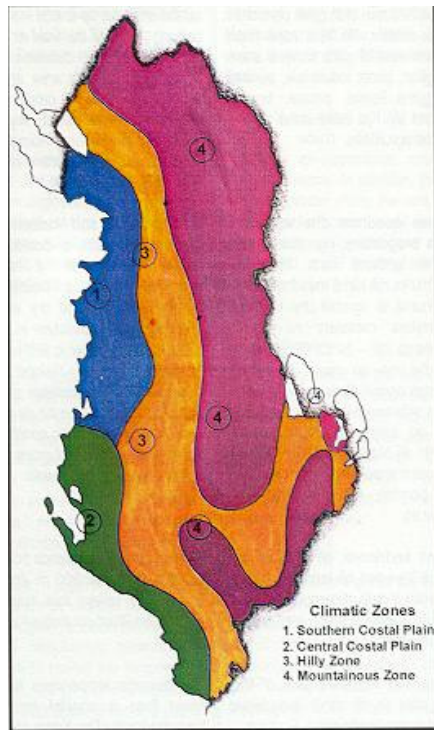
alluvial and wet forests, lagoons and coastal lakes), and terrestrial ecosystems, such as alpine pastures and meadows, continental and glacial lakes and oak and conifer forests.

- 5.87 Under Albanian Law, Law No. 7875 (1994) on the 'Protection of the Wild Fauna and Hunting' there is legal protection of mammals, including all bat species, carnivores (except stone marten, red fox and wolf), the chamois, roe deer and the Mediterranean monk seal. Hunting of protected species is allowed by special permission from the Ministry of Agriculture. The otter is controlled when damaging fisheries. The modern legal system in Albania for environmental protection, based on democratic principles, began in 1991 and has seen the creation of the Law on Hunting and Wildlife Protection (1994), Law on Environmental Protection (2002), Law on Protected Areas (2002) and Law on Environmental Impact Assessment (2003).
- 5.88 The Albanian Red Lists have been drawn up by local scientists reflecting conservation concerns at a local or national level and do not correspond to the IUCN Red Lists – there are many species on the Albanian Red Lists that are not considered to be of conservation concern at an international level. It is understood that, though the Albanian Red Lists of Plant and Animal Species have been published and recognised by the Ministry of Environment, the Ministry has the authority to permit their hunting/collection/removal e.g. by means of approval of an EIA report a project can be permitted to remove a red list species (Arsen Proko, University of Tirana, *pers. comm.*).

Climate and Vegetation Zones of Albania

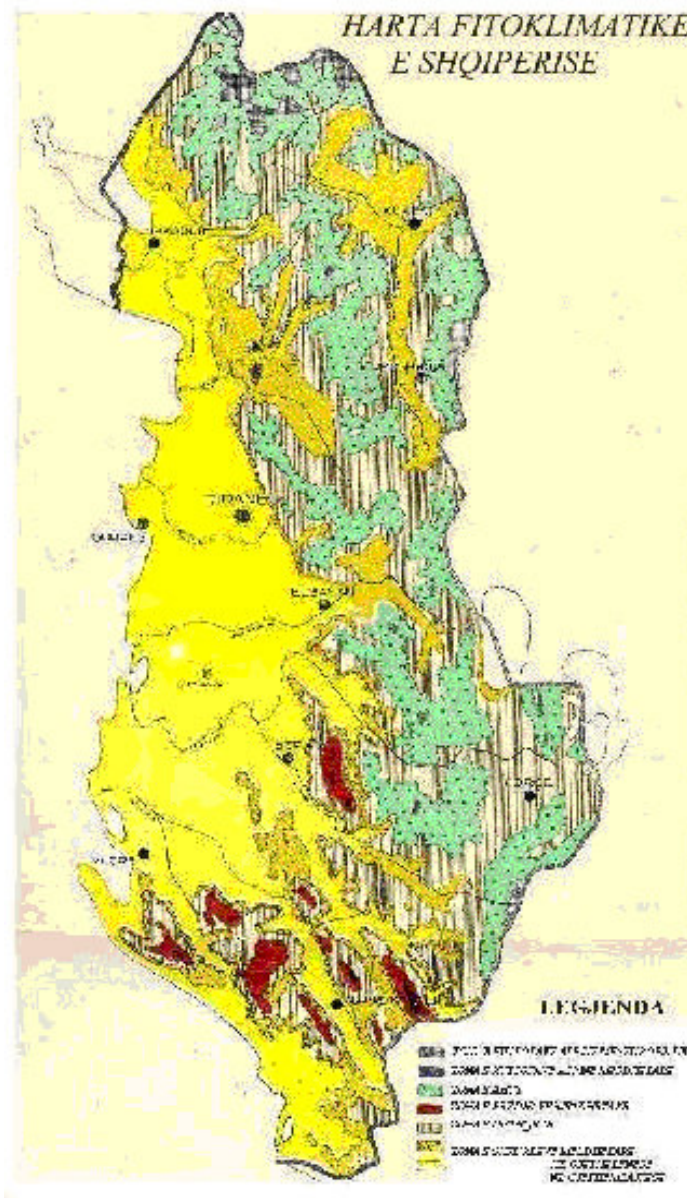
- 5.89 The climate of Albania is very diverse, as a result of its geographic position, high altitudinal range and, especially, the hilly and mountainous relief, which is characterised by deep valleys and gorges. The four climatic zones (Figure 5.2) and thirteen sub-zones that have been distinguished are major determinants of the country's vegetation types.

Figure 5.2 - Climatic Zones of Albania



5.90 With regard to vegetation, a line between Shkodra and Leskovik divides Albania's territory into two broad regions (Figure 5.3).

Figure 5.3 - Map of Albanian Phyto-climatic Zones



5.91 The vegetation typical of these two regions can be summarised as follows:

- The **Southwestern Region** is characterised by typical "Mediterranean Vegetation", dominated by evergreen trees, coastal, Mediterranean forest and shrubs, especially of *Quercion ilicis* Br.-Bl. 1936. Included in this region are macquis, shibliak, pseudo-macquis, garrigues and friganes vegetation formations and Mediterranean mountainous pastures, usually as the degraded stages of the potential climax vegetation (*Quercetum ilicis* Br.-Bl. 1947).

- The **Northeastern Region** is characterised by typical “Central European Vegetation” dominated by deciduous trees. A large proportion of Albanian forest is found here, particularly beech (*Fagus sylvatica* L.) and white fir (*Abies alba* Mill.), oaks (*Quercus* sp. L.) and black pine (*Pinus nigra* Arn.) forests. These forests are mainly found at a considerable distance from populated areas, partly because the lack of infrastructure for forest harvesting has left them virgin. This makes them extremely important as biogenetic reserves.

5.92 Across these two broad regions, four altitudinal phyto-climatic belts can be distinguished as follows:

- (i) A belt of sclerophyllous Mediterranean forest and shrub, predominantly consisting of evergreen tree and shrub species. The natural distribution range of Mediterranean evergreen broadleaved forests and scrub in Albania comprises the majority of the western hilly zone, the low elevation and coastal regions, with the exception of the mountainous and immediate coastal areas. The most important species are Holly (Holm) oak (*Quercus ilex* L.), strawberry-tree (*Arbutus unedo* L.), Briar Tree heath (*Erica arborea* L.), Broadleaved phyllirea (*Phyllirea latifolia* L.), terebint-tree (*Pistacia terebinthus* L.), Common myrtle (*Myrtus communis* L.), Red Berried Juniper (*Juniperus oxycedrus* L.).
- (ii) Thermophyllous oak forests, predominantly made up of broadleaved oak species, usually Hungarian Oak (*Quercus frainetto* Ten.), Turkey oak (*Quercus cerris* L.), and Macedonian oak (*Quercus trojanae* Webb.) or degradation stages of Oak forests, for example mixed formations of Oriental Hornbeam (*Carpinus orientalis* Miller.), Flowering Ash (*Fraxinus ornus* L.), Prickly Juniper (*Juniperus oxycedrus* L.), Blackthorn Tree (*Prunus spinosa* L.), Almond Pear Tree (*Pyrus amygdaliformis* Vill.), Christ's Thorn (*Paliurus spina-cristi* Miller.), Hawthorn (*Crataegus monogyna* Jacq.) etc. This belt is located between the Sclerophyllous Mediterranean forest and shrub belt and the mesophyllous broadleaved forest belt (Beech Forest Belt). The altitude varies from 500 m. to 1100 m. above sea level. It is important to emphasise that being situated in the most populated zone these forests have been susceptible to damage by human activity, especially by intensive harvesting and over-grazing.
- (iii) Vegetation of the mesophyllous broadleaved forest belt (beech belt) dominated by Beech forests (*Fagus sylvatica* L.), hop hornbeam (*Ostrya carpinifolia* Scop.), Hornbeam (*Carpinus betulus* L.), Chestnut (*Castanea sativa* L.) and small eco-systems of Black pine (*Pinus nigra* Arn.) and Bosnian pine (*Pinus leucodermis* Antoine).

- (iv) An Alpine Pastures or Mediterranean Mountainous pasture belt, characterised by interesting grassy meadow eco-systems.
- 5.93 The Burizana area, including both the proposed flysch and limestone quarry sites, belongs to the hilly climatic zone (3); this is characterized by wet, cold winters and dry, hot summers. These conditions are strongly linked with the hilly-mountain relief, the nearness to the sea (c. 20km), and the general wind direction from northwest to southeast. In such regions with this pronounced Mediterranean, “rainy winter” climate (i.e. with warm dry summers and cool, moist winters), evergreen broadleaved forests and scrub grow. In such thermo-Mediterranean regions frost in general is rare and hard frosts are absent. The precipitation peaks are mainly in November/December and in February/March. During the summer months, from May to September, there is little or no precipitation. Where there is pronounced relief, the windward-leeward effects provide for local climatic differentiation.
- 5.94 With respect to altitudinal zone, both proposed quarry sites are in the first altitudinal vegetation belt i.e. Sclerophyllous evergreen forest and shrub (Typical evergreen Mediterranean vegetation). This type of vegetation, as found in the project area, is described in more detail in the next section.

Vegetation of the Burizana and Project Area

- 5.95 The formation “Mediterranean sclerophyllous forests and scrub” in the Burizana area includes communities of xeromorphic evergreen tree and shrub species, especially of the genera *Quercus* L., *Pinus* L. (as part of reforestation projects), *Juniperus* L., *Olea* L. and *Pistacia* L.. Sclerophyllous forests and scrub occur on both types of substrate (flysch and limestone) on all slopes and exposures, though sites influenced by groundwater tend to be avoided.
- 5.96 The dominance of a single tree or shrub species is not common (Figure 5.4). Stand structure depends on abiotic site factors and the species composition, but especially on the current and previous use of the stand. Most evergreen broadleaved forest species can grow as trees or shrubs, depending on external influences. Stands with a dense canopy (quite rare) are dark and tend to be species-poor. The sparse undergrowth of such dense forests and thickets is composed of scattered small shrubs, grasses, lianas, geophytes, ferns and seedlings of the trees and shrubs.

Figure 5.4 - Holm Oak Forest (*Quercus ilex* L.)



- 5.97 Open stands are much more common. These occur naturally on steep slopes, though as a rule they arise from various forms of use, such as removal of timber, fire and overgrazing. Stands that have been degraded through unregulated logging possess scrub or bush forest structure (macchia, maquis) – Figure 5.5.

Figure 5.5 - Typical Evergreen Mediterranean Shrub (Macchia)



- 5.98 Stands that are patchy and opened up by grazing or inter-digitated with dwarf shrub and herbaceous vegetation are referred to as 'garrigue' (Figure 5.6).

Figure 5.6 - Typical Garrigue



- 5.99 Grazed woodlands consist of single-stemmed rather than coppiced, multi-stemmed trees, they have a more open canopy, and never a stand structure nor an internal architecture rich in eco-tonal effects.
- 5.100 The Mediterranean evergreen broadleaved forests of Burizana's area have a long history of anthropogenic destruction and degradation. In areas favourable for agriculture, this began during the Neolithic period; in agriculturally less favourable regions it occurred especially during times of human population growth through the extensive, unregulated removal of timber and grazing with goats and sheep.
- 5.101 They were to be replaced by various cultural landscapes. Secondary small shrub communities (referred to, depending on region, as tomillares, phrygana or batha) arose in areas that were extensively grazed. If a regressive syndynamic pattern persisted, geo-phytic and annual-rich dry grasslands and heaths developed.
- 5.102 Evergreen broadleaved forests are often regarded as the "original" vegetation of the Mediterranean vegetation zone. Palynological finds however suggest evergreen oak forests appeared following increased Neolithic land use. Furthermore, the site-specific potential natural vegetation of today should not be equated with the vegetation of the Neolithic period, that had been only little influenced by humans. Considerable soil erosion – with and without the involvement of humans – has fundamentally changed the conditions for forest growth and structure. Site-

appropriate regeneration of forests, in areas where they have been degraded or have disappeared, depends on soil characteristics and moisture regime, relief and local climate, the seed bank and possible disturbance.

- 5.103 With the receding pressure of human use in recent times, one can observe self-regenerating, evergreen broadleaved vegetation (Figure 5.7). The dynamic potential of such stands, especially the temporal process of progressive succession and the corresponding climax forest community, are to a great extent site-dependent and are still not understood in detail. Nevertheless, it can be observed that, while anthropogenically-thinned sclerophyllous forests can exhibit high numbers of species in a small area, stands that have gone for a longer time without or with only minimal disturbance are dense and conspicuously species-poor.

Figure 5.7 - Broadleaved Oaks Regenerate after Protection



- 5.104 Further details of Mediterranean dry forests and scrub and their vegetation dynamics, especially their levels of degradation and recovery, can be found in Appendix 4.1.

Fauna of the Burizana and Project Area

- 5.105 Based on (i) studies in the nearby Dajti National Park, where the ecological conditions are similar to those of the Burizana area and (ii) general familiarity with the ecology of Burizana and the project sites, a list of the fauna which may occur in the area of the proposed project has been prepared (Appendix 4.3). The list comprises 31 mammals, 134 bird species (of which 18 are considered to be threatened), 11 amphibian species, 24 reptile species and 215 insect species. However it is quite

unlikely that all these species are present; see paragraphs 5.118 to 5.134 for details of what was recorded during the short field investigation in March 2007 and for further discussion on threatened and “protected” species.

The Project Area - Conservation Status and General Condition

- 5.106 Neither the specific sites proposed for the development, nor the areas through which the access roads pass, are designated as conservation areas.
- 5.107 Briefly, the condition of the habitat both in and around the study area is generally degraded, to various degrees, with large areas given over to remnant coppice forest and scrub. The dominant species of this coppice forest habitat typically comprise *Quercus cerris*, *Q. petraea*, *Fraxinus ornus*, *Ostrya carpinifolia*, *Acer platanoides*, with a lower levels of *Prunus mahaleb*, *Acer obscuratum* and *Carpinus orientalis*.
- 5.108 Following the climax stage, four separate stages of vegetation succession can be identified, each representing a further stage of degradation. These five stages are described below. Different proportions of each are found on the two sites (Table 4.2) and this can be attributed to differing intensities and durations of human-related pressures.
- 5.109 At neither of the project sites does any of the first or climax stage vegetation remain i.e. there are no original patches of Holm oak - only rare individuals in the most inaccessible areas. At the flysch quarry area, as a result of traditional uses and disturbance, this forest type has been succeeded in some areas by the typical Mediterranean scrub or macchia, which is considered the second (degraded) vegetation stage. This vegetation type mainly consists of the Strawberry tree (*Arbutus unedo*), White Heath (*Erica arborea*), Terebint Tree (*Pistacia terebinthus*), Macedonian oak (*Quercus trojana*), Judas tree (*Cercis siliquastrum*), Common Myrtle (*Myrtus communis*), Red Juniper (*Juniperus oxycedrus* L.) etc.
- 5.110 At both the flysch and limestone sites there are extensive areas of the third stage of vegetation degradation – called “garrigues” (see photo-montage of flysch area from viewpoint 16). This is a result of further intensive harvesting and overgrazing and is composed especially of thorny and sclerophyllous scrub, and succeeds the maquis vegetation. The most important species to be mentioned are Kermes oak (*Quercus coccifera* L.), Flowering Ash (*Fraxinus ornus* L.), Christ’s Thorn (*Paliurus spina-christi* Miller.), Blackthorn tree (*Prunus spinosa* L.), Almond Pear Tree (*Pyrus amygdaliformis* Vill.), Firethorn (*Pyracantha coccinea* M.J. Roemer.) Juniper tree (*Juniperus oxycedrus* L.), Hawthorn (*Crataegus monogyna* Jacq.), Pomegranate (*Punica granatum* L.), Broad-Leaved Phyllirea (*Phyllirea media* L.), Eastern Hornbeam (*Carpinus orientalis* Miller.) etc.

- 5.111 The **fourth degradation stage** of this vegetation series belongs to a **sclerophyllous dwarf shrub and scrub** vegetation community, which is very common on the proposed limestone quarry site. The following are typical species: Common Sage (*Salvia officinalis* L.), Evergreen Rose (*Rosa sempervirens*), Elm Leaf Blackberry (*Rubus ulmifolius*), Alatern (*Rhamnus alaternus* L.), Rock-Rose (*Cistus incanus* L.) Sage-Leaved Rock Rose, (*Cistus salvifolius* L.), Spanish Broom (*Spartium junceum* L.), Radiant Broom (*Genista radiata* (L.) Scop.), White-Felted Germander (*Teucrium polium* L.), Viscous Fleabane (*Inula viscosa* (L.) Aiton.).
- 5.112 The **fifth** and final stage of this degradation series is steppe-**grassland** vegetation, composed primarily of tall grasses such as heath false-brome (*Brachypodium pinnatum* (L.) P. beauv), Brush grass (*Chrysopogon gryllus* (L.) Trin), (*Putoria calabrica* (L. fi.l.) DC), and some herb species - soapwort (*Saponaria calabrica* Guss.) and Thyme (*Thymus* sp L.), This vegetation type is found only on the proposed limestone quarry site and is characterised by a high level of soil erosion (see Figure 5.8 and photomontage from Appendix 3 Viewpoint 8).

Figure 5.8 – Steppe-grassland Vegetation at its Final Stage of Degradation (soil erosion)



- 5.113 Human interventions over a period of many years in the Burizana area have resulted in this deforestation and degradation, reducing the vegetation's protective function. The most severe degradation, leading to erosion, may have been in the last 20 or 30 years. Overgrazing by domestic livestock, fire wood production and gathering and clearance for traditional lime production have been the main interventions. Degradation is most evident near villages and on agricultural land on steep slopes; once it has reached this extreme state (i.e. with soil erosion taking place), then

floristic composition is affected and meaningful restoration of both soil and vegetation will take many, many years to achieve. Approximate estimates of the proportions of the different vegetation types/degradation stages at the two proposed quarry sites are given in the table below.

Table 5.8 - Vegetation Types at the Proposed Quarry Sites, with Estimates of Cover

	% cover at Limestone Quarry Site	% cover at Flysch Quarry Site
Mediterranean sclerophyllous forests and scrub (1 st or Climax Stage)	0%	0%
Macchia (2 nd Stage)	5%	60%
Garrigues (3 rd Stage)	50%	20%
Sclerophyllous dwarf shrub and scrub vegetation (4 th Stage)	30%	10%
Steppe-Grassland (5 th Stage)	15%	10%

Ecological Value Conservation Status of Plants of Burizana Area

- 5.114 Because of the phyto-climatic zone in which Burizana is situated there is a high level of plant biodiversity, despite the degradation that has taken place – in fact the different agricultural practices and land uses have contributed to various degrees of degradation, which has resulted in the presence of different vegetation types and a variety of ecosystems.
- 5.115 In the wider area c. 450 vascular plant species have been recorded, distributed in 63 families, of which 15 families are represented by only a single species and 11 by only 2 species. These include a number of threatened species based on the Red List of Albania. According to this list (and applying categories equivalent to those used by IUCN e.g. Endangered, Vulnerable, Least Concern) 13 of these c.450 species should be given due attention for *in-situ* conservation (see Table 5.9 below). **However, none of these 13 species are on the IUCN Red List i.e. they are not considered threatened at an international scale.**
- 5.116 Two of these species, *Quercus ilex* (the holly or holm oak) and *Salvia officinalis* (sage), have been recorded on project-affected sites – the holm oak in the flysch area and the sage at the limestone quarry site. There are only a few individuals of the *Quercus ilex* at the proposed flysch quarry site, but they are not unique to the wider Borizana-Kruja area - other individuals are found near Kruja for example. On a wider scale, this species is found in Albania from north to south, is very common in

the south of Albania and is widely distributed around the Mediterranean. The *Salvia officinalis* is common on the limestone areas of Burizana (i.e. is not restricted to the quarry site) and common in various other regions of Albania. It is understood that these two species have been placed on the Albanian Red List, not because they are in imminent danger of extinction but because they are under pressure from harvesting (respectively for timber/firewood and as a herb) and they would benefit from pro-active conservation measures.

- 5.117 Of the other 11 Albanian Red List species recorded in the wider Burizana area, their presence on the project development areas cannot be ruled out, without more detailed survey. However none of these 11 species are typical of the project areas and they are common elsewhere in Albania (Arsen Proko, University of Tirana, *pers. comm.*).

Table 5.9 - Red Data List (IUCN) of Plants of Burizana Area

N ^o	Species	Threatened status (IUCN categories)				
		Ex?	E	V	NT	LC
1.	Agrimonia eupatoria L.		x			
2.	Dictamnus albus L.		x			
3.	Hypericum perforatum L.		x			
4.	Laurus nobilis L.		x			
5.	Orchis sp. divaricata (L.) R. Br.		x			
6.	Origanum vulgare		x			
7.	Quercus ilex		x			
8.	Salvia officinalis L.		x			
9.	Cerastium grandiflorum Waldst et Kit.			x		
10.	Chamaecytisus tommasinii (Vis) Roth			x		
11.	Fritillaria macedonica Bornm.			x		
12.	Pedicularis brachyodonata Schlosser et Vuk			x		
13.	Ramonda serbica Pancic			x		
Total species		0	8	5	0	

Fauna Recorded at the Proposed Project Sites

5.118 Based on a field survey conducted in early March 2007, a range of fauna (birds, reptiles, amphibians) were recorded at both the proposed limestone and flysch quarry sites and summary is presented in the table below. The species were recorded at or on the borders of the Proposed Limestone Quarry and Cement Plant area (on 7th March 2007) and at the Proposed Flysch Quarry Site (on 8th March 2007). See Appendix 4.2 for further details.

Table 5.10 - Bird, Reptile, Amphibian and Invertebrate Species Recorded During Survey

Birds

Common Name	Latin name	Limestone Quarry	Flysch Quarry
Golden Eagle	<i>Aquila chrysaetos</i>		+
Common Buzzard	<i>Buteo buteo</i>	+	+
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	+	
Common Kestrel	<i>Falco tinnunculus</i>	+	+
Wood Pigeon	<i>Columba palumbus</i>	+	+
Lesser Spotted Woodpecker	<i>Dendrocopos minor</i>		+
Eurasian Collard Dove	<i>Streptopelia decaocto</i>	+	
Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>		+
Little Owl	<i>Athene noctua</i>	+	
Grey Wagtail	<i>Motacilla cinerea</i>		+
White Wagtail	<i>Motacilla alba alba</i>	+	
Winter Wren	<i>Troglodytes troglodytes</i>	+	+
White-throated Dipper	<i>Cinclus cinclus</i>		+
Black Redstart	<i>Phoenicurus ochrurus</i>		+
European Robin	<i>Erithacus rubecula</i>	+	+
Common Stonechat	<i>Saxicola torquata</i>	+	+
Song Thrush	<i>Turdus philomelos</i>	+	
Mistle Thrush	<i>Turdus viscivorus</i>		+
Common Blackbird	<i>Turdus merula</i>	+	
Blackcap	<i>Sylvia atricapilla</i>	+	
Sardinian Warbler	<i>Sylvia melanocephala</i>	+	+
Cetti's Warbler	<i>Cettia cetti</i>	+	+
Common Chiffchaff	<i>Phylloscopus collybita</i>	+	+
Goldcrest	<i>Regulus regulus</i>	+	
Firecrest	<i>Regulus ignicapillus</i>	+	+
Great Tit	<i>Parus major</i>	+	
Blue Tit	<i>Parus caeruleus</i>	+	+
Long-tailed Tit	<i>Aegithalo caudatus</i>	+	
Sombre Tit	<i>Parus cinctus</i>		+
Coal Tit	<i>Parus ater</i>		+
Common Magpie	<i>Pica pica</i>	+	+
Eurasian Jay	<i>Garrulus glandarius</i>		+

Common Name	Latin name	Limestone Quarry	Flysch Quarry
Common Raven	<i>Corvus corax</i>		+
House Sparrow	<i>Passer domesticus</i>	+	+
Common Chaffinch	<i>Fringilla coelebs</i>	+	+
European Greenfinch	<i>Carduelis chloris</i>		+
Cirl Bunting	<i>Emberiza cirius</i>		+
Hedge Accentor	<i>Prunella modularis</i>		+
Total no. of species		24	28

Reptiles and Amphibians

Common Name	Latin name	Limestone Quarry	Flysch Quarry
Balkan Green Lizard	<i>Lacerta trilineata</i>	+	
Dalmatian/ Balkan Wall Lizard	<i>Podarcis milisellensis/ taurica</i>	+	
Viviparous Lizard	<i>Lacerta vivipara</i>	+	+
Common Frog	<i>Rana temporaria</i>	+	+
Marsh Frog	<i>Rana ridibunda</i>	+	+
Balkan Stream Frog	<i>Rana graeca</i>		+
Total no. of species		5	4

Invertebrates (Butterflies and Crickets)

Common Name	Latin name	Limestone Quarry	Flysch Quarry
Hungarian Glider	<i>Neptis rivularis</i>	+	+
Small White	<i>Pieris rapae</i>	+	+
Large White	<i>Pieris brassicae</i>	+	+
Green-veined White	<i>Pieris napi</i>	+	+
Large Tortoiseshell	<i>Nymphalis polychloros</i>	+	+
Peacock	<i>Inachis io</i>	+	
Blue sps.		+	+
Speckled Wood	<i>Pararge aegeria</i>	+	
Bush Crickets		+	+
Total no. of species		9	7

Birds

- 5.119 The birds recorded represent only resident species or lingering winter visitors and therefore does not include potential summer/breeding migrants. A few more species were recorded at the flysch quarry site (28) than the limestone site (24) and this perhaps indicates that there is more extensive and diverse woody (shrub) vegetation at the flysch site. Bird of prey activity was notably almost absent at both sites and this could indicate either lack of prey and/or hunting of these predators. However, a Common Kestrel (Vulnerable status in Albania) was observed at the Limestone Quarry and Plant site and a Golden Eagle (Endangered status in Albania) 1 km west of the Flysch Quarry site.

Proposed Limestone Quarry Site

- 5.120 Suitable habitat for reptiles (Figure 5.9) existed across the entire “limestone” site and 3 species were recorded at or near the site; a livestock drinking pool (Figure 5.10) provided habitat for 2 species of frog (Common Frog and Marsh Frog).
- 5.121 Only one of the reptiles, the Common or Viviparous Lizard (*Lacerta vivipara*) is on the Albanian Red List; it is also on the IUCN Red List in the category “Lower Risk Least Concern” and recorded in 30 countries from the U.K. to China. It was common at the limestone quarry sites, was also found at the flysch quarry site and presumed to be present elsewhere in the Borizana area.
- 5.122 The Balkan Green Lizard *Lacerta trilineata*, of which one individual was observed close to an access track to the study site, is on the IUCN Red List as of “Least Concern” in view of its wide distribution (from Croatia through to Turkey), tolerance of a broad range of habitats, presumed large population, and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category. The Red List states that (i) there appear to be no major threats to this species, but populations in Romania are threatened by loss of steppe habitat largely due to agricultural intensification and also a number of distinct island populations (ii) there appear to be no conservation measures needed for this species.
- 5.123 The third reptile species recorded at the quarry site could only be identified to genus level, as a Wall Lizard (*Podarcis melisellensis* or *tauricus* Dalmatian or Balkan respectively). Both species are listed as “Least Concern”, on the IUCN Red List, in view of their wide distribution, tolerance of a degree of habitat modification, presumed large population, and because they are unlikely to be declining fast enough to qualify for listing in a more threatened category.

- 5.124 All 3 reptile species observed are listed on Annex IV (Animal and Plant Species of Community Interest in Need of Strict Protection) of Council Directive 92/43/EEC of 1992 on the conservation of natural habitats and of wild fauna and flora (the “Habitats Directive”). However, this does not necessarily mean that these species would warrant protection in Albania, which is not yet a member of the European Community, and any protection measures would need to be defined by Albanian legislation.
- 5.125 Neither of the two amphibian species are on the Albanian Red List, but both are on the IUCN Red List in the Least Concern Category. The European Common Frog (*Rana temporaria*) and the Eurasian Marsh Frog (*Rana ridibunda*) are both given as of “Least Concern” in view of their wide distribution, tolerance of a broad range of habitats, presumed large population, and because they are unlikely to be declining fast enough to qualify for listing in a more threatened category.
- 5.126 This site was unsuitable for bat roosts – there were no mature trees or buildings. The site was intensively grazed by goats and there was no immediate evidence of any other mammal activity.

Figure 5.9 - Reptile Habitat at Proposed Limestone Quarry Site



Figure 5.10 - Proposed Cement Plant Area with Drinking Pool in Background



Proposed Flysch Quarry Site

- 5.127 The study site borders a small village where woody vegetation was more evident, in part associated with gardens and orchards, and the general impression was of a more biologically productive and diverse habitat than is found at the proposed limestone quarry site. Suitable habitat for reptiles existed across the entire site but only 1 species was recorded, the Viviparous or Common Lizard. Individuals of the Balkan Stream Frog (*Rana graeca*) were noted along a watercourse/spring **adjacent** to the proposed quarry site. Roadside pools where rainwater had collected in the ruts created by tyres of heavy plant along access tracks (Figure 5.11) provided habitat for 2 other species of frog, the European Common Frog and the Eurasian Marsh Frog.
- 5.128 The conservation status of the Common Lizard has already been described (para 5.121). None of the amphibians are on the Albanian Red List, but all three species are on the IUCN Red List in the Least Concern Category. The Greek Stream Frog (*Rana graeca*), the European Common Frog (*Rana temporaria*) and the Eurasian Marsh Frog (*Rana ridibunda*) are all given as of "Least Concern" in view of their wide distribution, tolerance of a broad range of habitats, presumed large population, and because they are unlikely to be declining fast enough to qualify for listing in a more threatened category. The first species (recorded outside but not on the flysch quarry site) is also listed on Annex IV (Animal and Plant Species of Community Interest in Need of Strict protection) of Council Directive 92/43/EEC of 1992 on the conservation of natural habitats and of wild fauna and flora (the "Habitats Directive").

Figure 5.11 - Typical Access Track through Study Proposed Flysch Quarry Site where Pools Form



Mammals

- 5.129 The project site itself lacked suitable roosts for bats although it would presumably be a potential foraging area. The adjacent village and associated building looked suitable for roosting bats as does the steep rocky escarpment with associated crevices and caves to the west of the project site. Also, along the access track to the site, there were a number of man made tunnels which looked suitable for roosting bats.
- 5.130 The site is intensively grazed by goats and horses, but there was no immediate evidence of any further mammal activity at any of the project sites during the limited walk-over survey. Nevertheless, given that 12 species of bat (10 of them considered to be of conservation concern, Table 5.7) and 8 other species of mammal of conservation concern (Brown Hare, Red Squirrel, Common Dormouse, Wolf, Red Fox, Weasel, Western Polecat, Badger) are known from the wider area it is possible that further surveys would reveal that some of these species could sometimes be found on or very near to the project development sites, including access roads.

Figure 5.12 - Grazed Areas at Proposed Flysch Quarry Site



Conclusion - Ecological Value of Proposed Limestone and Flysch Sites

- 5.131 The Burizana area is ecologically diverse, but not unique in Albania; both proposed quarry sites are in a vegetation belt defined as “Sclerophyllous evergreen forest and shrub” which is considered to be typical evergreen Mediterranean vegetation. Similar habitats and species are found elsewhere in the region, including the Dajti National Park. Nevertheless, and despite the degradation, a range of quite species-rich habitats are represented at each location and along the routes of the proposed access roads. Though the March field visit did not reveal any very significant differences in fauna present at the two sites, from the vegetation perspective in particular, the Flysch area appears to be the more diverse, while parts of the limestone site are entering a final and severe stage of degradation with soil erosion taking place.
- 5.132 A small number of plant and animal species on IUCN and Albanian Red Data lists were recorded at or near the project sites (the bird species were foraging only – no signs of nesting on the site), during the limited field investigations conducted in spring 2006, but they are not species on the IUCN endangered or critically endangered list. It is possible that repeat surveys, adopting special techniques for e.g. bats and reptiles, might confirm the presence of other species of flora and fauna already on the Appendix 4.3 list of “possible” species, including one or two Red List species. However the field and desk studies conducted have indicated that the habitats and species recorded at the limestone and flysch quarry sites are neither unique to those sites nor critical for the survival of any species locally, in Albania as whole or in

Europe. The same or very similar habitats and the same species occur elsewhere in Albania and in Europe.

- 5.133 Thus the project areas are not considered to be “Critical Habitat” as defined by IFC’s Performance Standard 6 “Biodiversity Conservation and Sustainable Natural Resources Management” which are areas with high biodiversity value, including habitat required for the survival of *critically endangered* or *endangered* species (according to the IUCN Red List of Threatened Species or as defined in national legislation).
- 5.134 Furthermore, it should be noted that inclusion of a species on the Albanian Red List does not mean that “protection” for it is absolute (Albanian Law No. 7875 of 1994 on Protection of Wild Fauna and Hunting is especially concerned with the protection of fauna in relation to hunting). It is understood that permission to develop sites with protected species present can be granted, subject to mitigation measures being adopted (and this principle, of permission/mitigation, applies to protected species in other EU countries such as the U.K.). It should also be noted that the purpose of the IUCN Red Lists is to highlight threatened taxa and to promote their conservation. Therefore, when considering ecological mitigation, the conservation status of red-listed flora and fauna will need to be taken into account where they are found on project sites; this has been done in later chapters, with appropriate proposals being made for mitigation and compensation/enhancement.

CLIMATE

General Information on Albania’s Morphology and Climate

- 5.135 The Republic of Albania lies to the Western part of Balkan Peninsula at the coast of Adriatic and Ionian Seas. It is situated between 39° 38' - 42°39' N and 19°16' -21°04' E¹⁴. The country covers an area of 28,748 km² with the coastal plain in the west rising steeply to high mountains in its northern, central and southern parts.
- 5.136 The country is characterized by typical Mediterranean weather, i.e. by hot dry summer, with long days of sunshine, and mild winters with abundant rainfall. Rainfall in Albania usually occurs with southwest winds and is affected by the relief and thus providing a variety of climatic and rainfall patterns in the different Regions of the country. These variations are also apparent in Table 5.11 below, where monthly and annual rainfall data (continuous observations) from selected meteorological stations for the period 1951-1980 are listed [5].

¹⁴ Ref [7]: *Transboundary groundwater of Albania*, M. Banja, Hydrometeorological Institute.

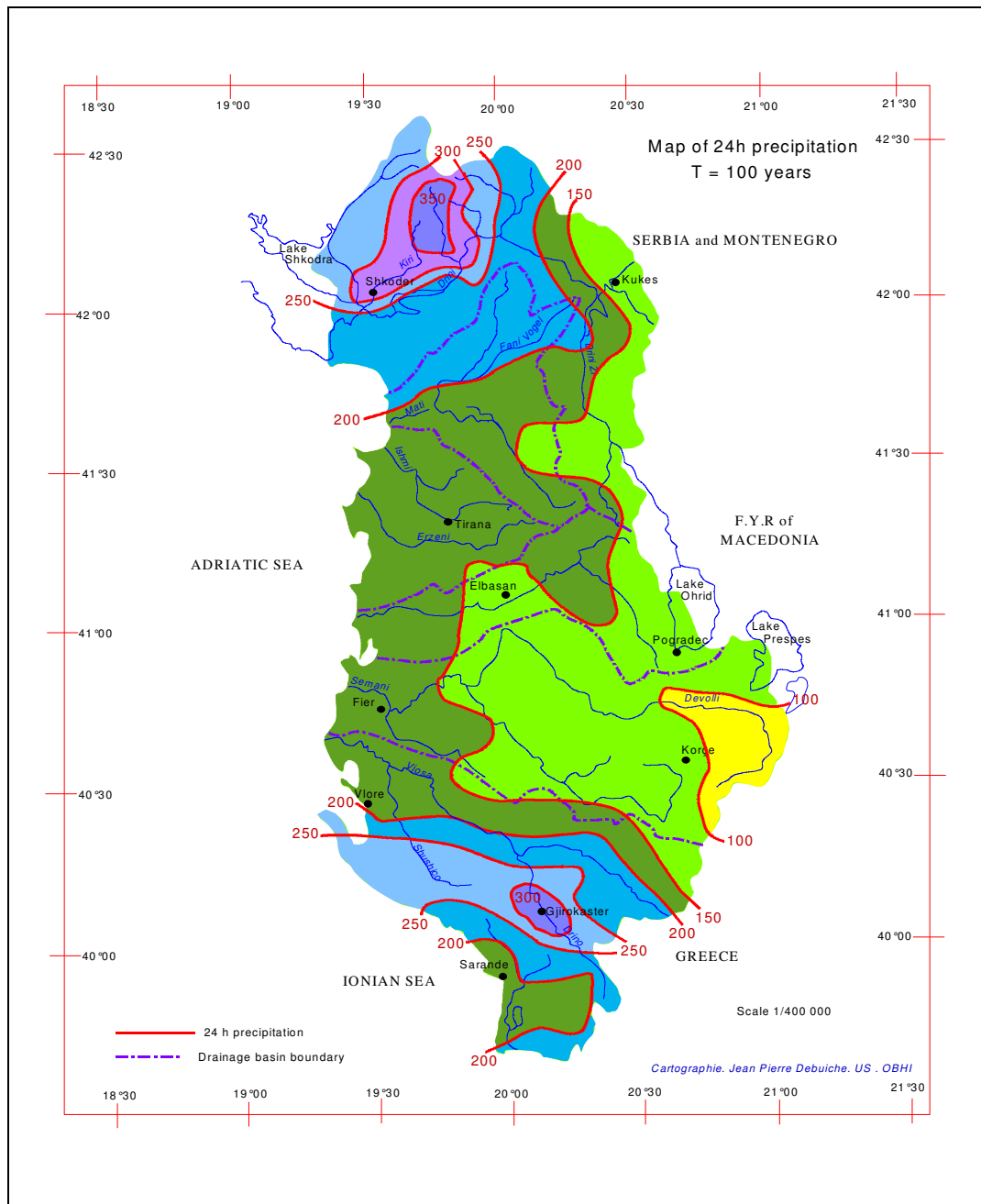
**Table 5.11 - Monthly and Annual Rainfall Data from Selected Stations
(for the years 1950-80)**

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bilisht	66.8	63.9	54.3	47.5	62.9	38.3	33.1	26.8	42.8	73.5	96.0	80.8	686.7
Kelcyre	182.2	160.5	107.2	86.5	76.0	39.6	33.4	33.0	71.2	141.6	215.4	209.0	1,355.8
Kukes	91.9	81.1	77.7	78.9	77.1	48.2	49.4	46.3	73.8	94.7	117.8	109.3	946.2
Lezhe	174.4	148.4	138.2	121.4	98.0	78.0	38.7	54.4	94.4	152.0	190.3	175.1	1,463.3
Polican	283.2	254.0	184.8	143.4	98.4	48.9	29.2	40.0	101.4	198.1	310.2	345.0	2,036.6
Puke	239.9	201.0	178.1	175.5	131.6	88.9	60.2	91.2	150.5	212.5	287.7	285.6	2,102.7
Sarande	188.3	151.0	117.9	80.9	57.4	25.0	10.7	22.9	97.4	232.1	232.1	203.6	1,351.6
Theth	315.8	311.3	242.3	233.4	146.7	100.1	67.1	105.5	142.5	332.1	463.3	460.7	2,920.8
Vlore	126.1	99.5	83.5	69.6	53.5	22.9	16.7	29.9	57.9	111.5	148.4	136.3	954.9

Source: Ref. [5]

- 5.137 In northern Albania (Alps) the average rainfall is over 2,500mm while in valleys in the interior of the country ranges between 650-700 mm. Annual distribution of rainfall shows a maximum of approximately 40%, which occurs in winter and a minimum of about 10% that occurs in summer. Secondary maximums are present at the interior part of the country. The number of rainy days (>1.0 mm) per year varies from 100-130 days mainly during the winter months. Summer droughts are more pronounced towards the southwest.

Figure 5.13 - 24 h Precipitation Allocation



Source: **Ref [8]**: Flood potential in Albania, Presentation/Introducer Dr. Agim Selenica, Hydrometeorological Institute.

Specific Information for the Proposed Area of Cement Plant and Quarries [6]

- 5.138 With regard to the climatic assessment of the proposed area of cement plant and quarries, a series of meteorological data, such as wind regime, rainfall, air temperature and humidity are given below. These data have been extracted from existing records of continuous observations for the period 1951-1980 from the meteorological station of Laci, which is located approximately 10km to the north of Burizana. The relief at the location of this station is quite similar to that of the cement plant and quarries sites and thus, the following meteorological information is considered representative for the examined area.

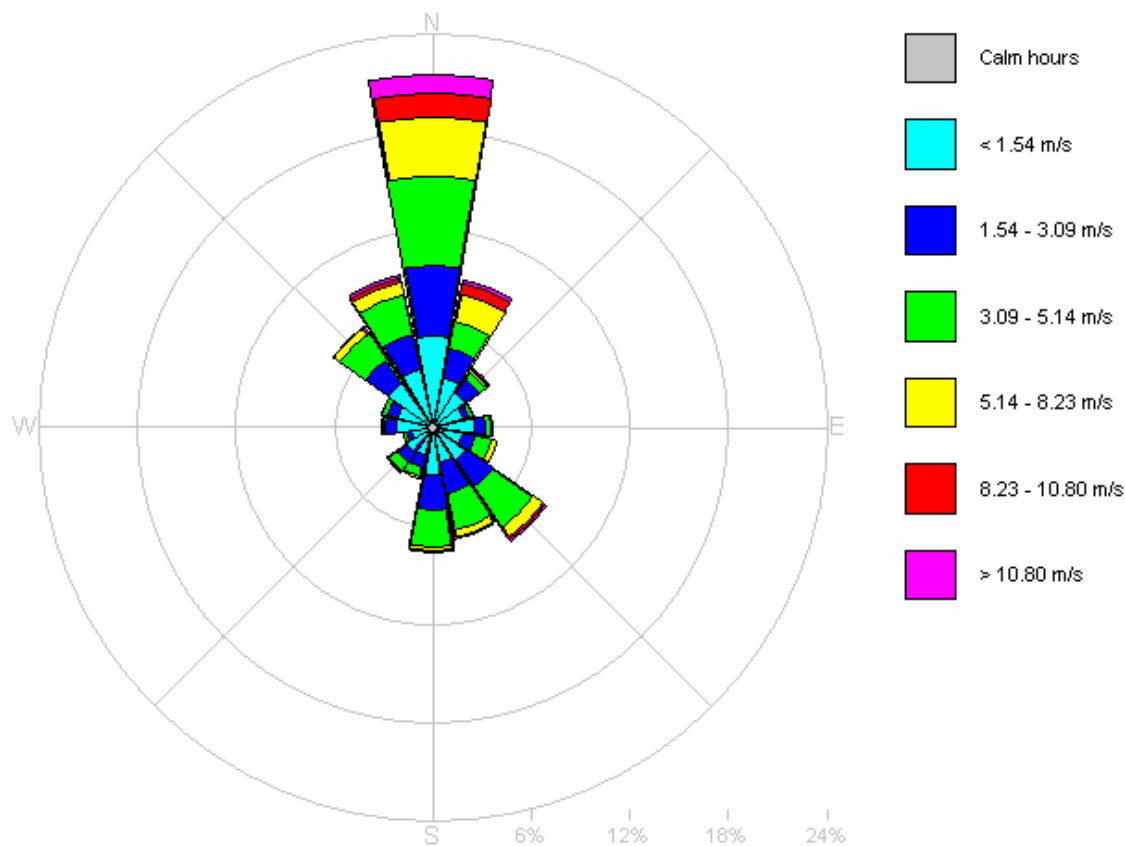
METEOROLOGY

- 5.139 Hourly sequential data was obtained for the period January 2003 to December 2006 from the meteorological station at Podgorica for use in the dispersion modelling study of the plant emissions. This station located at 42.37 N 19.25 E is approximately 105 kilometres to the north northeast of the project site and was found to be the nearest meteorological station with adequate records, although lacking some cloud cover data. Cloud cover data from Tivat was combined with the Podgorica data to provide a data set suitable for dispersion modelling of the plant. Meteorological conditions are expected to be broadly similar at Podgorica and Burizana, as both are at similar distances from the coast.
- 5.140 This meteorological data was used to generate a four year frequency distribution of wind speed and direction. This data is shown in Table 5.12 and in the wind rose diagram in Figure 5.14.
- 5.141 It is evident from the data for these years that there is a marked prevailing wind from the north and the adjoining sectors. Were winds to be evenly distributed, each of the sixteen sectors would have a frequency of 5.7%. The four sectors from the north west to the north north east account for over 45% of winds. The prevalence of high wind speeds follows a similar distribution.
- 5.142 There is a secondary prevailing wind from the south east to the south. Winds from these three sectors occur for over 21% of the time.
- 5.143 Winds from all other sectors are relatively infrequent; those from the four easterly sectors occur for only 12% of the time, as do those from the five sectors centered on the west south west.

Table 5.12 - Relative Frequency Distribution of Wind Speed and Direction, %

Direction		Speed m/s						Total %
Bearing	Degrees	≤1.54	1.54 to 3.09	3.09 to 5.14	5.14 to 8.23	8.23 to 10.8	>10.8	
N	0.0	4.985	4.372	5.342	3.605	1.454	1.175	20.933
NNE	22.5	2.515	1.805	1.740	1.714	0.636	0.240	8.650
NE	45.0	1.974	0.978	0.539	0.197	0.026	0.040	3.753
ENE	67.5	1.403	0.368	0.165	0.023	0.000	0.060	2.019
E	90.0	1.939	0.627	0.411	0.057	0.003	0.003	3.040
ESE	112.5	1.318	0.790	0.967	0.299	0.048	0.006	3.428
SE	135.0	1.834	1.974	2.983	0.767	0.171	0.108	7.837
SSE	157.5	1.651	1.888	2.307	0.382	0.068	0.077	6.374
S	180.0	2.276	2.156	2.304	0.205	0.017	0.046	7.004
SSW	202.5	1.172	0.844	0.530	0.125	0.011	0.003	2.687
SW	225.0	1.320	0.739	0.664	0.086	0.014	0.031	2.855
WSW	247.5	0.827	0.302	0.160	0.031	0.000	0.000	1.320
W	270.0	1.694	0.607	0.214	0.014	0.000	0.046	2.575
WNW	292.5	1.700	0.619	0.359	0.017	0.003	0.034	2.732
NW	315.0	2.781	1.663	1.979	0.405	0.023	0.046	6.896
NNW	337.5	3.057	2.153	2.567	0.790	0.197	0.231	8.995
Total %		32.446	21.886	23.232	8.718	2.672	2.145	91.099
Calms								8.901
Missing								0.000
Total %								100.000

Figure 5.14 – Wind Rose Diagram for Podgorica, 2003 to 2006



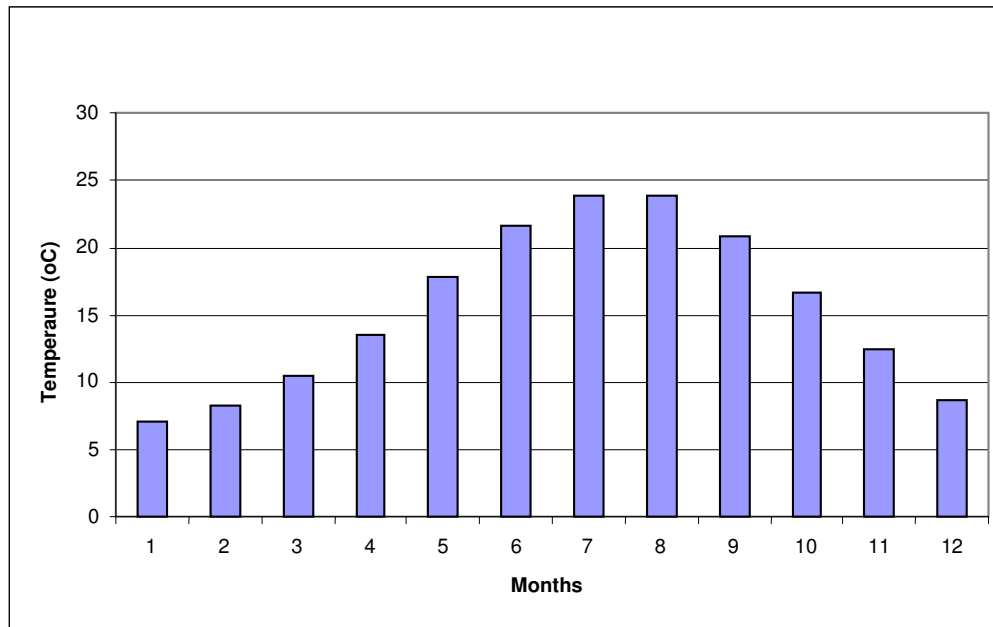
Temperature Regime

5.144 Following the general climatic features of the zone, the temperature regime is typically Mediterranean, characterized by hot summer and cold winter. Maximum, mean and minimum monthly temperatures are given in the Table 5.13, while Figure 5.15 depicts the annual distribution of mean monthly temperatures.

Table 5.13 - Monthly Mean, Absolute Maximum and Minimum Temperatures

Temperature (°C)	J	F	M	A	M	J	J	A	S	O	N	D	Year
Max Absolute	19.8	24.0	25.8	27.5	34.8	36.7	38.3	38.2	34.8	30.4	25.2	22.0	38.3
Mean	7.1	8.3	10.4	13.6	17.9	21.6	23.9	23.8	20.8	16.6	12.4	8.6	15.4
Min Absolute	-10	-6.2	-3.0	2.7	6.0	10.0	11.4	12.7	8.7	0.1	-1.2	-5.5	-10

Figure 5.15 - Mean Monthly Temperatures Distribution



Precipitation

5.145 Rainfall regime in this zone is typically Mediterranean. Thus, only 12% of the annual precipitation is observed during the dry season (Jun-Aug). The mean annual precipitation is 1,464mm. The distribution of monthly precipitation is depicted in Table 5.14 and Figure 5.16 below, while the monthly distribution of the maximum 24h precipitation is given in Table 5.15.

Table 5.14 - Mean Monthly and Annual Precipitation

Month	J	F	M	A	M	J	J	A	S	O	N	D	Year
Precipitation (mm)	174	148	138	121	98	78	39	54	94	152	190	175	1,464

Figure 5.16 - Mean Monthly Precipitation Distribution

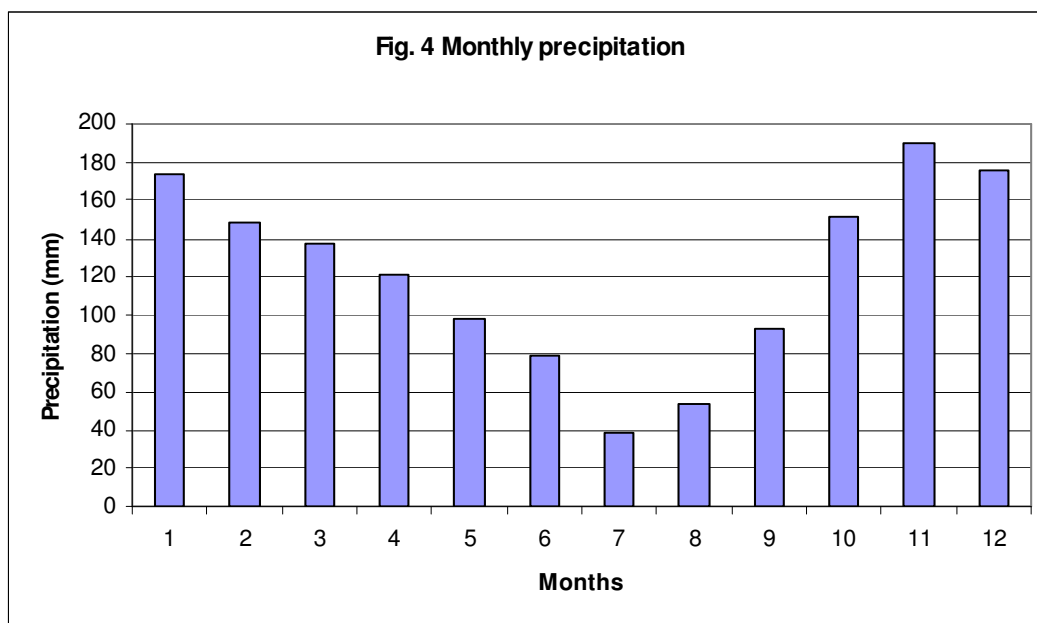


Table 5.15 - Maximum 24 Hourly Precipitation by Months

Month	J	F	M	A	M	J	J	A	S	O	N	D	Year
Height, mm	133	80	120.5	91.5	113.2	160.1	57	115.4	139.5	116.7	135.1	90	160.1

Air Humidity

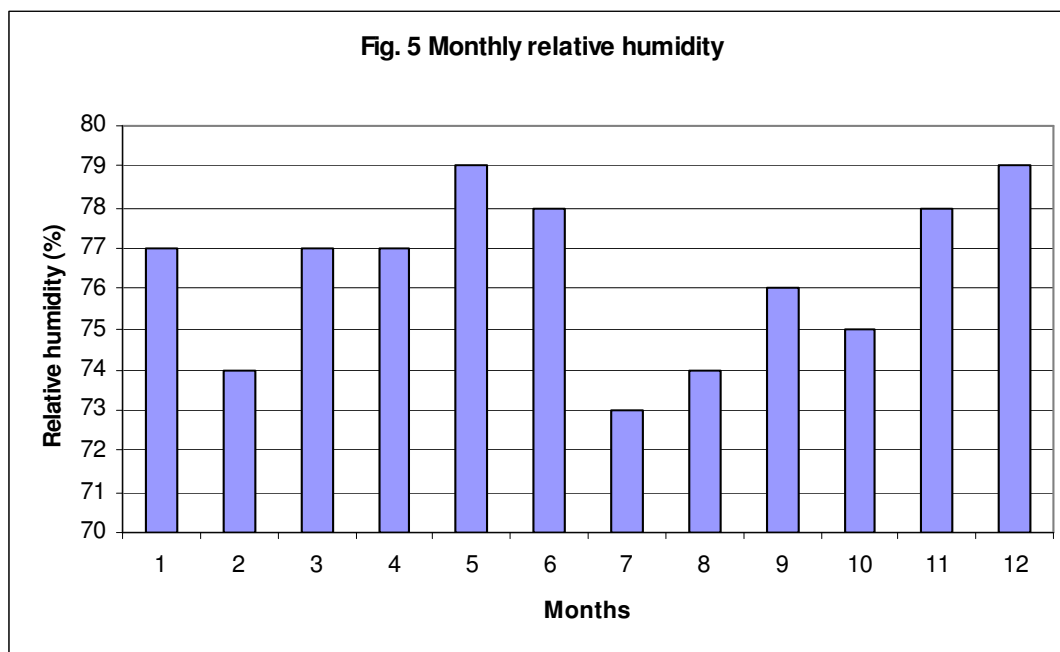
5.146 Following the general atmospheric circulation and the effect of the local relief, a monthly distribution of the relative humidity is observed. Higher values of relative humidity are observed during May-June and November-December and lower values during July and August.

5.147 The monthly distribution of the relative humidity is presented in the Table 5.16 and Figure 5.17 below.

Table 5.16 - Monthly Distribution of Relative Humidity

Month	J	F	M	A	M	J	J	A	S	O	N	D	Year
Relative Humidity, %	66	63	65	70	72	69	62	66	67	66	69	64	67

Figure 5.17 - Mean Monthly Distribution of Relative Humidity



AIR QUALITY

Air Pollutants

Sulphur Dioxide

5.148 The most common sources of sulphur dioxide include fossil fuel combustion, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of refuse and production of elemental sulphur. Coal burning is the single largest man-made source of sulphur dioxide followed by oil burning. Sulphur dioxide causes constriction of the airways of the lung. This effect is particularly likely to occur in people suffering from asthma and chronic lung disease. In much of western Europe, concentrations of sulphur dioxide in urban areas have continued to decline in recent years as a result of controls on emissions and changes in fuel use. Annual mean concentrations¹⁵ in such areas are now mainly in the range 20 to 60 µg/m³.

Nitrogen Dioxide

5.149 Nitrogen dioxide (NO₂) is a secondary pollutant produced by the oxidation of nitric oxide (NO). Nitric oxide and nitrogen dioxide are collectively termed nitrogen oxides (NO_x). Nitric oxide is produced during high temperature combustion of fuel in, for

¹⁵ Air Quality Guidelines for Europe Second Edition, WHO, 2000

example, road vehicles, heaters and cookers. NO₂ is associated with adverse effects on human health. At high levels NO₂ causes inflammation of the airways. Long term exposure may affect lung function and respiratory symptoms. NO₂ also enhances the response to allergens in sensitive individuals. Levels of nitrogen dioxide vary widely because a continuous baseline level is frequently present, with peaks of higher levels superimposed. Natural background annual mean concentrations are in the range 0.4 to 9.4 µg/m³. Outdoor urban levels have an annual mean range of 20 to 90 µg/m³ and hourly maxima in the range 75 to 1015 µg/m³.

Particulate Matter

- 5.150 Particulate Matter is generally categorised on the basis of the size of the particles (for example PM₁₀ consists of particles with an aerodynamic diameter of less than 10 µm). Particulate matter is made up of a wide range of materials and arises from a variety of sources. Concentrations of particulate matter comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. Particulate matter derives from both human-made and natural sources (such as sea spray and Saharan dust). One of the largest sources of particulate matter is emissions from road traffic. Particulate matter in vehicle exhaust gases consists of carbon nuclei onto which a wide range of compounds are absorbed. Diesel engines produce the majority of particulate emissions from the vehicle fleet. Both short-term and long-term exposure to ambient levels of particulate matter is consistently associated with respiratory and cardiovascular illness and mortality as well as other ill-health effects. The associations are believed to be causal.

Carbon Monoxide

- 5.151 Carbon monoxide is formed from the incomplete combustion of carbon containing fuels. The largest source is road transport, with residential and industrial combustion making significant contributions. Carbon monoxide is readily absorbed through the lungs and reduces the oxygen carrying capability of the blood which can lead to a range of symptoms. Early symptoms of exposure include tiredness, drowsiness, headache, pain in chest and sometimes stomach upsets.

Benzene

- 5.152 Sources of benzene in ambient air include cigarette smoke, combustion and evaporation of benzene-containing petrol, petrochemical industries, and combustion processes. Benzene is a genotoxic carcinogen and exposure to it is associated with leukaemia. Mean ambient air concentrations of benzene in rural and urban areas are

about 1 µg/m³ and 5 to 20 µg/m³, respectively. Indoor and outdoor air levels are higher near such sources of benzene emission as filling stations.

Dust

- 5.153 Dust¹⁶ is an inevitable part of the human environment and individuals are able to tolerate certain levels without adverse consequences. Human activities often generate dust and in some cases have potential to cause higher than tolerable levels resulting in annoyance (or 'nuisance') and/or leading to increased incidence of poor health. 'Nuisance dust' comprises particles between 10 and 75 micrometers in diameter, which deposit on exposed surfaces and can cause annoyance by appearance and/or physical effect, usually when levels are above the normal range. Noticeable accumulations of smaller particles are much less likely as these are less inclined to deposit and are more susceptible to being blown away.

Air Quality Criteria

EU Directive Limit and Guide Values

- 5.154 The first European Community (EC) air pollution limit values were introduced in the 1980s. These contained limit values that must be attained and more stringent, but non-obligatory, guide values. In 1996, the European Union adopted a Directive on ambient air quality assessment and management and later supporting pollutant specific Daughter Directives were prepared.
- 5.155 The first Daughter Directive set legally binding limit values for concentrations of sulphur dioxide, nitrogen dioxide, particles and lead in air which must be complied with by 1st January 2005 or, in the case of nitrogen dioxide, 2010. The Daughter Directive limit values will supersede previous EC Directives on their achievement date (i.e. 1st January 2005 or 1st January 2010).
- 5.156 A second Daughter Directive set limit values for concentrations of benzene and carbon monoxide to be complied with by 2010 and 2015, respectively. A third Daughter Directive for ozone has been agreed by the EU Member States and a fourth Daughter Directive for polycyclic aromatic hydrocarbons and heavy metals has recently been adopted.

¹⁶ British Standard BS6069 (Part 2) defines 'dust' as particles with a diameter between 1 and 75 micrometers.

WHO Guidelines

5.157 The WHO Air Quality Guidelines as revised in their Global Update 2005 are summarised in Table 5.17.

Table 5.17 – Updated WHO Air Quality Guideline Values, $\mu\text{g}/\text{m}^3$

Pollutant	Averaging Time	Guideline Value, $\mu\text{g}/\text{m}^3$
Particulate matter		
PM _{2.5}	1 year	10
	24 hour (99 th percentile)	25
PM ₁₀	1 year	20
	24 hour (99 th percentile)	50
Nitrogen dioxide, NO ₂	1 year	40
	1 hour	200
Sulphur dioxide, SO ₂	24 hour	20
	10 minute	500

5.158 An earlier WHO report¹⁷ discussed the basis for the 1-hour nitrogen dioxide guideline then recommended. They noted that the lowest-observed-effect level in asthmatics exercising during exposure to 560 $\mu\text{g}/\text{m}^3$ nitrogen dioxide is not necessarily adverse, as there was only a 10% reduction in pulmonary function. This demonstrates the considerable margin of protection of human health built into the 200 $\mu\text{g}/\text{m}^3$ guideline now recommended by the WHO and also inherent in the EU limit value.

Existing Data

5.159 There is limited published data on ambient air quality in Albania. There are measurements at five sites in Tirana, although these are thought to include roadside sites and all are of an urban nature. The annual average pollutant concentrations for the year 2006 are shown in Table 5.18.

¹⁷ Air Quality Guidelines for Europe, WHO Regional Publications, European Series No. 23, WHO, Copenhagen 1987

Table 5.18 – Annual Mean Pollutant Concentrations in Tirana, $\mu\text{g}/\text{m}^3$

Site	PM ₁₀	Sulphur Dioxide	Nitrogen Dioxide
Tirana 1	116	22	30
Tirana 2	137	26	36
Tirana 3	84	18	23
Tirana 4	369	31	55
Tirana 5	108	22	27

- 5.160 The reported PM₁₀ concentrations are well in excess of the EU Directive limit value of 50 $\mu\text{g}/\text{m}^3$. The PM₁₀ concentration at Tirana 4 is exceptionally high and the nitrogen dioxide concentration at this site also exceeds the EU Directive limit value of 50 $\mu\text{g}/\text{m}^3$. Sulphur dioxide concentrations are relatively low, although there is no health based limit value for annual mean concentrations specified in the EU Directive; the limit of 20 $\mu\text{g}/\text{m}^3$ set for the protection of vegetation is not applicable in urban areas. All pollutant concentrations in Tirana are likely to be considerably higher than those pertaining in Burizana.
- 5.161 The local regulatory authorities have not undertaken ambient air quality surveys in the area of the proposed cement works. However, given the largely undeveloped and rural nature of the area, ambient air quality is likely to be good.
- 5.162 Properties fronting onto the main road through Burizana are likely to be subject to somewhat higher pollutant concentrations due to exposure to vehicular emissions. However, based on our experience of conducting assessments of major road schemes in the UK and elsewhere in Europe, local air quality throughout the town is thought likely to be well below the EU Directive criteria, given expected traffic levels in the area, unless serious congestion or “street canyons” cause unusual localised effects.

NOISE

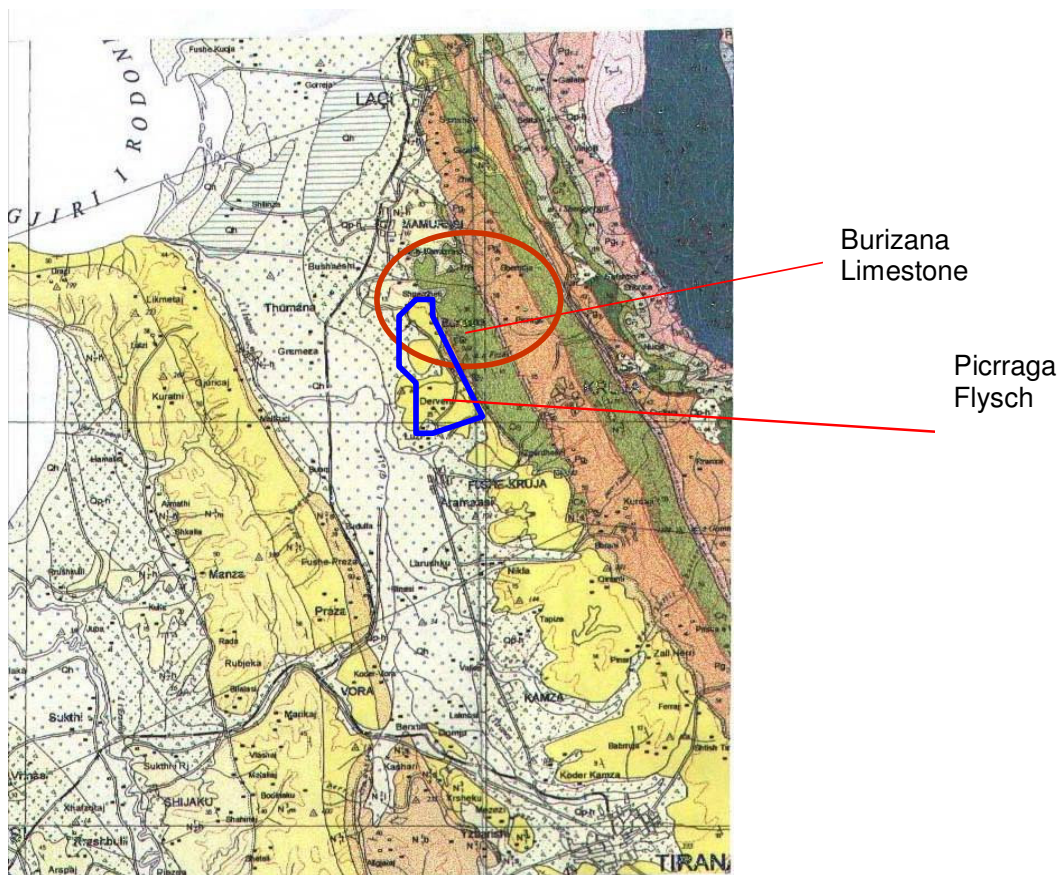
- 5.163 No baseline noise data is understood to exist for the areas where the proposed plant is to be located. The area is predominantly rural, away from any major transportation infrastructure.
- 5.164 No baseline data is understood to exist at the nearest noise sensitive locations, or along the proposed routes for the transportation of fuel, raw materials and the finished cement products to and from the plant area.

- 5.165 Access routes to the site are likely to be constructed as part of the development. These routes are likely to use corridors away from existing routes rather than upgrading existing routes.

GEOLOGY

- 5.166 The site is located within the Burizana – Piccrage – Droje Region, in the western mountain chain of Makaresh-Burizana. The central part comprises Eocene and Upper Cretaceous limestone, with Oligocene (Tertiary) flysch formations to the east and Tortonian (Miocene) molasse formations to the west.
- 5.167 Structurally, the Eocene and Upper Cretaceous limestone form a monocline, trending approximately north to south and dipping down to the east. The west flank is overlain by the Miocene molasse formations to the west. Oligocene deposits to the east have been folded into the Droje syncline. Regional geology is shown on Figure 5.18.

Figure 5.18 - Geology of the Region of Burizana -Droje and Areas of Picrraga



5.168 The geological sequence in the region includes:

- Quaternary (Q) strata. These include flood (diluvium) and deltaic deposits (proluvium) and those formed by the in-situ weathering of the underlying strata (eluvium),
- Pliocene (N2-Q) strata. These are transgressive formations, resting on flysch to the east or molasse to the west. They are between 10 and 50m thick and include gravel of both limestone and quartz, quartz conglomerates and mudstone/clays;
- Miocene (Tortonian) molasse (argillaceous and sandy strata and siltstone). These deposits are associated with marine transgressions and include a complex range of fossilised marine fauna. They range in thickness from 200 to 300m, although in Kuaternar, they are over 500m thick. The sequence comprises:

- e lbes (N1t-i), a sandy formation, with micro-conglomerate and cobbles. These strata are between 50 and 300m in thickness,
- Skuterre (N1t-s), a local, cobble rich, silty formation, rarely sandy. Siltstone strata crop out near Fushe-Kruja and are between 30 and 200m thick. Thick layers of cobbles (0.4 to 1.2m) are also present in these strata,
- Priska (N1t-p), a grey and white sandy formation, predominantly silt, with quartz gravel, glassy conglomerate and carbonate cement. Layers are between 10 and 12m in thickness. Limestone, between 30 and 70m in thickness, crops out on the hillsides of Burizana and Fushe-Kruja;
- Oligocene flysch. These comprise a rhythmically interbedded sequence of mudstone, siltstone and sandstone, with occasional slate, generally with beds between 1 and 5m thick, locally between 10 and 15m thick. These formations, between 300 and 500m thick, have been folded and micro-folded near Picrraga;
- Eocene and Palaeocene limestone, including fossiliferous, clastic limestone between 70 and 200m thick. Regionally, these dip to the north-northwest at 30 to 45°. The River Droje has cut through the limestone, forming a canyon. Plate limestone (300 to 400m thick) and grey-white limestone (500 to 600m) are present in the west. Massive, white to grey limestone (300 to 400m), recrystallised limestone (200 to 300m) and plate limestone (180 to 200m) are present towards the east; and
- Cretaceous limestone, including massive bedded limestone and dolomitic limestone between 400 and 500m thick. These strata comprise between 50 and 60% of the hilly, central mountain regions.

Limestone to be Exploited by Antea

- 5.169 An exploratory investigation was carried out by Antea in 2006 - 2007 to assess the geology of the Burizana limestone. The geology of the Boka e Kuqe limestone is shown in Figure 5.19 and geological cross sections in Figure 5.20.

[illegible]

[illegible]

5.170 The detected geological sequence comprises:

- Quaternary Diluvium, Eluvium and Proluvium, in most cases mixed with soil and plant roots, in most boreholes in the centre and east. These layers are between 0.5 and 2m thick. However, in some areas, dolomites are present at surface and these layers absent;
- Pliocene, N2-Q1 red clays in the west, north and south. The clays are up to 5m thick in the north, 18m thick in the south and between 2 and 5m thick in the west. They are generally absent in the east. Quartz grains and rare pebbles are also encountered within the clay. In addition, the clays are present as pockets within the underlying limestone, having infilled voids formed by weathering (karsification); and
- Eocene, Palaeocene and Cretaceous limestone (Burizana limestone). This comprises limestone, dolomite and dolomitic limestone. The limestone is almost entirely of the algae charophyte facies. The calcite is micritic and the dolomite is dolosparite. The limestone deposit has a biochemical origin, formed under the lagoon-like conditions of a long and narrow platform sea. The limestone, especially in the central part, is of very high (CaO >54.20%) and high-grade purity (CaO from 53.59% up to 54.20%).

5.171 Based on the geological sequence described above, the Quaternary deposits are predominantly granular and as such, likely to be of relatively high permeability and thus, relatively high leaching potential, that is, rainfall (and any pollutants) will be able to move relatively quickly downwards through this strata. The Pliocene clays may be of lower permeability because of the clayey material and thus, lower leaching potential. However, this will only be the case in areas where they are of high clay content, sufficient thickness and un-breached. The limestone strata are highly permeable.

Flysch to be Exploited by Antea

5.172 An exploratory investigation was carried out by Antea 2006 - 2007 to assess the geology of the Burizana flysch deposit. The geology map of the Burizana flysch deposit is shown on Figure 5.21 and geological cross sections on Figure 5.22.

HARTA GJEOLGJIKE SKEMATIKE E VENDBURIMIT TE FLISHT BURIZANE
Shkalla 1:2000
SCHEMATIC GEOLOGICAL MAP OF BURIZANA FLYSCH DEPOSITS
Scale 1 : 2 000

COORDINATES

Reference	East	North	Elevation
1.2	555000.00	560000.00	220.00
1.3	555000.00	560000.00	240.00
1.4	555000.00	560000.00	260.00
1.5	555000.00	560000.00	280.00
1.6	555000.00	560000.00	300.00
1.7	555000.00	560000.00	320.00
1.8	555000.00	560000.00	340.00
1.9	555000.00	560000.00	360.00
1.10	555000.00	560000.00	380.00
1.11	555000.00	560000.00	400.00
1.12	555000.00	560000.00	420.00
1.13	555000.00	560000.00	440.00
1.14	555000.00	560000.00	460.00
1.15	555000.00	560000.00	480.00
1.16	555000.00	560000.00	500.00
1.17	555000.00	560000.00	520.00
1.18	555000.00	560000.00	540.00
1.19	555000.00	560000.00	560.00
1.20	555000.00	560000.00	580.00
1.21	555000.00	560000.00	600.00
1.22	555000.00	560000.00	620.00
1.23	555000.00	560000.00	640.00
1.24	555000.00	560000.00	660.00
1.25	555000.00	560000.00	680.00
1.26	555000.00	560000.00	700.00
1.27	555000.00	560000.00	720.00
1.28	555000.00	560000.00	740.00
1.29	555000.00	560000.00	760.00
1.30	555000.00	560000.00	780.00
1.31	555000.00	560000.00	800.00
1.32	555000.00	560000.00	820.00
1.33	555000.00	560000.00	840.00
1.34	555000.00	560000.00	860.00
1.35	555000.00	560000.00	880.00
1.36	555000.00	560000.00	900.00
1.37	555000.00	560000.00	920.00
1.38	555000.00	560000.00	940.00
1.39	555000.00	560000.00	960.00
1.40	555000.00	560000.00	980.00
1.41	555000.00	560000.00	1000.00
1.42	555000.00	560000.00	1020.00
1.43	555000.00	560000.00	1040.00
1.44	555000.00	560000.00	1060.00
1.45	555000.00	560000.00	1080.00
1.46	555000.00	560000.00	1100.00
1.47	555000.00	560000.00	1120.00
1.48	555000.00	560000.00	1140.00
1.49	555000.00	560000.00	1160.00
1.50	555000.00	560000.00	1180.00
1.51	555000.00	560000.00	1200.00
1.52	555000.00	560000.00	1220.00
1.53	555000.00	560000.00	1240.00
1.54	555000.00	560000.00	1260.00
1.55	555000.00	560000.00	1280.00
1.56	555000.00	560000.00	1300.00
1.57	555000.00	560000.00	1320.00
1.58	555000.00	560000.00	1340.00
1.59	555000.00	560000.00	1360.00
1.60	555000.00	560000.00	1380.00
1.61	555000.00	560000.00	1400.00
1.62	555000.00	560000.00	1420.00
1.63	555000.00	560000.00	1440.00
1.64	555000.00	560000.00	1460.00
1.65	555000.00	560000.00	1480.00
1.66	555000.00	560000.00	1500.00
1.67	555000.00	560000.00	1520.00
1.68	555000.00	560000.00	1540.00
1.69	555000.00	560000.00	1560.00
1.70	555000.00	560000.00	1580.00
1.71	555000.00	560000.00	1600.00
1.72	555000.00	560000.00	1620.00
1.73	555000.00	560000.00	1640.00
1.74	555000.00	560000.00	1660.00
1.75	555000.00	560000.00	1680.00
1.76	555000.00	560000.00	170

5.173 The detected geological sequence comprises:

- Quaternary Diluvium. These are present in the east. They are 120m long, 30 to 36m wide and 3 to 10m thick. They include soil with sand, gravel and cobbles, siltstone and rare limestone;
- Quaternary Brecciated Diluvium (Q4-). These are also present in the east, are 65 to 70m long, 10 to 30m wide and 5 to 10m thick. They include soil, cobbles, limestone sand and blocks of limestone;
- Quaternary Proluvium (Q4). These are present in the riverbed, creating a 200m long line which is 2 to 5 and 8 to 10m wide and 3 to 5 and 7 to 10m thick. They include soil, gravel, breccia and blocks of dolomite;
- Quaternary Eluvium (Q4- Eluv). These are present across 60 to 70% of the flysch area investigated and include silty sand and soil, formed by in-situ weathering of the underlying flysch. They are between 0.5 to 1 and 2 to 3m thick;
- Upper Flysch. This is present in the east and up to 150m thick. It includes a rhythmically bedded sequence of mudstone and siltstone with rare sandstone;
- Lower Flysch. This is present in the west and up to 450m thick. It comprises a rhythmically bedded sequence of sandstone, siltstone and mudstone with micro-conglomerate.

5.174 Based on the geological sequence described above, the Quaternary deposits are predominantly granular and as such, likely to be of relatively high permeability and thus, relatively high leaching potential, that is, rainfall (and any pollutants) will be able to move relatively quickly downwards through this strata. The flysch deposits are a mixture of argillite, alevrolite, mudstone, siltstone and sandstone. The former two are likely to be of lower permeability than the sandstone, although fracture flow may occur.

Ground Conditions

5.175 Apart from chemical analysis of the limestone and flysch for assessment of the quality of the workable deposits, no chemical contaminant analysis has been carried out of the ground (soil, subsoil, natural strata and groundwater) beneath the site.

WATER RESOURCES AND MANAGEMENT

- 5.176 The hydrogeological regime in Central Albania is complicated due to the rugged mountainous terrain (in the east). This terrain is crossed by a well developed hydrographic network that, eventually, discharges into the Adriatic Sea through the western, erosion induced, sedimentary delta lowlands.
- 5.177 The hydrogeological regime is highly dependent on regional conditions as determined by such factors as climate, geomorphology, tectonics, geological structures and formations, hydrolithological characteristics, circulation and drainage of groundwater, recharging of aquifers, etc.
- 5.178 There are two principal types of aquifers that arise in Central Albania, namely; porous gravely aquifers; and, carbonate, fissured, and karstified aquifers.
- 5.179 The site of the proposed facility is between the coastal delta plains and the rugged mountainous highlands. This results in both types of aquifers being present in the subground of the region.
- 5.180 Albania is rich in water resources, including rivers, groundwater, lakes, lagoons and seas. Overall its resources exceed by far its consumption, although locally water shortage and conflicts among users may occur in the dry season. The hydrographic basin of Albania covers 43,305 km², of which 28,748 km² lie within its boundaries. The rest (i.e. 33 per cent) is in Greece, the Former Yugoslav Republic of Macedonia and Yugoslavia, so Albania shares upstream and downstream water resources with its neighbours¹⁸.
- 5.181 Albania's 247 natural lakes constitute an important component of the country's hydrographic network. Resources are unevenly distributed throughout the country and also, they exhibit an uneven seasonal distribution. The available quantity of surface water and, to a lesser extent, the quantity of groundwater, decreases significantly during the summer. Thus, only about 6-9 % of the annual runoff is observed during the dry season (July - September)¹⁹. The major water resource is surface water, which is found in rivers, lakes and lagoons.
- 5.182 Degradation of the quality of transboundary water resources, caused mainly by pollution from land-based activities (nutrients, pathogens and oxygen-demanding wastes) is an important problem for Albania. The Water Sector is one of the priorities of the National Government. Several lending operations from international financial

¹⁸ Ref [1]: *Earth Trends, Country Profiles, Albania Water Resources - 2005 Report*.

¹⁹ Ref [2]: M. Banja, Hydrometeorological Institute, Albania, '*Transboundary groundwater of Albania*'.

institutions are supporting the rehabilitation of the water and wastewater systems in the country [2].

- 5.183 Much of Albania's economic activity is dependent on the utilisation of water resources. Over 90 percent of energy production is from hydropower plants, while agriculture is critically dependent on irrigation. However, the inadequate and poorly maintained infrastructure in each of the water-using sectors and the absence of institutional coordination has resulted in the lack of water supplies becoming a key constraint to many economic activities and to satisfying basic social needs.
- 5.184 More than two thirds of the water is lost during transport and distribution as a consequence of the obsolete supply infrastructure. The towns are supplied with drinking water for only a few hours each day while, in rural regions, the public supply does not even reach one citizen in two. In all rural areas as well as in the majority of towns, sewage is discharged in an uncontrolled manner. The consequences are that water is contaminated and the environment polluted; gastrointestinal illnesses are very common [1].
- 5.185 The Government of Albania has begun the preparation of the National Water Strategy (with funding by the EU) to set out policies on the efficient management and protection of water resources, and to specify an appropriate legal framework. However, the lack of adequate monitoring systems, the rapid changes in economic activities, and the continuous movements in population make the assessment of the use of water resources a difficult task. Available data suggests that irrigation and mining rely mostly on surface water, while households and industry on groundwater from aquifers. Domestic water demand is increasing not only because of population growth but also because of the increase in the level of water losses, estimated to be greater than 50 percent in all cities.
- 5.186 Table 5.19 below, provides an indication of Albania's Water Profile as well as its comparison with the European situation (data available for the years 1977–2005).

Table 5.19 - Albania's Water Profile

R/n.	Categories of Water Resources	Albania	Europe
1.	Internal Renewable Water Resources (IRWR), in cubic km		
1.1	Surface water produced internally	23	6,223
1.2	Groundwater recharge	6.2	1,317.9
1.3	Overlap (shared by surface water and groundwater)	2	986
	Total IRWR	27	6,591
	Per capita IRWR (in cubic meters)	8,501	9,089
2.	Natural or Actual Renewable Water Resources (includes flows from other countries)		
2.1	Annual river flows:		
	From other countries (in cubic km)	16	-
	To other countries (in cubic km)	-	-
	Total NRWR, in cubic km	42	7,771
	Per capita NRWR (in cubic meters)	13,056	10,655
3.	Water withdrawals (year of withdrawal data 2005)		
3.1	Total withdrawals (in million cubic meters/yr)	1,714	400,266
3.2	Withdrawals per capita (in cubic meters)	551	581
3.3	Withdrawals as a percentage of actual renewable water resources	4,22%	5,45%
3.4	Withdrawals per Sector as a percentage of total		
	Agriculture	62%	33%
	Industry	11%	52%
	Domestic	27%	15%

Source: Food and Agriculture Organization of the United Nations (FAO): Water Resources, Development and Management Service, AQUASTAT Information System on Water in Agriculture: *Review of Water Resource Statistics by Country, 2005 Report*.

Surface Water

Country Level

- 5.187 Albania is one of the most complicated natural areas in Europe due to its physical, geographical and morphological specific conditions: mountainous region with an average altitude of 785m above sea level, peculiar lithological structure with significant calcareous formations, extended lake system, typical Mediterranean climate, vicinity with the Adriatic and Ionian Seas, etc.

5.188 The hydrographic network of Albania consists of eleven principal rivers and their numerous tributaries, such as the Buna River with a catchment area of $F = 5,750 \text{ km}^2$; Drini River with $F = 14,137 \text{ km}^2$; Vjosa River with $F = 6,706 \text{ km}^2$; Semani River with $F = 5,640 \text{ km}^2$, etc. There are 125 other rivers with a smaller catchment's area of $F > 50 \text{ km}^2$. The hydrographic network of Albania is represented in Table 5.20 below.

5.189 In the Albanian hydrographic network, the annual flow distribution is generally of a typical Mediterranean nature, increasing significantly during the winter and decreasing during the summer. There are two characteristic periods: (a) the dry period of the year (July to September) and (b) the wet period (October to November). Approximately 20% of the annual flow occurs during the dry period. Certain hydrological features of the principal rivers in Albania are shown in Figure 5.23 below²⁰.

Table 5.20 - Hydrological Features of Principal Rivers in Albania

Nr	Rivers	F	H	Q	R	r_o	D	W_p	W_f	W_t
1	Drini	11756	971	352	438	1250	1176	13825	2770	16594
2	Mati	2441	746	103	60.0	590	828	2021	505	2526
3	Ishmi	673	357	20.9	45.3	2161	2122	2020	510	2530
4	Erzeni	760	435	18.1	102	5635	4184	3180	795	3975
5	Shkum	2244	753	61.5	187	3040	2373	5800	1450	7250
6	Seman	5649	863	95.7	418	4367	2367	13200	3300	16500
7	Vjosa	6704	855	195	212	1087	997	6710	1680	8390
8	Other	53061	735	105.8	206	1962	1224	6497	1500	7997
9	Without lakes	53737	775	977	-	-	-	-	-	-
10	With lakes	43306	789	1303	1669.1	1707	1489	53252	12510	65763

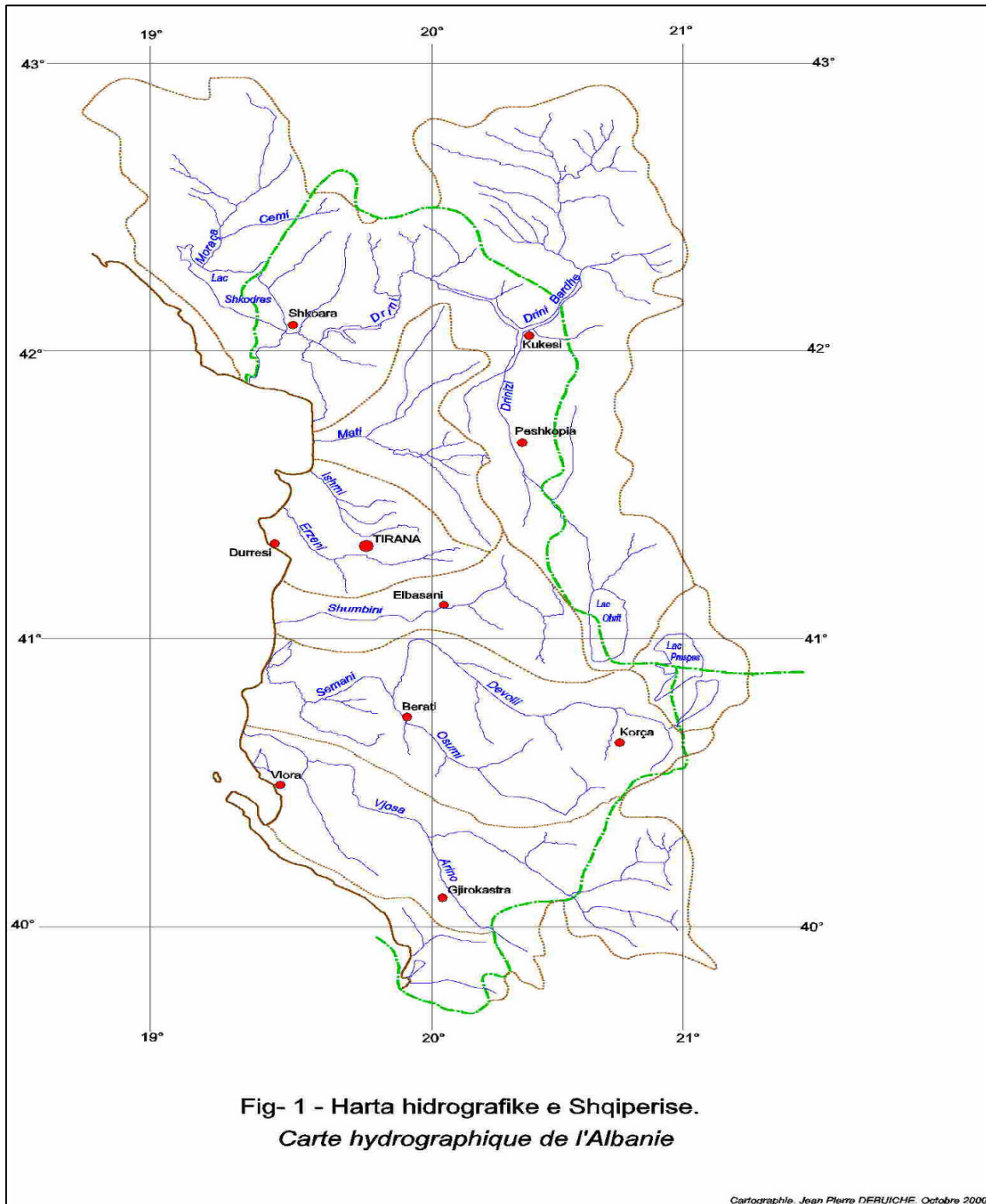
Source: **Ref. [4]**.

where:

F-Catchment km^2 ; H-Average altitude m; Q-Water discharge m^3/s ; R-Suspend load discharge kg/s ; r_o -Turbidity gr/m^3 ; D-Module of solid discharge Ton/ km^2 ; W_p -Suspend load volume 10^3 ton; W_f -Bead load volume 10^3 ton; W_t -Total alluvium volume 10^3 ton.

²⁰ Ref. [4]: **The impact of climate change on the erosion process in the Albanian hydrographic network**, Niko Pano, Alfred Frasheri, Bardhyl Avdyli,

Figure 5.23 - Hydrographic Map of Albania



Hydrological Characteristics of River Mati ²¹

- 5.190 The catchment area of the River Mati has a surface of 2,441 km². Its main tributary is the River Fani that flows from northeast, while the River Mati flows from southwest down to the confluence with the River Fani and then to the west. The River Fani has a catchment area of 1,076 km² and is formed by two tributaries: Fani i Madh and Fani i Vogel.
- 5.191 According to monitoring data for the period 1951-1985, the River Mati has a mean annual discharge of 103 m³/s, of which 60 m³/s come from the Mati itself and 42 m³/s from its main tributary Fani. The resulting specific discharge is about 40 l/skm² and the runoff coefficient 0.75. These values apply to both rivers. In particular, the main hydrological characteristics of the River Mati are as follows:
- Annual discharge volume: 3,250 million m³.
 - Specific discharge: 40 l/s km².
 - Ratio of the wettest month (December) over the driest month (August): 10.
 - 10-year extreme flow: approximately 25 times the river module (specific discharge).
 - Storage capacity of Ulza reservoir: 240 million m³ (about 15% of the River Mati annual flow).
- 5.192 With regard to the water quality, chemical analyses of samples taken at representative locations of the River Mati (before 1990) showed high concentration of metallic ions (iron, manganese and copper), which is not surprising due to the nature of the surrounding area (important mining area). These quality characteristics might not cause problems for some water uses such as hydropower, industry, etc, however their impact on irrigated land, coastal areas and marine environment is not yet fully assessed.

Hydrological Characteristics of River Ishmi [5]

- 5.193 The Erzeni - Ishmi river basin consists of the catchments of Erzeni and Ishmi Rivers and other minor Rivers and has a total surface of 1,439 km². The mean altitude of this river basin is lower than in adjacent catchments.

²¹ Ref. [5]: **Water Resources of Albania**, Dr. Agim Selenica.

5.194 The catchment area of the River Ishmi is important as it includes the largest urban centre of Albania i.e. the city of Tirana. The main hydrological characteristics of the Rivers Ishmi and Erzeni are as follows:

- Annual discharge volume: 660 million m³.
- Specific discharge: 31.5 l/s km² for River Ishmi and 24 l/s.km² for River Erzeni.
- Ratio of the wettest month (January-February) over the driest month (August): 9 to 10.
- 10-year extreme flow: about 55 times the river module (specific discharge).
- Storage capacity on either river: none.

5.195 Similarly to the River Mati, chemical analyses of samples taken from the River Ishmi (before 1990) showed high concentration values for many parameters (iron, manganese, nitrates, suspended solids, BOD5). Again, these results were more or less expected as both domestic and industrial wastewater produced in the Tirana area is discharged untreated to the river. However, this does not apply for the River Erzeni where water quality is quite acceptable for the current principal use, which is irrigation of cultivated land.

Area of Cement Plant and Quarries

Hydrological Characteristics of the River Droje^{22 23 24}

5.196 River Droja is located in between the low parts of Mati and Ishmi watersheds accumulating water that emanates from Skenderbeu and Shengjergji mountains. After the village of Shperdheti, Droje is regulated and flows into an artificial channel, which consists part of the drainage system of the lowlands of the village Thumana.

5.197 Climatic conditions of the River Droje are typical Mediterranean, which means that the area is characterized by hot and dry summer and mild and wet winter. The mean

²² Ref. [6]: Information released by Dr. Agim Selenica for Antea Cement sh.a..

²³ Ref. [9]: **Research and Exploration Report on the evaluation of Limestone/Carbonates Raw Materials of Boka e Kuqe near Burizane (following the geological and drilling project investigations in Burizane – Piccrage – Brett of Kruje Region)**, Antea Cement sh.a., Tirana, January 2007.

²⁴ Ref. [10]: **Research and Exploration Report on the evaluation of Clays/Flysch Raw Materials of Brett near Piccrage (following the geological and drilling project investigations in Burizane – Piccrage – Brett of Kruje Region)**, Antea Cement sh.a., Tirana, January 2007.

annual temperature ranges at about 16 °C and the annual precipitation at 1,278 mm. The maximum 24h-rainfall ranges values from 140 to 160 mm/24h.

GROUNDWATER

Country Level

- 5.198 Groundwater in Albania is extremely important as it is the only source of potable water. Despite being a critical resource its real availability and extraction capacity is not that well known. This presently leads to some problems; for example, abstraction borehole areas located near the Adriatic coast and in particular near Laç and Durrës, are now affected by the intrusion of saline water, probably due to excessive abstraction [2].
- 5.199 Groundwater is usually exploited through abstraction boreholes, mainly at the plains and valleys, or through springs, most frequently present at the hilly and mountainous areas. As frequently the case, and particularly where large karstic areas affect the movement of groundwater, river basins do not coincide with groundwater units [2].
- 5.200 By approaching to the area of the cement plant and quarries, the following observations could be made: the basin of Erzeni and Ishmi Rivers comprises two main aquifers, one along the Erzeni and one along the Ishmi. The aquifer following the course of the Ishmi and its main tributaries is extensively exploited and in particular [5]:
- Downstream near the village of Fushe Kruja, where boreholes show abstraction yields varying from 0.5 l/s to 20 l/s. Water quality is generally acceptable, however, in some cases an excessive concentration of iron or nitrite ions or high hardness is observed.
 - Upstream in the greater area of Tirana, there are many abstraction boreholes with yields sometimes exceeding 100 l/s. Water quality is highly variable. There are boreholes where water quality is characterised by excessive iron, nitrate and sulphate ions concentration; however, water quality in abstraction boreholes used specifically for drinking water supply is generally acceptable.
- 5.201 On the other hand, Erzeni aquifer is not used on a large scale and information with regard to water quality and availability is quite limited. The number of important springs within Erzeni - Ishmi basin is limited; there are some high hardness springs near Kruja, while those near Tirana provide both high yield and excellent quality water and are used solely for drinking water supply.

Area of Cement Plant and Quarries [6]

- 5.202 The area of the cement plant and quarries is located in a zone where only one significant aquifer is present, specifically around the Mati river mouth, and extended from Lezhe in the North to Mamurras in the South, at the land reclaimed from the swamps during the last 50 years.
- 5.203 Water extraction yield from existing abstraction boreholes varies from 0.1 l/s to more than 80 l/s, however, water quantity as well as quality vary greatly according to the location and in particular:
- Water abstraction boreholes at the north, near Lezhe, have fairly high yields and water quality ranging from good to bad (excess of chloride and high pH indicating brackish water) that infers that excessive drawdown of the water table caused penetration of saline water into the aquifer. The latter indicates that the exploitation of this aquifer should be based on the results of studies that will define the optimum water abstraction rate for any abstraction borehole.
 - Water abstraction boreholes located south of the Mati River, near Laç, show very low yields and brackish or salty water most of the time. Similarly, the exploitation of this aquifer should also be based on the results of studies that will define the optimum water abstraction rate for any abstraction borehole.
- 5.204 In the rest of the basin groundwater appears in springs, with 13 of them yielding more than 100 l/s during the winter, mainly in the district of Mat. In particular, the spring of Uraka is one of the biggest in Albania showing a discharge rate reaching 20 m³/s. Most springs provide good quality soft water, however, their yields vary significantly throughout the year and in some instances they even run dry during the summer.

Groundwater Availability Assessment

Current Status of Groundwater Exploitation

- 5.205 Groundwater quantity is both dependent on natural factors (i.e. rainfall, temperature, infiltration, evaporation) and technical factors such as intensive exploitation and changes in the hydrographic network.

5.206 Water supply system for the wider area of Rinas – Thumana comprises of the following drinking water abstraction boreholes per location²⁵:

- Ura e Gjoles: There are four water boreholes with maximum exploitation rate of $Q = 208-250$ l/sec, which supply with drinking water the city of Shijaku and the surrounding settlements.
- Fushe Kruja (village Hasan): Water supply through a series of water boreholes with maximum exploitation rate of $Q=40-60$ l/sec.
- Bubq: Water supply through a water borehole with maximum exploitation rate of $Q = 8$ l/sec.
- Prezës: Water supply through a water borehole with maximum exploitation rate of $Q = 20$ l/sec.
- Mazhës: There are two water boreholes with maximum exploitation rate of $Q = 10$ l/sec.
- Rinas airport: Water supply through one water borehole with maximum exploitation rate of $Q = 20$ l/sec.
- Vores: Water supply through one water borehole with maximum exploitation rate of $Q=30-50$ l/sec.
- Thumana: – Water supply through one water borehole with maximum exploitation rate of $Q = 20$ l/sec.
- Existing cement plant: The plant uses a water borehole with maximum exploitation rate of $Q=30-40$ l/sec.
- Irrigation of the Institution of Field plants of Fushe Kruja: Water supply through two water boreholes with maximum exploitation rate of $Q= 20$ l/sec.

5.207 Further, there is a considerable number of water boreholes drilled and exploited by individuals showing a total maximum exploitation rate of $Q = 50-100$ l/sec. Based on the above, water exploitation in the wider area of Rinas – Thumana amounts up to 500-600 l/sec or 15,768,000 – 18,921,600 m³ annually, while the annual coefficient of exploitation (k) varies between 0.8 – 0.9.

²⁵ Ref. [11]: **Monitoring of groundwater in the basin of the Rivers Erzeni and Ishmit**, Information released for Antea sh.a..

Current Status of Water Level Monitoring

5.208 In 2005, water level monitoring system of the quaternion aquifer of Tirana – Fushe Kruja included 6 monitoring boreholes in each of Tirana and Fushe Kruja, which covered the area of the centre of Tirana, Laknas, Valias, Rinas, Fushe Kruja, Ura e Gjoles, Gramez and up to Thumana. However, during the hydrological year 2005-06 measurements are scarce rather than systematic. Some measurements were implemented in December, May and October of the same year and the results in relation to water level fluctuation were as follows:

- Drilling Nr. 102/Laknas
 - Ns= - 7.0m (December)
 - Ns= - 6.0m (May)
 - Ns= - 8.5m (October)
- Drilling Nr. 329/Fushe Kruja
 - Ns = - 2.12m (December)
 - Ns = - 1.25m (May)
 - Ns = - 6.8m (October)

The increase of the water level in October is related to the reconstruction of Fushe Kruja water supply network, the increase of exploitation of existing and new water abstraction boreholes.

Drilling Nr 333/Thumana

Ns= + 0.40m (December)
Ns= +0.35 m (May)
Ns= + 0.05m (October)

5.209 Analysis of the above data indicates that the fluctuation of groundwater level is mainly depended on seasonal changes and changes in the boreholes exploitation rate. Seasonal changes are mainly due to climatic changes throughout the year and are reflected by increase of water level during the winter and decrease during the summer. Changes in the exploitation rate are noticed through comparison systematic monitoring data (monthly and/or annual) such as extreme levels, amplitude of the water level fluctuation, etc.

5.210 Extreme levels and the amplitude of water level fluctuation for the hydrological year 2004-05 in the areas of Tirana and Fushe Kruja are given below:

In Tirana

Amplitude of water level fluctuation: 2.99 – 6.8 m

Maximum level: -1.46 m – 5.04 m, ne - 10.21 m,
Minimum level: -7.25 m up to - 17.85 m

In Fushe Kruja

Amplitude of water level fluctuation: 0.5 - 4.68 m
Maximum level: +0.4 m up to -0.33 - 2.33 m
Minimum level: -0.1 m up to -5.01m - 6.95 m.

Current status of underground water quality monitoring

- 5.211 Monitoring of underground water quality for the aquifer of Fushe Kruja for the year 2006 has been undertaken through sampling and full chemical analysis of the samples taken at four (4) sampling boreholes on a semester basis (May and October). According to the results of the chemical analysis, water pH ranges from 6.93 to 7.78, which is acceptable according to drinking water standards.

TRAFFIC AND TRANSPORT

- 5.212 The details present in this section of the report are mainly taken from a Transport Planning Study undertaken by WS Atkins International Limited (Athens) in March 2007. The report is presented in its entirety, appended to this report at The following section covers the existing conditions on the available relevant transport networks both on the infrastructure and the operation side as well as relative plans for improvement that may have an effect on the transport generated by the plant.

Highway Network

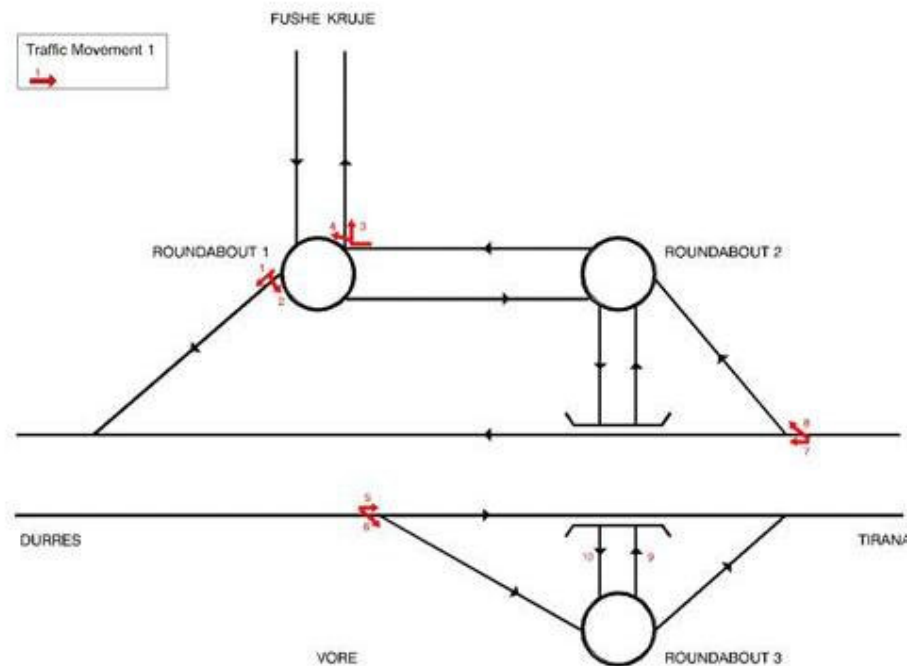
- 5.213 The wider area highway network providing access to the cement plant appears in the following figure. It comprises the highway sections Tirana – Durres, Vore – Fushe Kruja, Fushe Kruja – Shkoder (new and old roads) and the connection Tirana – Fushe Kruja.

Figure 5.24 - Cement Plant Access Highway Network and Turning Movement Count Locations - Wider Area



5.214 The riding quality and physical characteristics of the highway network have been assessed through a relevant survey which took place between 12 and 14 March 2007. Traffic volumes have been counted by observers at the locations indicated in the figures above and below, Figures 5.24 and 5.25 during the same period.

Figure 5.25 - Vore Highway Intersection Turning Movement Count Locations



5.215 The traffic volume survey covered the period between 06:00 to 18:00 (daylight period) and included traffic volume composition information to (among other parameters) establish the heavy vehicle traffic share participation. Summary results of the survey effort are presented below:

5.216 Tirana - Durres

- This is a two by two lane cross section separated through a New Jersey median on generally flat terrain. It generally features grade separated intersections and limited interference by road side land uses. The riding quality is generally satisfactory and high speeds are achieved on this link (higher than 100 km/hr).
- Traffic volumes counted reached almost 1,800 vehicles per hour and direction in the peak hour. The share of truck traffic was counted at 11% of the total traffic.

5.217 Vore - Fushe Kruja and Fushe Kruja - Shkoder (New Road)

- These links feature a one lane per direction cross section with considerable interference from road side land uses. The alignment generally crosses flat terrain and speeds are in the area of 80 - 90 km/hr. The riding quality is good as the pavements are fairly recent (4-5 years old).
- The traffic volumes counted reach up to 650 vehicles per hour and direction in the peak hour. The percentage of truck traffic has been measured to exceed 20% during certain hours.

5.218 Fushe Kruja - Burizana - Mamuras - Lac (Old Road)

- This is part of the old national road (one lane per direction) going through most of the villages in the area. It goes through flat or lightly hilly terrain. Speeds are low in the area of 50 km/hr and the riding quality is poor hampered by badly maintained pavements especially in the road sections located within the villages.
- Traffic volumes have been measured not to exceed 70 vehicles per hour and direction in the peak hour. The share of truck traffic has been measured to exceed the 20% level in some instances.

5.219 Fushe Kruja - Tirana

- This is part of the old national road (one lane per direction) going through many conurbations with extensive interference by road side land uses. Speeds are in the area of 60 - 70 km/hr and the riding quality is mediocre as a relative poor maintenance level has been observed on this road. Nevertheless road works for rehabilitation and maintenance were observed on the road during the period of the survey. Plans exist to improve its standards to the same level as the Fushe Kruja - Lac new road connection.
- The alignment crosses generally flat terrain and carries relatively heavy traffic volumes of up to 400 vehicles per hour and direction in the peak hour. The truck traffic has been observed not to exceed the 13% level. This fact clearly indicates a preference of the heavy traffic Tirana - North to the itinerary Fushe Kruja - Vore - Tirana (New Road) despite its longer distance. This preference is explained by this connection's better geometric standards, riding quality, travel speed and safety.
- The following table presents in summary form the traffic volumes surveyed (for the peak hour and by highway section):

Table 5.21 - Traffic Volume Counts

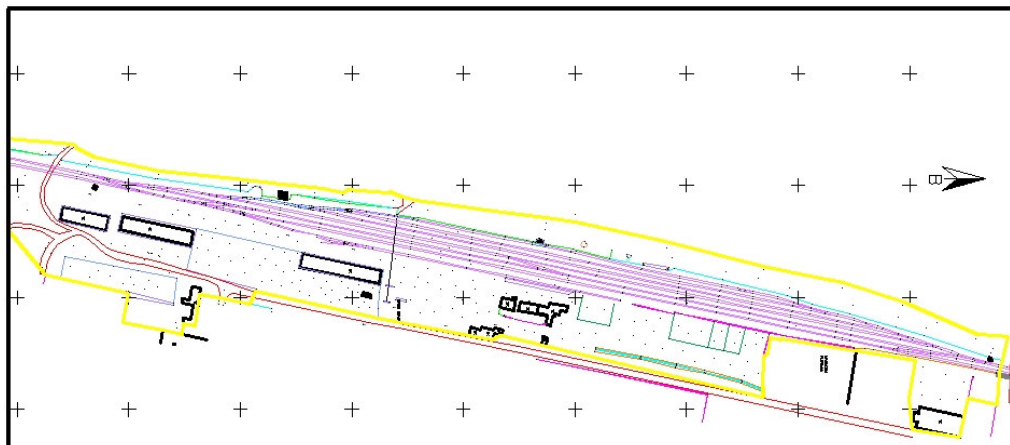
Highway Section	Max Peak Hour Traffic (One Direction)	Max Truck Traffic Share(%)
Tirana - Durres	1800	11
Vore – Fusche Kruja	650	20
Fusche Kruja – Burizana (New Road)	650	20
Fusche Kruja – Burizana (Old Road)	70	20
Fusche Kruja - Tirana	400	13

Railway Network

- 5.220 The central point of the Albanian rail network is the Port of Durres, on the Adriatic Sea. It basically runs in three directions: north to the Albania-Montenegro border at Hani Hotit, south to Ballshi and the Port of Vlora, and east to Pogradec, near the FYROM border. The rail network serves most residential and industrial areas. The railway standard adopted is of standard gauge, single non-electrified line.
- 5.221 The railway was developed during the period of centrally planned economy with the government placing strong restrictions on the use of other modes of transportation. Car ownership was banned and, on roads parallel to the railway, bus traffic and freight movements of trip length over 11 km were prohibited. At the time, a number of manufacturing industries and an active mining industry supplied Eastern European industries, through the railway connection with Montenegro. This connection is the only link between the Albanian railway and the rest of the European networks and it was used exclusively for freight transport.
- 5.222 With the political and economic changes of the 1990's the country's transportation requirements changed dramatically. There has been a rapid growth of the trucking industry, bus services and especially in private car ownership. These trends resulted in a severe reduction of the railway traffic which has been further exasperated by the closure of many state owned factories and mines.
- 5.223 Presently, the railway network appears to be at a derelict state (see photos in Appendix B of the transport study (Appendix 5 of this report) at Gjorm Yard), nevertheless the relevant survey has shown that ample space exists at the Gjorm railroad yard to accommodate a transshipment facility if the railroad is chosen to form a part of the plant's import / export transport link. This yard is the closest to the cement plant point of rail access with adequate space (6 rail sidings apart from the main line and a few abandoned buildings that could be used for storage) to support the operation of unloading cement carried by trucks from the plant, storing it and

further loading it to rail cars in order to take the cargo to either the Durres or the port of Bar in Montenegro.

Figure 5.26 - Gjorm Railroad Yard



- 5.224 Such an operation would require a detailed survey of the rail infrastructure to be used and the execution of necessary maintenance, rehabilitation and possibly modernization works. Another requirement would be the provision of the necessary rolling stock (currently not available by the Albanian railways). These actions clearly lie outside the scope of the present study.

Port Infrastructure

- 5.225 The port infrastructure in the plant's greater area comprises the ports of Durres and Bar (in Montenegro). The port of Durres is much closer to the cement plant and the obvious choice to serve its needs. The port of Bar is larger and has better facilities. Nevertheless it is located much further away, compared to Durres, in a different country (Montenegro) – a fact that might create issues of import / export tariffs and additional institutional issues for the plant management to handle. Both ports are served by both road and rail (port photos are available in Appendix A of the Transport Study, Appendix 5 of this report).
- 5.226 At the port of Durres, freight is handled at the eastern pier. This pier has a length of approximately 420 meters (see photos), a usable depth ranging between 7.5 to 11.5 meters and it possesses enough space to serve a transshipment facility. The port's master plan provides for a considerable widening of the eastern pier in the future and further extension of the port in the same direction.
- 5.227 The port infrastructure at the end of the centrally planned economy period (1990s) was characterized by old technology (cranes), low output, overstaffing and poor supporting infrastructure (roads, railways etc). The current effort (according to the port's management) is to improve the relevant legal framework, to try to privatize port

services, to improve the port infrastructure and the cargo handling facilities and to adopt new technologies in order to increase the cargo handling capacities and the safety and security.

5.228 Currently the upgrade of the port infrastructure is financed by the World Bank and OPEC, the PHARE program and the EIB with a total investment budget of approximately US\$50 million. This program comprises:

- Rehabilitation of port wharfs
- Rehabilitation of the wind wall and west breakwater
- Rehabilitation of storehouses
- Repairing and purchase of new cranes
- Rehabilitation of ferry terminal
- Construction of 60 m new wharf
- Feasibility study and start of construction for a container terminal
- Drainage system and paving works
- Dredging of basin and access channel

5.229 Further actions to be taken in the future include:

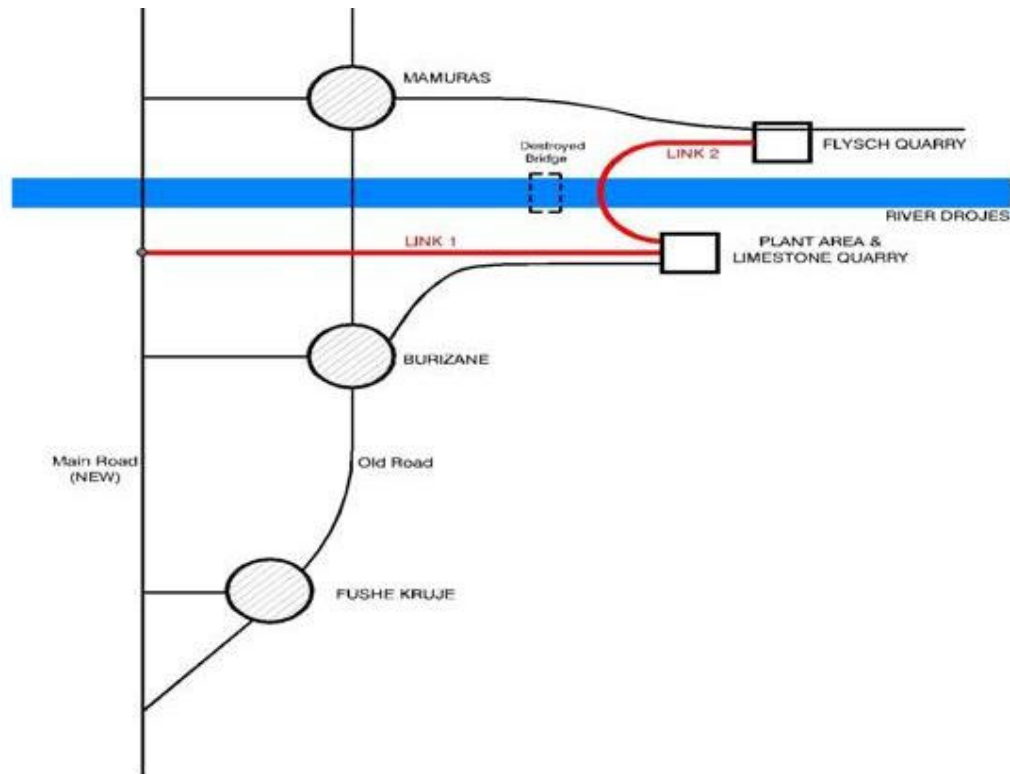
- Improve legal framework on ports
- Privatization of services (Concession and PPP)
- Rehabilitate railway and road connection

5.230 The port of Bar is in a better state both from the infrastructure and the access facilities point of view but, as mentioned above, much further away and in a different country. Nevertheless it is in a better position to accept cargo traffic and it can accommodate larger ships.

Plant Site Transport Infrastructure

5.231 The transport infrastructure in the immediate vicinity of the plant appears in the figure below.

Figure 5.27 - Cement Plant Access - Immediate Vicinity



- 5.232 Currently access to the plant area is achieved through a road that goes through the village of Burizana. This is clearly a difficult connection especially for heavy vehicles both from the geometric and road safety point of view. A new cement plant connection will be constructed directly to the Shkoder – Fushe Kruja Highway bypassing the urban areas of Burizana and Mamuras. This new connection (Link 1 in the figure above) would directly serve the plant avoiding any interference with village traffic.
- 5.233 A second access to the area between the flysch and limestone quarry locations is provided through a road starting from the village of Mamuras along the northern bank of river Droje. A bridge used to connect the two river banks at that point. Presently the bridge deck has been removed and the bridge structure appears insufficient to carry the necessary loads if the same bridge was to be rehabilitated. A more detailed assessment of this structure will be required if it is going to be used even as an auxiliary connection.
- 5.234 Alternatively a river crossing can be used further upstream (see Figures 43 and 44). At that location, a detailed assessment will be needed whether a new crossing would be necessary and technically feasible or if the plant needs can be satisfied with the

existing one. In any case, a new road connecting the flysch quarry with the plant and limestone quarry areas will need to be constructed.

Summary of the Condition of the Existing Environment

- 5.235 The area surrounding the proposed development site is mountainous and rural. There are several relatively small communities in the immediate surrounding and two large communities of Burizana and Picrraga. These are located within 5 km and 10 km respectively of the proposed development. Poverty is a persistent problem locally due to the level of subsistence agriculture, farm size, low livestock numbers and low returns from off-farm employment.
- 5.236 The proposed locations of the cement plant and limestone quarry are above the village of Burizana. View points of this area are possible from more than 10 km from a number of locations including the agricultural plain and the historical city of Kruja. The area of the proposed flysch quarry is within a more enclosed setting, within a quiet valley at the foothills of the high mountains of the region.
- 5.237 There is significant evidence of human intervention in the area. Overgrazing by domestic livestock, fire wood collection as well as small scale quarrying and lime burning activities have had a significant detrimental impact on the landscape. These impacts reflect the long term economical problems of the area.
- 5.238 There are no significant industrial developments in the immediate surroundings although there is a large cement plant 6km to the south. The lack of industrialisation to date means that the air and water quality is good. Background noise levels are generally very low with the exception of the area adjacent to the Fusche Kruja – Mamuras highway. It is the developers' intention to link this highway by a new road to the cement plant. Links from this highway to the rest of the country and major ports are good.
- 5.239 The area is rich in the mineral resources suitable for the production of cement. There is also a significant aquifer that would be used to support the manufacturing operation (although the availability and quality of the water contained within it varies with season and location). Groundwater is also the only source of water presently available in the area for industrial use.
- 5.240 The areas of the proposed development are of low ecological value, although due to the nature of the climate, a good range of plant species were found when the area was surveyed. Some of these plants are picked by local people for use and sale as medicinal herbs. The area is not under any special protection due to its ecological value.

- 5.241 The area has been set aside by the local municipal authorities as suitable for industrial development for strategic economic developmental reasons. This designation has been made due to the availability of mineral (and water) resources, proximity to Tirana and the national highway network as well as the detriment caused to the environment from human activity.

6. IMPACTS ASSOCIATED WITH CONSTRUCTION

INTRODUCTION

- 6.1 This chapter identifies the environmental impacts that may be caused by the construction phase of the project, and, where possible, assesses the likely severity of these impacts based on current information. Measures to reduce the severity of the impacts identified are also proposed (termed “mitigation measures”).

OVERVIEW OF CONSTRUCTION ACTIVITIES

- 6.2 The proposed cement facility will be constructed for Antea by CBMI, a specialist contractor based in China. A building programme has been established and the logistics of the construction process were being produced at the time of the Assessment. Although full details of the construction activities were not available (e.g. the details of the main equipment enclosures, methods of construction including the final balance of onsite and off-site fabrication)
- 6.3 To date no preparatory works have been undertaken for construction but construction is programmed to begin in 2008. Construction will be completed by 2010.
- 6.4 Most of the plant and equipment that will be installed at the site is highly specialised, purpose built and will be supplied as vendor packages that have been manufactured off-site and delivered to site by road.
- 6.5 Details on construction materials (e.g. cladding and building finishes) and construction methods (e.g. how much of the structures can be pre-fabricated and transported to site) is not available. However, due to the size and nature of many of the major plant items it will be necessary to provide substantial foundations but the buildings themselves are likely to be of light steel construction. It has been assumed that all plant items will be enclosed in steel-framed buildings clad in insulated profiled steel, constructed on concrete footings.

6.6 Construction activities will include:

- Demolition and site clearance;
- Fill importing/exporting and site levelling;
- Utilities and services connections to site;
- Foundation excavations and concrete footings pours;
- Erection of building steel frames and cladding;
- Installation of equipment;
- Ancillary facilities erection;
- Services, gas and utilities connections;
- Building fitting-out; and
- Commissioning.

6.7 The main contractor will require a number of on-site facilities to support the construction process. It is expected that there will be 3 areas of operation:

- Administrative and storage area with warehouses and storage areas for equipment and materials.
- Workers camp.
- Operational area with concrete batching and storage areas.

6.8 The main contractor will provide the majority of the construction workers. It is expected that approximately 700 Chinese workers will work on site (at the peak time). It is planned that they will live on-site in a specially constructed camp. As the assessment was undertaken in the early stages of project design, the details of the construction camp have not been finalised. However, the camp will be located adjacent to the construction site itself. The construction camp will consist of several pre-fabricated buildings and necessary infrastructure (see below).

6.9 The camp will be equipped in all the necessary utilities including heat, water, wastewater and electricity. Electricity will be produced on site using by diesel generators.

SOCIO-ECONOMIC ASPECTS

6.10 The introduction of a large migrant workforce during the construction period has the potential for significant impact on the local communities and economy. In addition, to the impact on the local communities consideration has to be given to the working

(and living) conditions of the workers themselves. The socio economic impact assessment of the work camp has considered:

- Terms of employment for foreign workers;
- Living conditions for foreign workers;
- Camp facilities for foreign workers (including health care and leisure);
- Local employment and procurement opportunities and
- Other impacts on the local community.

Terms of Employment

6.11 All foreign workers require work permits to work in Albania (Law No. 8492, 1999). These work permits will be arranged by the main contractor. In order to obtain a work permit the company employing the foreign worker and the worker themselves must agree to certain conditions with regard to employment conditions and local taxation. These conditions are summarised below:

- The contractor's terms and conditions of employment must meet minimum Albanian wage requirements. The National monthly minimum wage introduced in 1/8/2005 is 11,800 ALL (ILO minimum wage database). National requirements on the working week will also be met; these set a 44 hour working week. A maximum of 5 hours overtime can be worked per week. Overtime will be paid at twice the standard rate. Workers are entitled to 30 days paid annual leave and an annual return flight paid by the contractor.
- Albanian tax on salaries and payments for social insurance and health contributions will be calculated in accordance with the "Reference Table for Salaries" Albanian Council of Ministers Decision No. 286, of 4/5/2007. Tax and contributions for qualified and unqualified employees and personnel in the private sector are calculated according to the classification of the economic activity performed. The tax inspector will assess tax payments in relation to the salaries paid, and will assess if salaries are appropriate to local market rates.
- According to the decision (No. 288) the tax on personal income is 10%. For salaries < 30,000 ALL, the first 10,000 ALL are exempt from tax. Tax is applied at a flat rate of 10% on salaries > 30,000 ALL.
- Health and medical costs will be paid by the Albanian medical insurance. CBMI will pay any additional costs. Information has not been provided on sick leave entitlement and payments.

- 6.12 It can therefore be assured that the Chinese workers will contribute to the economy through the appropriate payment of tax and insurance contributions (as well as through local expenditure).
- 6.13 Albania recognises the ILO convention on Migrant Workers (Supplementary Provisions) Convention, 1975 (No. 143); however, part II which covers the equality of opportunity and treatment is excluded.
- 6.14 The supply contract between Antea and CBMI specifies the terms and conditions of workers employment and payment. Clause 7.2.2 covers 12 points, including requirements identified under the ILO conventions for forced labour, child labour and discrimination and other aspects such as the minimum wage requirements and deductions, grievance mechanism, codes of conduct in camp and outside camp. Foreign workers will keep their own passports.
- 6.15 It can therefore be assured that (inter alia) the workforce will be in Albania of their own free will, they will be provided with a fair wage and their working conditions will be satisfactory.

Living Conditions and Camp Facilities

- 6.16 Information has been provided by CMBI regarding the workers camp. The facilities will be largely self-contained. Workers will be accommodated four persons / room or two person / room with spacing of 4.5m² and 9m² / person respectively.
- 6.17 Dining facilities are to be provided through 3 canteens with a catering capacity for 500 persons. The area will be dedicated for dining with dining table and chairs. There will be big screen television in each canteen. Chinese food will be served for all staff.
- 6.18 For washing and personal hygiene, strip cisterns special will be provided. Each strip cistern can serve 40 persons. Washing machines are provided for laundry. On average 20 persons share one washing machine; 3 Bathhouses with 20 shower nozzle in each bathhouse. One special boiler house and one worker will be dedicated to the supply and maintenance of hot water and to undertake periodic sterilization.
- 6.19 Recreational facilities will be freely available and accessible for workers. Facilities will include:
- An entertainment room in the camp. TV, DVD, KTV, Books, newspaper and internet will be provided.
 - Indoor games: Table tennis, board games, DVD show.

- Outdoor sports : Badminton court, volleyball court and basketball court.
- 6.20 Other facilities will include an on-site shop which will serve basic items such as Coca Cola, cigarette, biscuits, etc and will cater for a demand from 500 persons.
- 6.21 Communications in the form of a telephone room and wireless internet will be available (for 500 and 200 persons respectively). There will be 2 office telephones and 4 telephones for private use charged according to telecom rates. CBMI consider this to be adequate as most workers have their own personal mobile telephone.
- 6.22 Camp codes of conduct (within camp and outside camp) cover aspects of camp security and visitor policies.
- Security guards will be in charge of the security of camp.
 - Visitors are allowed to visit the camp if accompanied by CBMI staff.
- 6.23 Two buses (40 seats each) will be provided by CBMI for transport on weekends and foreign workers will also use local transport. Given the size of the camp, and the fact that half the camp is expected to make weekend visits to local villages, towns and Tirana, this level of transport may be insufficient. Antea, the contractor and local communities should monitor the situation carefully. CBMI should ensure that additional buses are hired to meet the camp demand and avoid inconvenience to the local population and provide a reasonable service for the work force demands.
- 6.24 Medical services will be provided at a small clinic served by a doctor. The clinic will have 2 sick beds. The doctor will treat minor injuries, deliver first aid, and provide direction on the best course of care (Tirana or local care). For serious injuries and emergencies a contract is being established with a private clinic in Tirana which can provide good quality hospital and medical facilities.
- 6.25 Fire and safety plans and precautions have been identified and will be put in place in CBMI camps. The CBMI branch company has a safety department in charge of safety management, including the monitoring of accident statistics. There is a full time supervisor for safety inspections. Each team has a safety supervisor in charge of daily safety management. All staff will attend safety training prior to joining the camp and must pass a safety examination. Further periodic safety training is undertaken. There will be weekly safety meetings to review the issues of the week and to arrange the safety target in the coming week. Camp and construction site will be equipped with fire extinguishers
- 6.26 Basic camp infrastructure includes:

- Power supply: This is from the grid and has a capacity of 1600KVA. Secondary power will be supplied via an emergency diesel generator with a capacity of 1000KVA. The secondary power supply will be sufficient to ensure normal living and working supply for critical aspects.
- Water: This will be taken from boreholes within the plant area. One pump system will be in use with one standby pump system. A water tank will provide storage for 20 tons. This is sufficient for daily use water (between 28-40 litres / person for up to 700 people).
- Drinking water will be purchased from Fushe Kruje Town. Two tanks of 2 and 3 tons are used for storage. Approximately (5 tons would provide between 10 -10 litres/ head, up to 700 people.)
- Sanitation will be provided for through a sewage treatment station. This is presently being designed to ensure it is of an appropriate capacity.
- Solid waste will be collected and transported to the local recycling/disposal site. If there are not local sites that can handle the waste produced, it will be sent to the nearest suitable waste management site. Domestic solid waste will be transported to local waste management site. CBMI should be required to assist with the resources needed for upgrading the local waste facility as necessary to allow it to cope with the increase of waste from up to 700 people.

Work Camp Communication and Codes of Conduct

- 6.27 CBMI policies and codes of conduct forbid the drinking of alcohol in work time and lunch time, and forbid the use of unauthorised drugs and other illegal substances. Drug and alcohol testing is undertaken. Gambling is forbidden, as are the keeping of firearms, knives or other weapons. These codes of conduct depend on the workers and camp residents to report infringements.
- 6.28 Worker communications are undertaken on a daily basis through daily team communication, through training and routine periodic meetings.
- 6.29 An independent department, with a specific person is responsible for dealing with worker's grievance. This department communicates with the Branch Company or relevant department in order to solve the worker's grievance.
- 6.30 With respect to neighbouring communities CBMI do not report a formalised liaison and community communication policy. Liaison is based on goodwill and common events such as sporting occasions are arranged jointly.

- 6.31 CBMI has a programme for the cultural sensitisation for the workers, covering aspects of communication mutual respect and learning with respect to other's cultural customs and habits.
- 6.32 CBMI has a health awareness and training programme for its workers. This includes but is not limited to: an advance introduction about the STDs and communicable diseases, key aspects for attention, how to avoid and prevent from such diseases; the emergency and curative measures. CBMI doctor is responsible for communication on these aspects with the local health institution.

Impacts on the Local Communities: Opportunities for Employment and Local Procurement

- 6.33 Camp infrastructure and utility requirements (provision of water, disposal of domestic wastewater and solid waste etc) may put pressure on local services, already stretched and with limited funding. CBMI should work with the local municipal authority to ensure adequate provision for all and no loss of service to local residents and no loss of environmental quality. This is with particular reference to waste disposal.
- 6.34 The nearest local communities with commercial services will be Burizana and Thumana. Each has one or more cafe/bars, billiard rooms, small food and tobacco shops. These localities are served by mini buses which connect to the towns of Fushe Kruja (a transport nodal point) and Kruja. These are towns with populations of 10,000 and 17,000 respectively.
- 6.35 Antea and CMBI have opportunities to contribute to the local economy through the procurement of services and sourcing of local labour. These services are expected to include:
- The purchase of fresh vegetables and meat/fish/chicken and foodstuffs (rice and flour, etc) from local market.
 - Employment of some local catering staff in supporting roles.
 - Hire of local transport
- 6.36 A liaison committee should monitor the situation to ensure that local shortages or service disruption does not occur as a result of such provisions (e.g. shortage of local buses for local people, or reduction in frequency of local waste disposal service).
- 6.37 Antea will put CMBI into contact with local community leaders and representatives to discuss areas of co-operation and supply. In spite of this, and following the

experience of supplying the 7000 Kosovans in 1999, some of the local communities have said they would require assistance to adequately take advantage of possible business opportunities. Antea should facilitate this by providing one or more trained business consultants who would help both parties to look at the social opportunities and business risks (both for small business providers and from the perspective of CBMI) and to identify potential solutions and compromises as well as to support local initiatives in developing business plans and accessing credit.

Impacts on the Local Communities: Other Aspects

- 6.38 This area and in particular Thumana has had previous experience with large numbers of foreign temporary residents. In 1999, 7000 refugees from Kosovo were housed in Thumana for a 3 month period. Of these, half were housed in a camp and the other half was provided with accommodation in the homes of local residents. The commune is eager to provide supplies and to take advantage of commercial opportunities offered by the Antea camp and has had some experience in provisioning and accommodating large numbers of people in the past, all be it for a much shorter period of time.
- 6.39 Early and good factual information to local communities on the local camp and its population and on Chinese culture and behaviour and opportunities for local employment, supply chain and provisioning will help to prepare the local communities and minimise possible suspicion or hostility by the local population.
- 6.40 The Mayor and community leaders have not identified any potential health risks to the local communities. These communities have tight knit structures and traditional practices. Risks from transmittable diseases and in particular STD's are considered low. Health officials recognise that this might be an issue in larger urban centres (e.g. Kruja and Fushe Kruja). Previous experience with a work camp at the cement works of Fushe Kruja provide no evidence of the risk of such issues, however, this may be due to shortcomings in the health records or because people are often embarrassed and afraid to admit to such a problem.
- 6.41 The Director of Health Services in Kruja suggested that early preventative action, such as STD awareness campaigns, targeted at specific audiences in local urban areas (e.g. Kruja and Fushe Kruja) should be taken. Kruja Health Service has said that such campaigns should be organised in co-operation with themselves. Local staff know and understand the population and would be available to undertake this work. They can be supported through training by Institute of Public Health in Tirana.
- 6.42 Limited medical records and reporting mean that early preventative measures are very important as the identification and monitoring of such problems may be difficult.

As a result any potential problem might remain unidentified for a considerable period, causing future problems.

Communications and Monitoring

- 6.43 It is recommended that a local liaison forum or committee should be established to monitor the work camp integration, identify any potential or emerging issues, promote good practice and act as a formal channel of communication between the local communities and work camp. Members of the liaison committee should be appointed from the work camp, and to represent resident interests from: Thumana, Burizana, Brett and Picrraga, Kruja and potentially Fusche Kruja. One or more health representative(s) for the Kruja region should also sit on the committee. To work in a flexible manner the committee should not be more than 7 members. The committee should meet as regularly as necessary and at least once a month for the first 6 months. It should continue throughout the life of the work camp.
- 6.44 The forum should be provided with detailed information on the establishment of the work camp, its specification, facilities and provisioning (utility services, food, transport, health etc.), codes of conduct, build up of camp numbers, etc so any potential issues can be discussed and suitable measures identified in a timely manner. The forum should also receive regular reports summarising key monitoring findings and trends, e.g. on transport availability for workers and local people, on health of workers and local services, numbers and types of grievances made, etc..
- 6.45 Information on the purpose and the committee should be given to local communities through village meetings or local radio, and local communities encouraged to discuss / report any concerns, grievances or issues. The Antea grievance mechanism set up during the ESIA process should be reviewed (by Antea and the Liaison forum), amended as necessary and should also remain active.
- 6.46 It is noted that CMBI have stated that all construction supervisors will speak English and that 5 translators will also be employed.

AIR QUALITY

- 6.47 Construction activities have the potential to affect air quality mainly due to the dust created by activities during demolition, completion of ground works and construction. In addition, construction plant and vehicles can affect air quality as a result of exhaust emissions.
- 6.48 Re-suspension of dust through activities on the site or the wind can cause a nuisance and affect human health and vegetation. Favourable conditions for dust generation are dry weather combined with high winds. Continual or severe concerns are most

likely near to dust sources, usually within 100 metres. The perception of nuisance is subjective and highly variable.

- 6.49 There has been no monitoring of deposited dust levels near the proposed project area, but due to the nature of the location, the background ambient particulate levels are expected to be low.
- 6.50 There are a wide range of dust control measures that are commonly used on construction sites. However, these measures are often designed for small sites directly accessed from public roads, with sensitive receptors bordering the site.
- 6.51 Many of these techniques are not practicable in this instance nor are they required for sites remote from sensitive receptors. Those measures considered to be appropriate, given the location of the development and surroundings, will be employed at the construction site to minimise dust emissions. These measures will be incorporated in the Environmental Management Plan (EMP) which will be developed to control construction activities. Measures that may be employed include:
- Water-spraying of roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required;
 - sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling;
 - enforcing speed limits for vehicles on unmade surfaces to minimise dust entrainment and dispersion; and
 - employing suitable measures to ensure that vehicles leaving the site do not entrain dust onto public roads.
- 6.52 Dust emissions from construction activities will be mitigated using measures identified in the detailed EMP. Any emissions will be of a temporary nature and at some distance from residential properties, thus minimising any potential for a nuisance to occur.

SURFACE WATERS AND EFFLUENT

- 6.53 Construction activities have the potential to pollute surface waters from the escape of:
- Silty and contaminated water from de-watering of excavations;

- Silty and contaminated water from exposed ground, earth stockpiles, and muddy roads;
 - Silty water from vehicle/plant washing areas;
 - Leakage or accidental spillage of fuels, oils, chemicals etc, especially on the construction lay-down area;
 - Washing down concrete mixing equipment; and
 - Sanitary wastewater from the workers camp and effluent treatment plant.
- 6.54 Areas of ground become exposed and disturbed during construction. This increases the potential for soil erosion and could potentially result in an increase in the sediment load of waters leaving the construction site. Even though the cement plant site is level and thus, the potential for water flowing across the site to cause significant soil erosion is low, to prevent impacts from runoff during land preparation and gradual plant construction the following measures are foreseen: (a) excavations' face will be kept minimal to avoid the exposure of expanded surfaces to natural conditions, (b) surface runoff collection will be implemented through temporary drainage grooves and sedimentation ponds to avoid their direct discharge to the natural receptor (i.e. River Droje).
- 6.55 Appropriate measures will be employed at the construction site to reduce the risk of potentially polluting materials leakage. In particular, polluting materials such as oils, fuels and chemicals will be stored in dedicated storage areas, complete with spillage protection and working procedures, which ensure that these materials are handled correctly. Further, any hazardous materials will be stored in areas with secondary containment.
- 6.56 Domestic type wastewater from the workers camp will be collected through an appropriate sewage system and directed to a small-scale wastewater treatment plant prior final disposal to a natural receptor. At present the final design of this plant is not known, however, indications are that the design will conform with the BAT requirements. The operator is required to submit the details of the plant with an appropriate impact assessment when the design is finalised.
- 6.57 According to the initial findings of the Hydrogeological Survey, there are significant pockets of good quality groundwater at the area of cement plant and quarries at a depth of approximately 150 m. Therefore, any water supply requirements during the construction phase (for example water for workers camp showers and toilet flushing) will be addressed through the abstraction boreholes, which will be drilled on-site to cover water demand during the operation phase.

- 6.58 The measures outlined above will be incorporated into the Environmental Management Plan (EMP) see Chapter 9.

LAND QUALITY AND GROUNDWATER

- 6.59 Construction activities have the potential to release pollutants to the ground (topsoil, subsoil and natural strata) and groundwater. Potential sources of pollution include:

- importation of pollutants already present within the materials to be used for filling and site levelling operations. Pollutants could be introduced onto the site and then leach from the imported material into the groundwater;
- accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during delivery, storage, handling and use, for example, re-fuelling, maintenance activities, etc. with subsequent leaching to groundwater;
- accidental release of liquid wastes during storage, handling and removal, with subsequent leaching to groundwater;
- accidental discharge of sanitary wastewater to ground and groundwater from the workers camp and effluent treatment plant; and
- discharge of pollutants in water used for plant, equipment and vehicle washing to ground and subsequent leaching to the groundwater.

- 6.60 Measures will be employed to reduce the risk posed by the potential sources of pollutants listed above. All possible steps will be taken to prevent materials being imported onto the site which are already polluted.

- 6.61 Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during delivery to and removal from the storage areas.

- 6.62 Working procedures will ensure that these materials (raw and waste) are handled correctly. Working procedures will seek to prevent accidental release during the use of these materials, for example, vehicle refuelling and plant maintenance, especially with regard to waste oil. Procedures will be adopted to minimise the potential for accidental discharge of pollutants during the washing down of plant, equipment and

vehicles. Sanitary wastewater will not be discharged to either ground or groundwater.

ENERGY AND GREENHOUSE GAS BALANCE

- 6.63 The operation of equipment (like concrete mixing facility) and transport will use energy. Energy use will be reduced by good site practice; ensuring that vehicle trips and deliveries are planned to prevent unnecessary movements, and ensuring that equipment is turned off when it is not in use (this measure is also required to reduce noise and vibration).
- 6.64 Energy use in construction is not considered a potentially significant issue.

MATERIALS USE AND WASTE MANAGEMENT

- 6.65 The majority of the waste generated during the construction phases generally arises from the demolition of existing structures (above ground and sub-surface), site levelling and excavations. Since there are no previous structures at the proposed site, this will not be a source of waste.
- 6.66 Waste generation will arise from earth moving and construction activities. Construction waste generated will include inert fill and waste building materials, steel, metals, wood, cardboard, paper, oils, hazardous wastes and general wastes. There is no available information on amount of waste likely to be produced.
- 6.67 Soil from site levelling and excavations will be reused for final landscaping in the final phase of construction works.
- 6.68 Waste produced when operating or maintaining the equipment and vehicles will be segregated, stored in designated places and removed off site by appropriate waste contractors.
- 6.69 There are several measures that can be recommended to minimise waste handling problems:
- Topsoil should be stored separately and covered to enable its reuse for landscaping;
 - Waste storage and control procedures should be introduced to ensure that wastes are identified and stored correctly, in order to prevent the escape of polluting materials;

- Wastes generated should be segregated and recycled, as far as possible.

ECOLOGY

Impacts at Cement Plant and Quarry Sites

- 6.70 The main direct ecological impact resulting from the construction phase of the project is likely to be the loss of vegetation associated with the “clearance” at the two quarry areas, the cement plant and construction camp sites and the access road alignments.
- 6.71 With soil and vegetation removed, the habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates) will also be destroyed along with any fauna that cannot readily move away from the affected areas when site clearance takes place. The livestock drinking pools also constitute habitat for frogs that will be lost, unless steps are taken to protect or replace them.
- 6.72 Since the natural and semi-natural habitats in Burizana already appear to be under significant pressure from various exploitative practices, removal of the vegetation from the development areas is likely to lead to an increase in those same exploitative pressures on the reduced areas of habitat that remain. Goats and horses that currently feed on the proposed project site will have a smaller grazing area available to them. They are liable to damage the adjoining vegetation, unless their numbers are reduced – or extra fodder is provided and their access restricted. This is an indirect impact of the project.
- 6.73 It has been stated that a camp to accommodate Chinese workers, involved in the construction of the cement plant, will have to be provided at the site, with peak numbers up to 700. Without management controls in place, these workers could have an impact on the ecology of the surrounding area through the removal of vegetation (possibly for firewood or medicine) and the capture of mammals, birds, reptiles, amphibian and even insects.

Mitigation and Compensation Measures

Translocation of Vegetation

- 6.74 Translocating the vegetation on a large scale is unlikely to be feasible.

Habitat Restoration, Nursery Establishment and Seed Gathering

- 6.75 It is understood that it is Titan's usual practice to establish forest or tree nurseries in association with its projects and that the tree seedlings produced are used (i) to

provide physical screening of quarries and cement plant sites and (ii) for subsequent site restoration. The establishment of one or more nurseries in relation to the two proposed project sites should therefore assist with short-term (operation phase) mitigation and longer term on and off-site restoration of damaged habitat. This measure could be regarded as a combination of mitigation and, in the case of off-site habitat restoration, compensation.

- 6.76 Careful consideration needs to be given to the plant species that are to be raised in the nursery and how this is done. For habitat restoration to be effective, native species should in general be used in preference to exotic and/or commercial forestry species, though there may be a role for commercial species if there is local demand for wood-producing plantations (for timber or firewood). In particular, consideration should be given to the propagation of indigenous herbal species with medicinal and other practical uses i.e. species that are favoured by neighbouring communities. Species of known biological conservation value should also be favoured i.e. rare or threatened plant species and those known to be important food plants for wildlife e.g. butterflies. In the case of this project, *Salvia officinalis*, *Quercus ilex* and other species from the area that are on the Albanian Red List should be amongst those propagated.
- 6.77 To achieve this, a “habitat survey and management study” needs to be conducted in and around the two sites in order to (i) assess in more detail the type, distribution and condition of the existing vegetation and wildlife habitats (and soil cover) (ii) assess better the presence and status of fauna, especially species of conservation significance and (iii) to develop habitat and species management proposals. The latter would identify areas for habitat enhancement, the target habitats for establishment (i.e. what is the habitat type that the project should be aiming to establish at each location), how these would be established and how they would be managed and monitored, including measures to conserve significant fauna. As well as advice from local scientists, this activity will require close consultation with local communities to ensure that their requirements are met and that they subsequently comply with any management practices e.g. stocking rates for goats and horses. In general it is recommended that a mosaic of those vegetation types (stage of degradation) described in the “Existing Conditions” section of the report be the target, since this is likely to provide the richest habitat for fauna.
- 6.78 At the same time the areas from where vegetation will be removed (including the road alignments) should be investigated as a source of seed and other propagation material (e.g. bulbs and cuttings) for the plant nursery. The best means of propagating many of these wild species may not be known, so a degree of experimentation and a competent horticulturalist with ecological training or interests will be required (to oversee the collecting of the material, its propagation at the nursery and its subsequent planting). For some areas, transplanting of the soil, with

its seed-bank, may be feasible though additional seeding and weed control measures may be needed to encourage the desired flora/plant communities to develop.

Mitigation for Fauna

- 6.79 No wild mammals were recorded on the site during the brief March survey, but species such as badgers may occur and small mammals almost certainly occur – though the species may not be of conservation significance in Albania. Therefore, shortly before site clearance, more thorough mammal surveys could be conducted and some live trapping and release (in suitable receptor habitats) of small mammals undertaken.
- 6.80 For reptiles, though it is understood that they do not receive the same legal protection as certain species do in many parts of Europe, appropriate exclusion and translocation procedures could also be adopted, including the construction of hibernacula (over-wintering refuges). More detailed survey is recommended first to determine the status (presence and abundance) of species of conservation interest in and around the project areas. For amphibians, the livestock drinking pools on the site should be protected from damage until steps have been taken to create similar ponds elsewhere on or near the project sites, so that they provide suitable breeding habitat.
- 6.81 With regard to birds, the main mitigation measure to be adopted should be the clearance of vegetation in the winter season prior to spring nesting by breeding birds. Where this is not possible, a suitably qualified ecologist should carry out an inspection of vegetation to check that nesting birds are absent, prior to vegetation clearance.
- 6.82 It is recommended that Antea appoint an ecologist (fauna specialist), as a part of the “habitat survey and management study” proposed above, to draw up a fauna survey programme and design a simple mitigation/translocation scheme that takes into account the seasonal activity cycle of the Albanian fauna expected to occur on the site.
- 6.83 The ecologist should also participate in and contribute to the quarry plan/programme with regard to the sequence of the quarries development. With a knowledge of the clearance sequence and time-table and subsequent quarrying schedule, any programmes for surveying and translocating fauna and vegetation can be tied into the site-stripping programme.

Access Road Alignment and Construction - Ecological Method Statement

- 6.84 It is understood that the detailed route and design of the road that will take material out of the flysch quarry site has yet to be finalised. A route for the produced cement to be taken to the highway has been selected, but the road has not been designed. These routes should be subject to survey by an ecologist as part of the design process to ensure that more important ecological features (e.g. groves of large trees) or sensitive habitats (e.g. streams and springs) are not inadvertently destroyed or damaged. Adjustments to the alignment and construction methods should be made to avoid these sensitive areas wherever practical and to allow e.g. suitable stream/river crossings to be incorporated. An Ecological Method Statement should be developed in conjunction with the designer/contractor to provide a mechanism to ensure that the necessary protection measures are put in place.

Location of Construction Camp

- 6.85 At the time of writing the exact location of the construction camp had not been finalised, but it was proposed that it be sited near to the Cement Plant. Since the camp is temporary and can be closed when construction is complete, it is proposed that the Camp be built on land that will in due course be required for quarrying by the Company – instead of on neighbouring land - in order to reduce the land take and thus loss of vegetation and associated wildlife.
- 6.86 Adequate waste management and sanitation facilities will need to be provided at the camp to ensure that solid and liquid waste do not become a direct or indirect hazard to wildlife. Waste food should be stored in sealed containers prior to disposal (preferably composting) so that rats and feral animals (cats, dogs) are not attracted to the area – which then in turn can have an impact on local wildlife.

Management of Construction Camp Workforce

- 6.87 To prevent the Chinese and other workforce members, during off-duty periods, from damaging the vegetation of the Burizana area or hunting for wildlife (around the camp and project site), a range of education, monitoring and enforcement measures will be necessary. As part of site induction, there should be a section on ecological conservation, in the native language(s) of the workforce. This should be re-enforced and/or updated by periodic “tool-box talks” in work hours. The keeping of domestic pets or livestock should be forbidden so that they do not act as predators or introduce disease to local wildlife populations.

LANDSCAPE AND VISUAL

- 6.88 The assessment of potential landscape effects and visual impacts are based on the changes the development proposal will bring to the existing site as well as the surrounding landscape. Effects and impacts are graded according to their scale and magnitude; this is otherwise referred to as their 'severity'. Effects and impacts are rated to include three definable levels of severity; these are substantial, moderate and minor. The nature of effects and impacts is assessed on the potential negative (adverse) and positive (beneficial) consequences of the proposals. For the purposes of this assessment the significance criteria is summarised as follows:
- Severe adverse - where the scheme would cause a significant deterioration in the existing landscape resources / visual amenity.
 - Moderate adverse – where the scheme would cause a noticeable deterioration in the existing landscape resources/ visual amenity.
 - Minor adverse – where the scheme would cause a barely perceptible deterioration in the existing landscape resources / visual amenity.
 - Negligible – no discernable deterioration or improvement in the existing landscape resources / visual amenity.
 - Minor beneficial – where the scheme would cause a barely perceptible improvement in the existing landscape resources/ visual amenity.
 - Moderate beneficial – where the scheme would cause a noticeable improvement in the existing landscape resources/ visual amenity.
 - Substantial beneficial - where the scheme would cause a significant improvement in the existing landscape resources/ visual amenity.
- 6.89 From the assessment of the baseline landscape condition and visual amenity it has been determined that the development site has low landscape sensitivity. The area is considered to be of a pleasing scenic value resulting in a good baseline visual amenity. For the purposes of assessing severity and nature of any change resulting from the development, the landscape effects and visual impacts are described separately.
- 6.90 Whilst the local area has undergone extensive deforestation, the existing landscape is of a semi-natural character, and sites for the development can be seen to be befitting of the wider landscape character. The proposals for the cement manufacturing facility will result in the loss of natural landscape character due to the

clearance of existing vegetation, change in existing land use, including an increased intensity of activity and ground remodelling to accommodate the construction of the cement plant facilities and associated infrastructure. As part of the works temporary parking and on-site offices and facilities for the workers are likely to be required, this may involve temporary plant to supply utilities. It is also anticipated that temporary lighting will be necessary to carry out the construction of the facility. This will have a severe adverse effect on the landscape resources during construction. These changes to the landscape character will have a continuing effect through the operational phase of the development.

- 6.91 As part of the enabling works for the limestone and flysch quarries it is anticipated that there will be a moderate level of activity relating to opening up and preparation of the land in order that the quarrying activities can take place. There will also be construction of basic site amenities for the site workers, particularly in the case of the flysch quarry which will be remote from the main installation as well as establishing initial infrastructure. The proposals include for the excavation of the area for the cement plant facility. This will require major ground modelling, involving extensive areas of extraction, the use of major digging plant as well as resulting in significant stockpiles of excavated materials. It is anticipated that there will be an associated clearance of existing vegetation and potentially minor ground modelling works for the external areas. This will have a moderate adverse effect on the landscape resources during construction.
- 6.92 Included within the works directly related to enabling the construction of the cement plant as well as setting up the two associated quarries, advance construction and/or upgrading of existing access roads will be required. The severity of the effect of offsite infrastructure requirements will be dependant on the extent of the infrastructure required, however it is anticipated that these works will have a moderate adverse effect on the landscape resources during construction as currently there is only limited infrastructure, most of which within the upland areas comprises rough dirt tracks.
- 6.93 Based on the information available, the potential for adverse visual impact arising from the construction of the cement plant is considerable. This will be the result of the introduction of prominent detracting features into a landscape currently of moderate to good baseline visual amenity. These features will include the machinery and infrastructure of construction, construction activity and the cement plant itself, as well as the enabling works for the associated quarries and construction of the access roads. Additional potential sources of visual impacts are the movements of plant and traffic to, from and within the site. Temporary lighting and utilities may be required, as temporary offices and facilities for the construction teams.

- 6.94 For the residential properties located within the lowland plateau they will be exposed to the increased traffic relating to the construction activities of the cement plant and construction machinery such as cranes required to erect the taller of the cement plant structures. The night time impact of the works will also be significant due to the lighting requirements in a currently rural semi-natural landscape. Lighting within the upland depression will likely have a visual impact on the residents of the lowland plateau even where the topography provides natural screening of the works. They will experience a noticeable increase in the intensity of vehicle movements, especially where constructing and then using the proposed access road from the cement plant to the main highway across the western face of the ridge. Again, there will be a negative impact as a result of vehicle lights crossing the ridgeline. The intervening topography of the ridgeline will provide screening to the enabling works relating to the limestone quarry. They will have no exposure to the works relating to the flysch quarry. Though their sensitivity is high, the severity of the visual impacts is anticipated to be moderate adverse, due in the intervening distance and topography of the ridgeline.
- 6.95 For the residential properties located within the hillside communities they will be exposed to the operational activities relating to the extraction of material from the flysch quarry as well as the transportation links between the flysch quarry and the cement plant. The degree of exposure to the impacts will increase as the working area of the quarry expands. However, ongoing mitigation works will lesson the cumulative impact of the quarry site. They will have minimal exposure to the works relating to the cement plant operation or the limestone quarry. For receptors located to the south of the proposed site, the intervening topography of the valley limits the exposure to the view, resulting in a moderate adverse impact. Receptors located to the north and west of the proposed site are provided only limited screening by the topography and will therefore experience a moderate to severe adverse visual impact relating to operation.
- 6.96 Road users of the new national route and infrastructure of the lowland plateau will have views of the construction activities and construction machinery erecting the cement plant however their exposure to the view is for a limited period only. With a low sensitivity these receptors will experience a minor adverse visual impact relating to construction.
- 6.97 As part of the initial, detailed design phase of the development the potential mitigation measure that should be incorporated into the site planning include careful location and orientation of the plant within the identified area. This should to optimise the natural topography of the upland depression to screen views of the proposals from residents within the lowland plateau.

- 6.98 There is limited scope for mitigation of the construction phase of the proposals. Sensitive planning of any temporary structures and infrastructure should use the natural topography to screen the works. This includes the careful consideration of location of any construction plant, works compounds and vehicle parking areas. Careful programming of the works and consideration to such factors as noise and lighting requirements to minimise night time impacts may provide some mitigation of the works. Where possible advance screening should be undertaken, including establishment of nursery plantations and advance structure planting to screen access tracks. It is also proposed that the quarry works will include the setting up and maintenance of a nursery to supply plant stock for restoration. The opportunity would exist for this to also support the plant mitigation planting. This also offers the potential for advance tree planting to both provide for visual screening and biodiversity enhancement, taking account of recent depletion of natural forest area. Overburden should be blended with the existing topography to screen ground level clutter and vehicle movements. Works outside the immediate plant and quarry areas should be minimised.

TRAFFIC AND TRANSPORT

- 6.99 The details of traffic during the construction phase are not presently known. However, it is reasonable to assume that before heavy plant is transported to site for the construction activities, suitable roads will need to be in place. This is particularly the case for the road joining the main arterial highway to the cement plant.
- 6.100 With regards to the actual construction of the plant, the overall construction traffic levels will be determined by a number of factors; how much additional fill / cut material is required; the quantities of raw materials for the construction of hard standing and building; site operating hours; and the use made of the railway system.
- 6.101 The number of cranes and specialized equipment is not yet known. This equipment will be provided directly by the contractor. However, most heavy movements will be infrequent, relating to the transport of heavy plant and machinery.
- 6.102 It is anticipated that the traffic generated by the construction phase will not have significant impact on current volumes of traffic that use the main arterial highways and the main effect will be the impact on the traffic along the local routes. However, the level of disruption is not expected to be significant and it should be noted that most of the heavy transportation connected with ground works will not leave the plant, as excavation material will be stored within the limits of the site area.
- 6.103 In order to minimise impacts, the following mitigation measures should be considered:

- Restricting delivery hours to reduce noise nuisance and congestion;
- Heavy construction traffic will be subject to the traffic management plan.

6.104 Mitigation measures will be incorporated in to the Environmental Management Plan once transport requirements and suitable options have been established.

NOISE AND VIBRATION

6.105 Until more details are known about the types of equipment to be used in the construction phase, and the specific processes and programme, detailed calculations of the noise and vibration impact cannot be undertaken. Generally, those activities likely to be most noise-intrusive include piling. There are no significant demolition activities to be undertaken.

6.106 Mitigation measures will be used during construction works and will be incorporated into the Environmental Management Plan once construction details are known. Measures likely to be adopted include:

- Switching off plant and equipment when it is not in use for longer periods of time;
- establishment of agreed site working hours for normal construction activities;
- programming works such that the requirement for working outside of normal working hours is minimised;
- ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities;
- use of temporary noise screens or partial enclosures around particularly noisy activities, for example pneumatic breakers used in close proximity to dwellings;

6.107 Construction activities are likely to require high numbers of heavy goods vehicles to deliver plant and materials to the site, and to remove excess material. The noise impacts would be assessed once quantities of materials and the traffic generated have been identified.

6.108 Commissioning activities will generate noise; noise levels are expected to be similar to those generated in the operational phase.

ARCHAEOLOGY AND CULTURAL HERITAGE

- 6.109 There are no archaeological or cultural heritage features identified on the site, and the assessment has not identified any sites that are likely to be affected by the development.
- 6.110 Road building should not interfere with either the cemetery or access to Boka e Kuye. There is an existing access road to the cemetery. The new road will be built at a distance from the cemetery but a connecting road will be established. Currently access to Boka e Kuye is by a rough track. Where this track is intersected by road workings care should be taken to provide an alternative pedestrian / mule route.

RISK MANAGEMENT

- 6.111 Abnormal and emergency conditions in construction phase may be divided into the following categories:

Emergencies

- fire in plant, equipment, installations, buildings (including the workers' camp, administration building etc.)
- fire in adjacent industrial installations
- spills of hazardous substances such as oils

Abnormal Situations

- breakdown of energy or heat supply
 - failure of water supply system or wastewater collection system
 - ground stability problems
 - non-standard weather conditions; strong winds, heavy rain or snow;
 - unexpected findings during excavations
 - encountering unexploded ordnance (unlikely as this area was not bombed during WWII)
 - encountering unidentified structures or services (e.g. pipelines, foundations). This is highly unlikely due to the rural nature of the area.
- 6.112 All the above will have specific procedures describing actions to be taken to mitigate environmental impacts.

- 6.113 Fire and spill risks will be covered by emergency procedures describing proper evacuation, communication, availability and use of fire fighting or spill removal procedure. It is understood that all fire issues will be supervised and executed by the contractor. However, all activities will be supervised by members of Antea.
- 6.114 Procedures will be also developed for situations regarding lack of power, heat or water supply. This will involve the use of secondary reserve sources, proper handling of machines and equipment (stop procedure). Specific procedures will apply to the temporary construction camp. This will include prevention of any environmental damage or risk to the local community. Similar documents will also cover also unfavourable weather conditions when it may be necessary to stop works, switch-off the energy supply, etc.
- 6.115 The procedure for handling of any abnormal conditions or finds during the excavation will allow for immediate halting of the works. The situation will be assessed (including risks), sampling undertaken if necessary and communication established with specialised services (e.g. archaeology, fire brigade, chemical emergency, army). Proper handling of the situation may include isolation of the area or removal of hazardous materials.
- 6.116 Mitigation measures will be incorporated into the Environmental Management Plan once transport requirements and suitable options have been established.

Table 6.1 - Summary of Construction Impacts and Mitigation Measures

AIR			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Air quality - dust emissions during construction and ground works	Development of procedures for : - water spraying roads and dusty materials stockpiles - sheeting vehicles carrying dusty materials on leaving the site to prevent materials being blown from the vehicles - speed limits on unmade surfaces on site to limit dust	Dust propagation will be limited to construction area and will not influence local community. However workers should be supplied with dust masks especially in dry days.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Importation of pollutants already present within the materials to be used for filling and site levelling operations	Ensure that pollutants are not present in materials imported onto the site by appropriate selection of source material and chemical analysis if required	Potential for importation of pollutants in the material will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground, especially in the construction lay-down area, during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater to ground and groundwater from the workers camp	Sanitary waste will not be discharged to the ground	None	Negligible/Nil
Contamination of local water ways from proposed effluent plant discharge	Ensure that the plant complies with local and international standards and guidelines. Final effluent should have no significant negative impact on the receiving water. The	Potential for release of harmful of effluent if the facility is underspecified or not managed correctly.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	plant should be designed so as to be able to cope with the load of the full construction camp.		
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse
Increase of sediment load in natural aquatic receptors resulted from direct runoff disposal	- Minimisation of excavations face during construction - Temporary drainage grooves and sedimentation ponds for surface runoff collection	None	Negligible
Natural aquatic receptors degradation due to direct disposal of domestic type wastewater	- Construction of appropriate sewage system and wastewater treatment facility.	None	Negligible
Groundwater contamination from leakage of polluting substances	- Usage of non-hazardous construction materials for human health and environmental protection. - Storage of potential polluting materials in appropriate areas, including secondary containment. - Any contaminated land occurred during construction will be directly removed and disposed off in hazardous	None	Negligible

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	waste landfill sites.		

MATERIALS USE AND WASTE MANAGEMENT			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Waste generation	- Reuse of soil - introduction of waste storage and control procedures - segregation and recycling of waste	Waste for disposal will be disposed of through the municipality	Minor adverse

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Loss of vegetation on site clearance	- Translocate soil and some vegetation to help restore neighbouring eroded areas - Habitat Restoration Programme including “Habitat Survey and Management Study” (especially of neighbouring areas, to be defined, and in close co-ordination with local ecologists and communities); Seed Gathering; Nursery	Vegetation loss cannot be avoided but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation	Severe adverse (Flysch site) to moderate adverse (Limestone site) and Moderate to substantial beneficial (neighbouring restoration areas)

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Establishment - Propagation of threatened species (Albanian Red List) such as <i>Quercus ilex</i>, <i>Salvia officinalis</i> to be included. - Survey and Ecological Method Statement for Access Road Construction (Appoint Project Ecologist)		
Further land take (habitat loss) for temporary Construction Camp	- Build temporary construction camp on land that will in due course be required for quarrying	No additional impact since land take would occur anyway at quarry site	Negligible / Nil
Destruction of fauna and habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates)	- Further ecological/fauna survey at appropriate seasons and translocations monitored by the company specialist	Moving fauna to neighbouring sites may help short-term survival, but not medium-term if these sites are already occupied. In long-term populations may recover on restored sites	Minor adverse
Increase in exploitative pressures on habitats neighbouring the sites	- Conduct and implement "Habitat Survey and Management Study", in close consultation with local communities	With co-operation of local community and project providing alternative source of income, habitats should be improved.	Moderate to Substantial Beneficial
On ecology of surrounding area by temporary foreign workforce as a result of removal of vegetation (for firewood, medicine) and the capture of wildlife	- Education, monitoring and enforcement programme. - Adequate waste management and sanitation facilities.	Implementation may be difficult and some impact can be expected	Minor to moderate adverse (depending on implementation)

LANDSCAPE & VISUAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Sensitive planning of site works and compound Advance structure planting Minimise lighting and night time workings	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

NOISE AND VIBRATION (incorporating Transport)			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Noise from construction of new plant/quarry and link roads	Good site management; Appropriate choice of machinery; Methods of working; Hours of working; Efficient material handling;	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A
Noise from traffic relating to construction using existing roads through local residential areas	Define access routes to the site with the smallest number of properties in proximity to it. Keep vehicle movements to a minimum. Once link roads are completed, all construction traffic to/from the site should only use the link roads.	There may be noise increases at residential properties in proximity to the chosen access route, and then from the link roads once completed.	Minor Adverse

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Foreign worker health problems may impact on work and wage payment	Specification by CBMI of reasonable sickness benefits and sick leave with pay	Sickness over specified period will affect earnings. Early return to work may damage health.	Minor adverse
Worker - industrial emergency	Contracted quality curative treatment in Tirana for all emergencies.	Depends on nature of emergency	Minor adverse
Foreign worker living conditions and quality of life.	CBMI to provide Antea with detailed specification of camp layout,	Depends on individual worker susceptibility.	Minor / Moderate adverse
Utility and service provision impacts on local villages.	facilities, and utility provision (and disposal) in accordance with identified international standards. Antea to monitor health and safety and terms and conditions of employment. To do this a Chinese speaker should be part of the team	If conditions are poor multitude of issues could arise in camp and spill into local communities.	
Disturbance and conflict in camp	In- camp codes of conduct and enforcement of key behaviours and reasonable use of alcohol	None identified	Minor adverse
Disturbance and /or conflict with local population	Camp code of conduct upheld by workers and enforced by camp. Provision of employment and opportunities to local population to minimise hostility. Liaison committee to identify early issues and their resolution	Some residual impact expected but scale limited by worker free time, and local interaction with camp	Minor / Moderate adverse

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Opportunities for local procurement	Titan /Antea to arrange initial contacts and encourage CMB to maximise local procurement Antea should provide a trained facilitator to examine business opportunities and issues from CMBI and local provider points of view.	Unless Antea provide financial incentives or contractual requirements to CMBI this may be unlikely to happen Poor community relations if community see no commercial benefits from the camp	May vary from negligible to moderate beneficial depending on the effort and incentives provided by all parties.
	Antea should provide consultant to support business development initiatives and ensure projects are financially sustainable Provision of support by Antea and /or concessionary terms (not subsidies) by CBMI to assist new supply businesses.		
Potential for increased incidence of sexually transferable disease (STD) in local populations and amongst workers	Preventative health awareness campaigns for STDs provided to foreign workers and targeted at key urban locations / groups. Provision of free condoms in pharmacies and toilets or similar common access facility.	Difficult to identify cause or source of such disease as this is commonly hidden and poorly reported. However some disease may be spread and curative treatment may be required for the different diseases, in case of HIV this would be of a long term nature.	Moderate (possibly severe) averse -

7. IMPACTS ASSOCIATED WITH OPERATION

AIR QUALITY

- 7.1 This section includes a detailed assessment of the effects of operational plant emissions and of vehicle emissions from plant traffic using the local trunk roads network. The potential effect of quarry operations on the local environment is also discussed.

Assessment of Cement Plant Emissions

Introduction

- 7.2 This section presents the results of the detailed air dispersion modelling study undertaken for the proposed cement plant at Burizana. The aim of the study is to determine increases to ground level concentrations of pollutants resulting from the routine stack emissions during the operation of the plant. The emissions to the atmosphere were modelled using the US Environmental Protection Agency (EPA) atmospheric dispersion model AERMOD PRIME. The plant discharge characteristics were as advised by Antea.
- 7.3 This AERMOD study includes direction specific building downwash effects for the main site buildings that are greater than 40% of the stack height and therefore may cause plume downwash effects. Digital terrain data were used in the modelling to take account of local topography. Four years of hourly sequential meteorological data from Podgorica were used in the study. The joint frequency distribution of wind speed and direction is shown as a wind rose in the baseline conditions chapter.
- 7.4 The following sections describe:
- the air dispersion methodology, together with the various meteorological and geographical/topography data inputs used;
 - the emissions to air from the plant;
 - the results of the air dispersion modelling; and
 - a discussion of the model results at residential properties in the context of the EU air quality criteria.

Dispersion Modelling

- 7.5 The dispersion modelling was carried out using the US EPA model AERMOD PRIME version 07026. This model is the result of many years development by the US EPA and the American Meteorological Society. It has been developed as a regulatory model that incorporates the current understanding of atmospheric physical processes.
- 7.6 AERMOD simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. The modelling system includes:
- an advanced meteorological pre-processor to compute site-specific planetary boundary layer (PBL) parameters;
 - highly developed dispersion formulations that incorporate current PBL understanding and variables for both convective and stable boundary inversions;
 - enhanced treatment of plume rise and plume penetration for elevated inversions allowing for effects of strong updrafts and downdrafts that occur in unstable conditions;
 - improved computation of vertical profiles of wind, turbulence and temperature;
 - a “dividing streamline” approach for computations in complex terrain.
- 7.7 AERMOD includes two data pre-processors for streamlining data input: AERMET, the meteorological pre-processor discussed earlier, and AERMAP, a terrain pre-processor. AERMAP imports receptor elevations from digital data formats and computes a “hill height scale” parameter for each receptor as input to AERMOD.
- 7.8 The building downwash algorithms in AERMOD PRIME use parameters calculated by the Building Parameter Input Program (BPIP), distinguish this model from earlier versions of AERMOD, which used simpler procedures to address downwash. The model provides reasonable estimates over a wide range of meteorological conditions and modelling scenarios.
- 7.9 The hourly sequential data for Podgorica for the years 2003 to 2006 were processed using the meteorological pre-processor AERMET version 06341. This software processes the meteorological data and estimates the necessary boundary layer parameters for the site-specific dispersion calculations in AERMOD. The data were processed to take account of the location and surroundings of the meteorological station and of the modelled facility using the certain surface characteristics.
- 7.10 These characteristics were specified to reflect the nature of the surroundings within three kilometres of the facility. A single zone was designated to reflect the rural

characteristics surrounding the site. The pre-processor was used with default annual average parameters for surface roughness²⁶, albedo²⁷ and Bowen ratio²⁸ respectively for these surfaces. The values used are presented in Table 7.1.

Table 7.1 – Surface Characteristics

Terrain type	Albedo	Bowen ratio	Surface roughness (m)
Rural	0.28	0.75	0.0725

- 7.11 AERMOD was run with the four year meteorological data file produced by AERMET. The model reports the maximum hourly, daily and annual average concentration found using these meteorological data. This provides a robust estimate of the result at each receptor.
- 7.12 The BPIP programme can be used to calculate for each wind sector the direction specific building downwash parameters to be used by AERMOD PRIME in the dispersion calculations. Buildings close to sources that are more than 40% of the stack height may potentially cause downwash effects. The dimensions of the pre-heater structure and various silos were processed using BPIP to determine appropriate direction specific downwash parameters for the stack and incorporate them in the AERMOD input file.
- 7.13 The AERMOD software uses the UTM co-ordinate system for receptors and all model objects. This is necessary as receptor heights are read from the DEM format terrain data file which is also based on UTM co-ordinates. Ground level concentrations were modelled using two Cartesian receptor grids. A grid of receptors spaced at 250 metre intervals was specified to cover the site and low lying terrain to the west. Receptors falling within the cement works boundary were eliminated from this grid; however discrete receptors were specified at intervals on this boundary. A higher resolution grid spaced at 125 metre intervals was used to the east of the project site in order to provide the desired spatial resolution in areas of elevated terrain where concentration gradients are more pronounced.

²⁶ Surface roughness length is a measure of the height of obstacles to wind flow. It is not equal to the physical dimensions of obstacles, but is generally proportional to them.

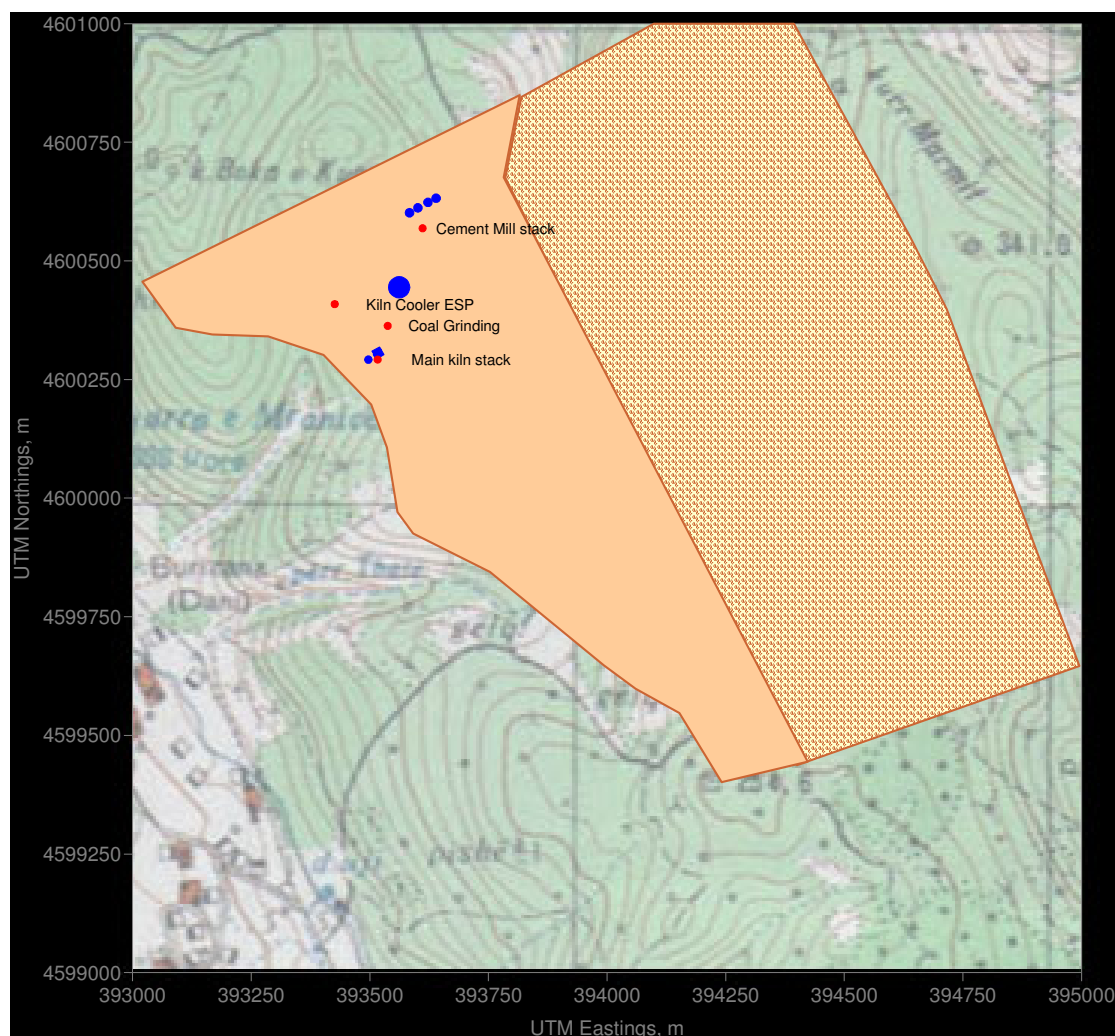
²⁷ Noon-time albedo is the fraction of incoming solar radiation reflected from the ground when the sun is directly overhead. Adjustments are made in AERMET to incorporate the variation in the albedo with solar elevation angle.

²⁸ The Bowen ratio is a measure of the amount of moisture at the earth's surface. This influences other parameters which in turn affect atmospheric turbulence.

Emissions Characteristics

- 7.14 This study addresses the combustion gas emissions from the kiln stack and particulate emissions from the kiln, the clinker cooler, the coal mill and the cement mill.
- 7.15 The stack and the main facility structures are shown schematically in Figure 7.1, as are the plant and limestone quarry boundaries.

Figure 7.1 - Facility Schematic



- 7.16 The stack characteristics are shown in Table 7.2. The main kiln stack base is at a terrain elevation of approximately 180 m, over a hundred metres above the elevation of the town of Burizana.

Table 7.2 – Stack Characteristics

Source	UTM coordinates		Stack height	Stack diameter	Exit temp	Exit velocity	Actual volumetric flow rate
	Easting	Northing	m	m	°C	m/s	m ³ /s
Cooler ESP	393426.1	4600408.8	30	2.6	127	16.48	87.5
Kiln, Raw Mill	393516.6	4600292.0	140	4.3	94	8.31	120.7
Fuel Mill	393537.7	4600363.0	35	1.4	88	14.44	22.2
Cement Mill	393611.3	4600568.7	40.	2.65	95	8.56	47.2

7.17 The pollutant emission rates are shown in Table 7.3. The oxides of nitrogen mass emission rate is based on an emission concentration of 600 mg/Nm³, under reference conditions of temperature, pressure, and 10% oxygen, dry basis.

Table 7.3 – Pollutant Emission Rates, g/s

Source	Sulphur dioxide	Particulates	Oxides of nitrogen	Carbon monoxide
Cooler ESP	-	1.16	-	-
Kiln, Raw Mill	1.57	1.57	47.14	86.42
Fuel Mill	-	0.33	-	-
Cement Mill	-	0.68	-	-

Results

7.18 The maximum modelled short-term and long-term increments to ground level pollutant concentrations are presented in this section. The short-term increments are:

- the maximum hourly average concentrations modelled at each receptor for the least favourable hour in three years meteorological data, i.e. over 26,000 hours, and
- the maximum 24-hourly average concentrations modelled at each receptor for the least favourable day in 1095 days of meteorological data, and
- for carbon monoxide, the maximum eight hourly average concentration (of three periods each day) at each receptor for the least favourable day in 1095 days of meteorological data.

7.19 The long-term increments reported are the highest of the three annual averages modelled at each receptor.

- 7.20 These results are shown graphically in the form of contour plots that demonstrate the pattern of ground level concentrations around the site and in the wider region. The plots also clearly show the boundaries of the site and that of the nearby limestone quarry, which is regarded as part of the project site for the purpose of this study, and within which there is no relevant public exposure.
- 7.21 The UK government provides advice to local authorities on the interpretation of the national regulations implementing the EU Directives on air quality in the DEFRA publication Technical Guidance for Local Air Quality Management TG(03).²⁹ This advice is also relevant to the consideration of compliance with the EU Directive air quality criteria elsewhere in Europe.
- 7.22 This advice states that **"The Regulations make clear that likely exceedences of the objectives should be assessed in relation to 'the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present'. Reviews and assessments should thus be focussed on those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Authorities should not consider exceedences of the objectives at any location where relevant public exposure would not be realistic."**
- 7.23 The locations of sensitive receptors where individuals may be exposed for the averaging periods specified in the air quality criteria are identified by the place names and UTM coordinates in Table 7.4. The terrain elevations at these locations are also shown in the table, as the results are influenced by the local topography. These locations are shown graphically in Figure 7.2 as identified by the alphabetic site codes in the table.

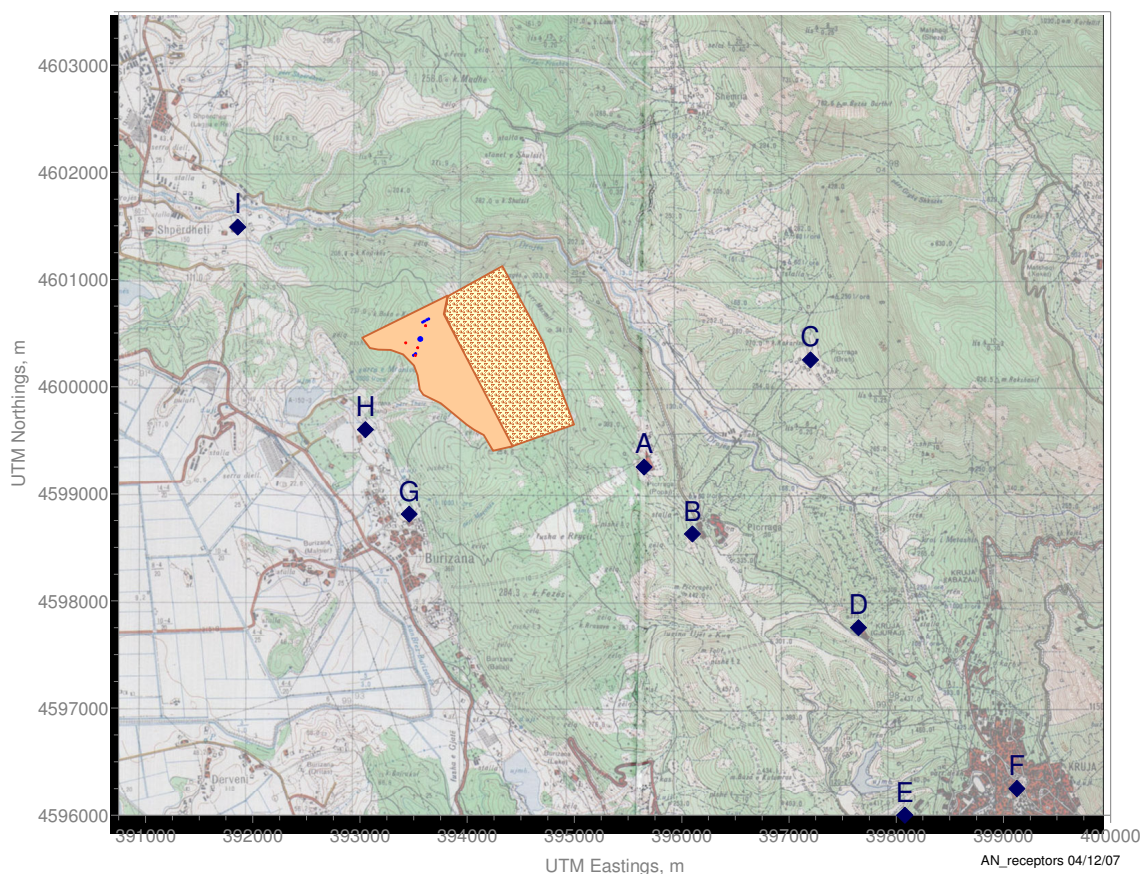
Table 7.4 - Nearby Sensitive Receptors

Name	Site Code	Eastings, m	Northings, m	Elevation, m
Picrraga (Popaij)	A	395650	4599250	365
Picrraga	B	396100	4598625	336
Picrraga (Broti)	C	397200	4600250	298
Kruja (Gjuraj)	D	397650	4597750	343
Kruja (Pengile)	E	398080	4596000	385
Kruja	F	399125	4596250	522
Burizana	G	393460	4598810	64

²⁹ <http://www.defra.gov.uk/environment/airquality/local/guidance/pdf/laqm-tg03.pdf>

Burizana (North)	H	393050	4599600	56
Shpërdheti	I	391860	4601490	55

Figure 7.2 – Nearby Locations of Sensitive Receptors



- 7.24 The results at these sensitive receptors where there may be relevant short-term and long-term exposures are summarised below in Table 7.5. The relevant European and WHO criteria are also reiterated for ease of reference when assessing the significance of these increments in terms of public health.
- 7.25 For all pollutants the highest concentrations modelled were found at Receptor A in Picrraga (Popaij), other than for particulate matter. The results for particulates are highest in Burizana due to the influence of lower level emissions from sources close to the north west of the site. The conclusions to be drawn in the context of the air quality criteria and the potential health implications of these exposures are discussed in detail below in the sections addressing the graphical presentation of results for each specific pollutant.

Table 7.5 – Maximum Pollutant Increments at Representative Locations, $\mu\text{g}/\text{m}^3$

Pollutant	Sulphur Dioxide $\mu\text{g}/\text{m}^3$			Particulate Matter $\mu\text{g}/\text{m}^3$		Oxides of Nitrogen $\mu\text{g}/\text{m}^3$			Nitrogen Dioxide $\mu\text{g}/\text{m}^3$			Carbon Monoxide mg/m^3
	1-hour	24-hour	Annual	24-hour	Annual	1-hour	99.79 th percentile	Annual	1-hour	99.79 th percentile	Annual	8-hour
A	36.8	1.86	0.10	1.87	0.15	1105	263.8	3.05	221.0	52.8	0.61	0.26
B	7.3	0.44	0.02	1.19	0.07	218	27.7	0.58	43.6	5.5	0.12	0.06
C	0.9	0.10	0.01	2.37	0.12	28	9.7	0.19	5.7	1.9	0.04	0.02
D	5.1	0.41	0.02	0.79	0.05	153	35.0	0.60	30.7	7.0	0.12	0.06
E	9.9	0.86	0.07	0.95	0.09	299	148.8	2.01	59.7	29.8	0.40	0.12
F	4.8	0.32	0.01	0.41	0.02	144	10.7	0.26	28.8	2.1	0.05	0.06
G	1.4	0.19	0.03	2.27	0.48	43	13.8	1.04	8.6	2.8	0.21	0.03
H	0.9	0.11	0.02	2.81	0.37	26	14.8	0.54	5.3	3.0	0.11	0.02
I	1.2	0.09	0.02	1.41	0.10	35	10.5	0.47	7.0	2.1	0.09	0.01
Criteria	350	125	30	50	40	-	-	-	-	200	40	10
Source	EU [†]	EU [†] /WHO	EU (veg)	EU [^]	EU	-	-	-	-	EU [*]	EU	EU

[†] Daily limit value is for the 99.2nd percentile; hourly limit value is for the 99.7th percentile

[^] Limit value is for the 90th percentile

^{*} Limit value is for the 99.8th percentile

- 7.26 It is evident from the graphical presentation of the results that the absolute highest ground level concentrations in the overall modelled domain are generally found on the uninhabited high ground to the south-east, within or just beyond the quarry boundary. This ridge, of elevations between 350 to 400 metres, is considerably higher than the plant elevation of 180 metres, and the terrain is above the 140 metre high stack. The dispersion model will report the highest concentrations for those least favourable hours of meteorological data when the plume interacts with this topographical feature.
- 7.27 These domain-wide maximum results are summarised below in Table 7.6. These results are at locations which are not considered to be of “relevant public exposure” in terms of compliance with the EU Directive air quality criteria.

Table 7.6 – Maximum Domain-Wide Increments to Pollutant Concentrations, $\mu\text{g}/\text{m}^3$

Pollutant / averaging period	Modelled Increment
Sulphur Dioxide	
Maximum 1-hour	57.5
Maximum 24-hour	5.8
Annual average	0.20
Particulate Matter	
Maximum 24-hour	14.7
Annual average	1.7
Oxides of Nitrogen	
Maximum 1-hour	1725
99.79 th percentile of hourly means	566
Annual average	6.0
Nitrogen Dioxide	
Maximum 1-hour	345
99.79 th percentile of hourly means	113
Annual average	1.2
Carbon Monoxide	
Maximum 8-hour (mg/m^3)	0.95

Sulphur Dioxide - Annual Average

- 7.28 The increments to annual average sulphur dioxide concentrations are shown in Figure 7.3. The concentration shown at each receptor location in the figure is the highest annual average found from the four years meteorological data used in the dispersion modelling study. The figure illustrates how concentrations decrease rapidly as distance from the maximum increases. Note that in this series of figures, contours with inward tick marks, such as that found in this figure at 396250, 4597500 in a lower lying part of the ridge denote areas of minimum concentrations.
- 7.29 The maximum annual result is found on the high ground at grid reference 395250, 4599375, approximately two kilometres to the south east of the main kiln stack, where the concentration is $0.20 \mu\text{g}/\text{m}^3$. Concentrations are elevated along the length of this ridge continuing to the south east. There is a second area of slightly elevated concentrations approximately four kilometres to the east, again occurring along a ridge of high ground. At the closest residential properties in Burizana to the south west of the plant, concentrations are less than $0.03 \mu\text{g}/\text{m}^3$. The highest concentration at residential properties of $0.10 \mu\text{g}/\text{m}^3$ is found in Piccraga (Popaij). These modelled increments to annual average sulphur dioxide concentrations are insignificant compared with the EU vegetation based guideline of $30 \mu\text{g}/\text{m}^3$ and the former WHO guideline of $50 \mu\text{g}/\text{m}^3$.

Sulphur Dioxide –Daily Average

- 7.30 The daily average concentrations of sulphur dioxide are shown in Figure 6.3. These results show the maximum daily result for each receptor in 1,460 days modelled. The highest increment to daily average concentrations shown above in Table 7.4 of $5.8 \mu\text{g}/\text{m}^3$ occurs at grid reference 394875, 4600250 on the high ground to the east of the plant at a distance of approximately 1.5 kilometres from the main kiln stack. There is another area of somewhat elevated concentrations further along the ridge to the south east of the main stack at 395250, 4599250 where the increment is $3.7 \mu\text{g}/\text{m}^3$. The figure shows that in the majority of the surrounding area, and at all residential properties, the maximum increments to daily average concentrations are less than $2 \mu\text{g}/\text{m}^3$. These results for the daily mean are considered to be negligible in terms of the EU limit value of $125 \mu\text{g}/\text{m}^3$, of which three exceedences are allowed each year.

Sulphur Dioxide – Maximum Hourly Average

- 7.31 The maximum hourly average concentrations are shown in Figure 7.5. These are the highest concentrations at each receptor in over 35,000 hours modelled. The maximum concentration is $57.5 \mu\text{g}/\text{m}^3$, which occurs at grid reference 394750, 4600250. This is a similar location to the maximum daily average concentration but

closer to the quarry boundary at a distance of approximately 1.4 kilometres to the east of the kiln stack. There is a secondary maxima of around $50 \mu\text{g}/\text{m}^3$ at a distance of approximately 1600 m to the south east of the kiln stack near the corner of the quarry. Typical maximum hourly increments in the surrounding area are less than $5 \mu\text{g}/\text{m}^3$. These results are considered to be negligible in the context of the EU limit value of $350 \mu\text{g}/\text{m}^3$, of which 24 exceedences are allowed each year. The maximum concentration at residential dwellings is $37 \mu\text{g}/\text{m}^3$ at Piccraga (Popaiji), approximately 10% of the EU limit value.

- 7.32 Given these small increments in terms of the air quality criteria, no adverse health effects are expected from exposures to sulphur dioxide emissions at any location.

Figure 7.3 – Annual Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$

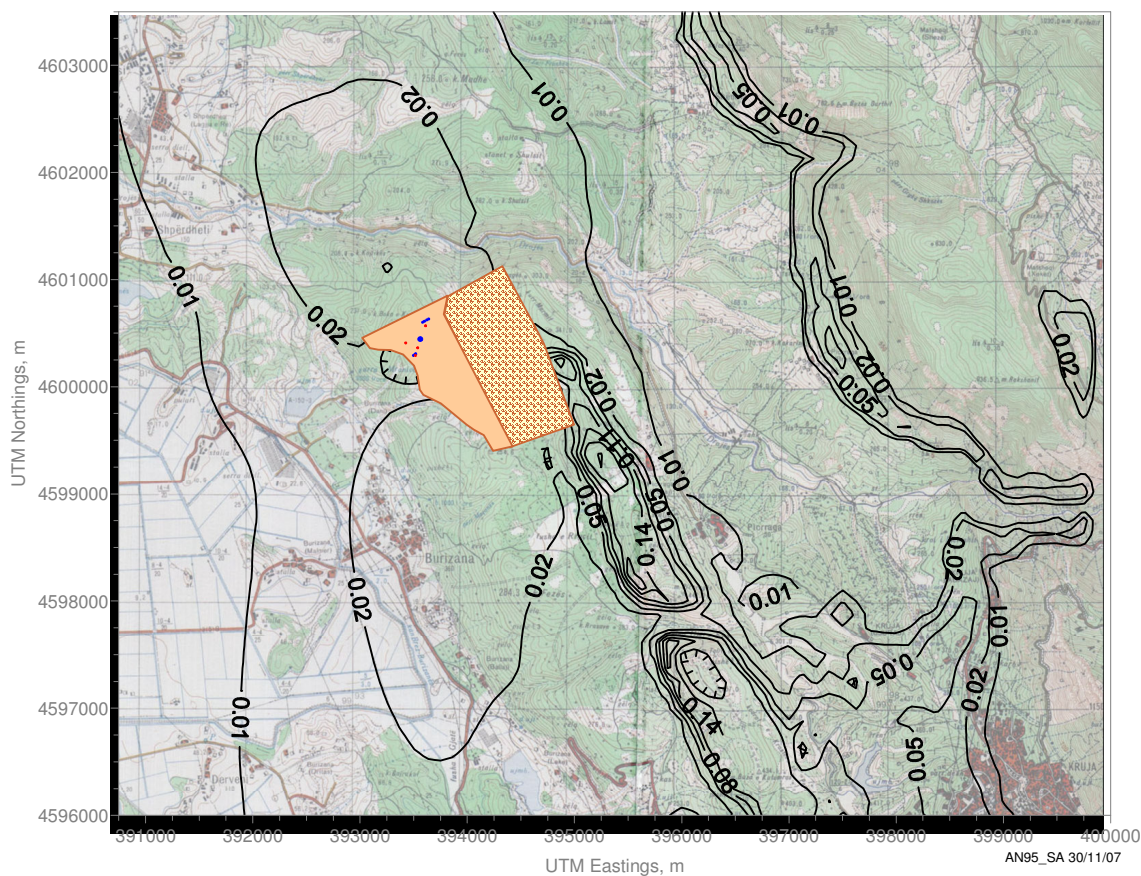


Figure 7.4 – Maximum Daily Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$

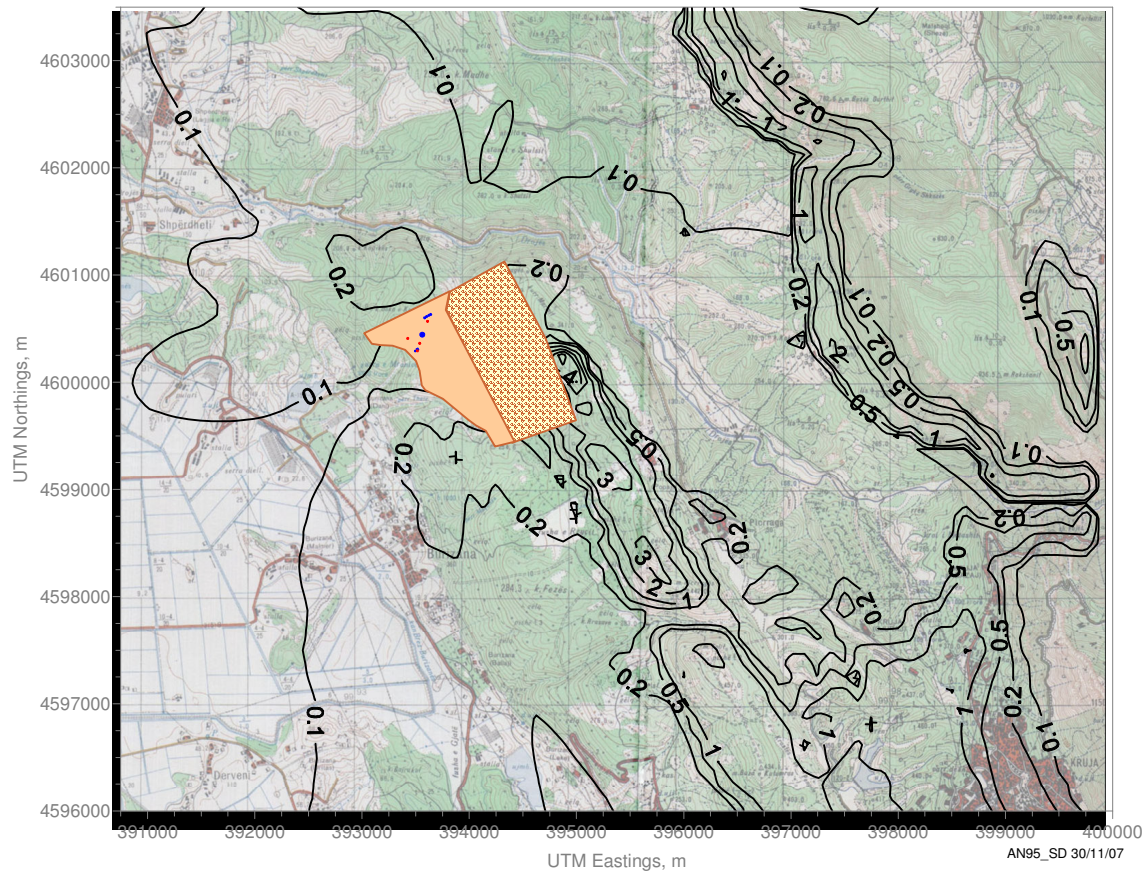
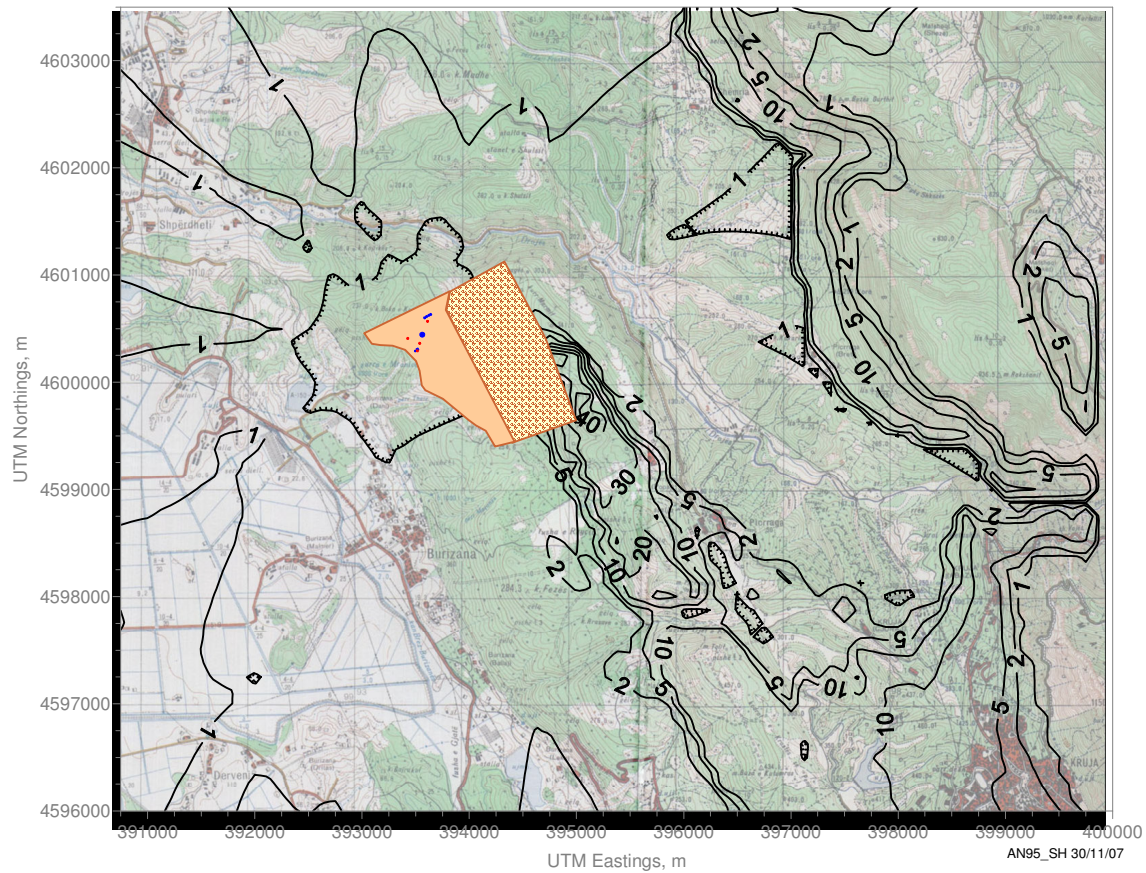


Figure 7.5 – Maximum Hourly Average Sulphur Dioxide Concentrations, $\mu\text{g}/\text{m}^3$



Particulate Matter - Annual Average

- 7.33 The maximum increments to annual average particulate matter concentrations are shown in Figure 7.6. The concentration shown at each receptor location in the figure is the highest annual average found from the four years meteorological data used in the dispersion modelling study. The pattern of dispersion differs from that for sulphur dioxide due to the additional emission sources. The maximum annual result is found just to the north of the site boundary at 393500, 4600750, approximately 250 m from the cement mill stack, where the concentration is $1.7 \mu\text{g}/\text{m}^3$. There is a secondary maximum of $1.4 \mu\text{g}/\text{m}^3$ to the south of the stacks at 393500, 4600000 on the western site boundary. The highest concentrations at residential properties are found in Burizana, $0.48 \mu\text{g}/\text{m}^3$ and in the north of Burizana, $0.37 \mu\text{g}/\text{m}^3$. These modelled increments to annual average concentrations are very low compared with the EU limit value of $40 \mu\text{g}/\text{m}^3$ and hence are not deemed to be significant in terms of health effects.

Particulate Matter –Daily Average

- 7.34 The daily average concentrations of particulates are shown in Figure 7.7 . The highest increment to daily average concentrations of $14.7 \mu\text{g}/\text{m}^3$ occurs within the quarry, and hence there would not be exposure to members of the public. The highest increment to daily average concentrations outside the site is $13.3 \mu\text{g}/\text{m}^3$ which occurs near the site boundary at 394625, 4599500 to the south east of the emission sources $13.3 \mu\text{g}/\text{m}^3$. Concentrations can be seen to decrease rapidly with increasing distance from the site with very little effect due to the high ground. The figure shows that in the majority of the surrounding area, the maximum increments to daily average concentrations are less than $4 \mu\text{g}/\text{m}^3$. Concentrations in Burizana are in the range 2.3 to $2.8 \mu\text{g}/\text{m}^3$ and in Piccraga (Popaij) are $1.9 \mu\text{g}/\text{m}^3$. These results for the daily mean at relevant local receptors are considered to be small (4 to 7%) in terms of the EU limit value of $50 \mu\text{g}/\text{m}^3$, of which 35 exceedences are allowed each year.
- 7.35 Given these small increments in terms of the air quality criteria, no adverse health effects are expected from exposures to particulate emissions at any location.

Figure 7.6 – Annual Average Particulate Matter Concentrations, $\mu\text{g}/\text{m}^3$

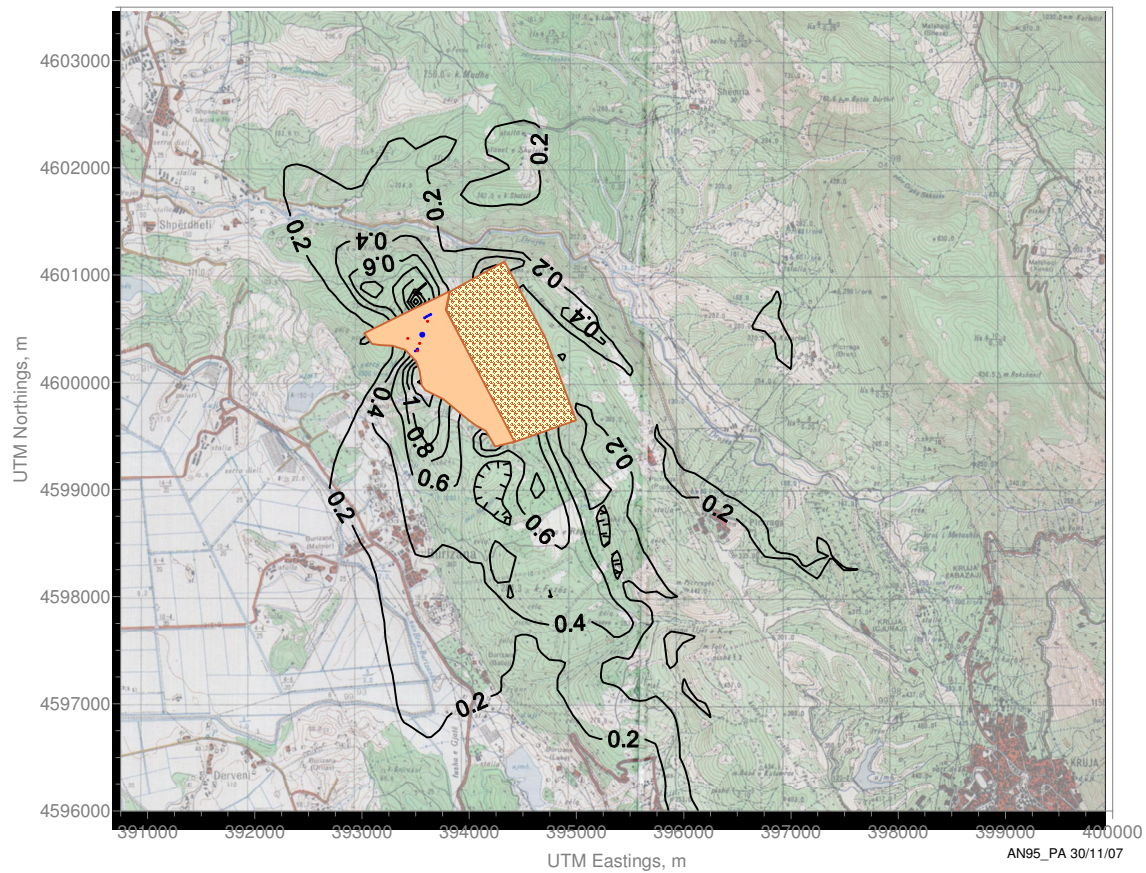
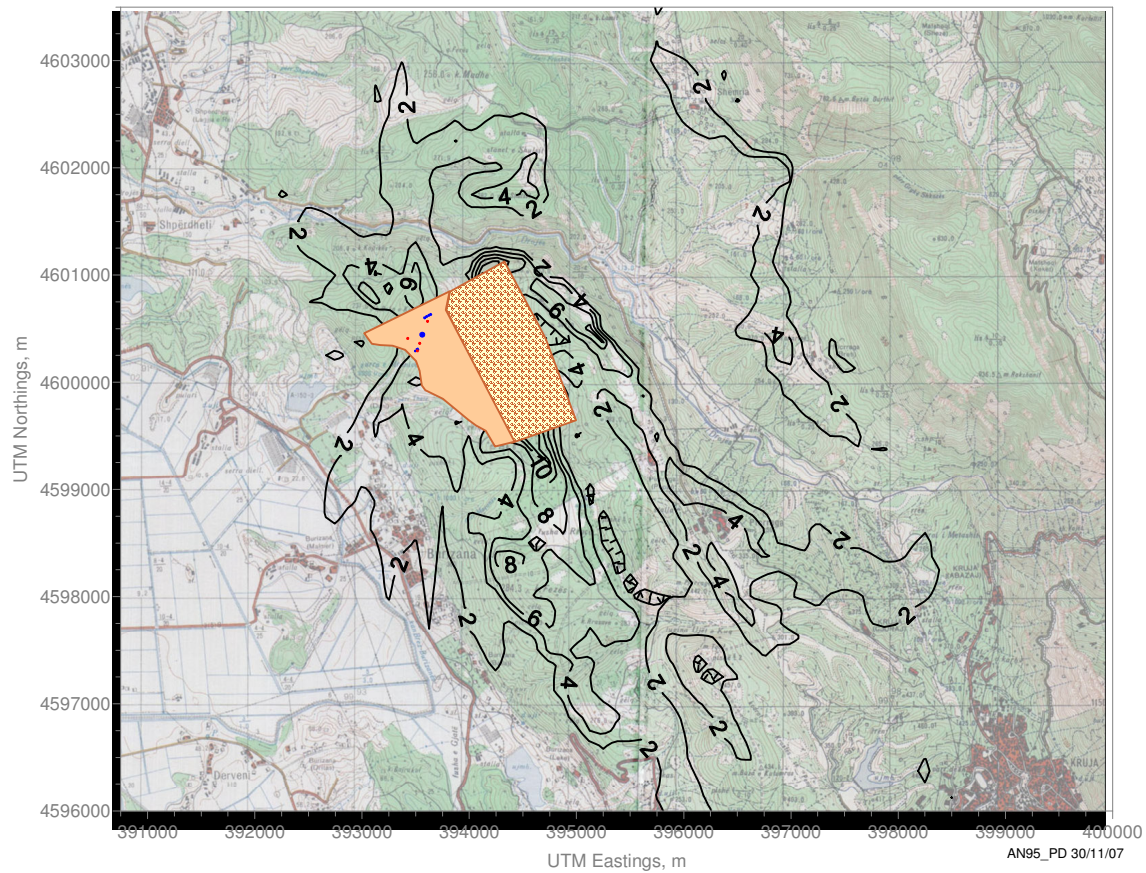


Figure 7.7 – Maximum Daily Average Particulate Matter Concentrations, $\mu\text{g}/\text{m}^3$



Oxides of Nitrogen – Annual Average

- 7.36 The increments to annual average oxides of nitrogen concentrations are shown in Figure 7.8. The pattern of dispersion follows that of sulphur dioxide. The absolute maximum annual result of $6.0 \mu\text{g}/\text{m}^3$ is at 395250, 4599375, at a distance of approximately two kilometres to the south east of the main kiln stack. This location is on the ridge towards Picrraga. The increments to annual average oxides of nitrogen concentrations are below $1 \mu\text{g}/\text{m}^3$ in most of the surrounding area but exceed $2 \mu\text{g}/\text{m}^3$ in areas of high ground to the west of Kruja.
- 7.37 To the south east of the site at Picrraga (Popaij), annual average oxides of nitrogen concentrations are $3 \mu\text{g}/\text{m}^3$, but are typically less than this in the towns of Burizana ($0.5 \mu\text{g}/\text{m}^3$) and Kruja Pengile ($2 \mu\text{g}/\text{m}^3$).

Oxides of Nitrogen – Hourly Average

- 7.38 The increments to maximum hourly average oxides of nitrogen concentrations are shown in Figure 7.9. The absolute maximum result of $1725 \mu\text{g}/\text{m}^3$ is at 394750, 4600250 within the quarry on the high ground approximately 1.2 kilometres to the east of the kiln stack. There are also a few receptors in the uninhabited area near the south east corner of the quarry where the maximum increment to oxides of nitrogen concentrations may exceed $1500 \mu\text{g}/\text{m}^3$. The maximum concentration at the residential property in Picrraga (Popaij) approaches $1100 \mu\text{g}/\text{m}^3$.
- 7.39 The implications of these modelled oxides of nitrogen concentrations in terms of potential exposure to nitrogen dioxide, for which there are air quality criteria, are discussed below.

Figure 7.8 – Annual Average Oxides of Nitrogen Concentrations, $\mu\text{g}/\text{m}^3$

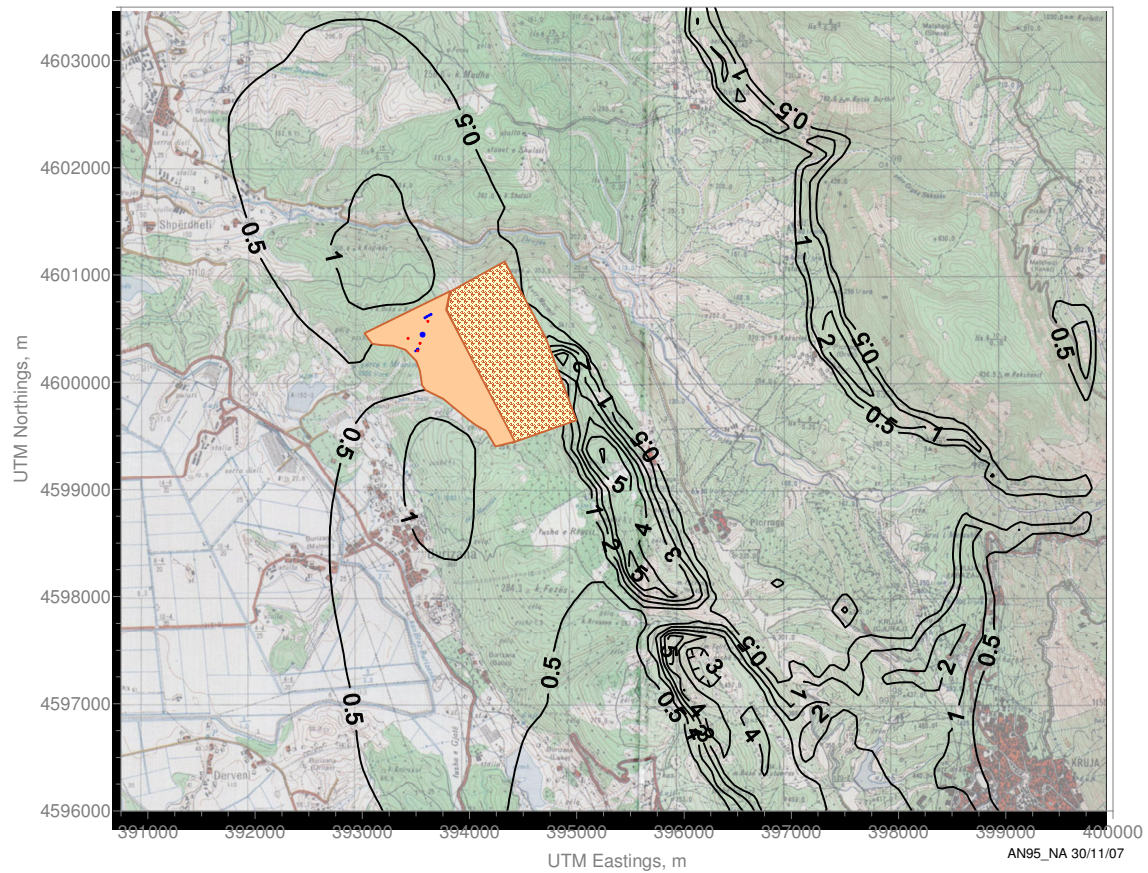
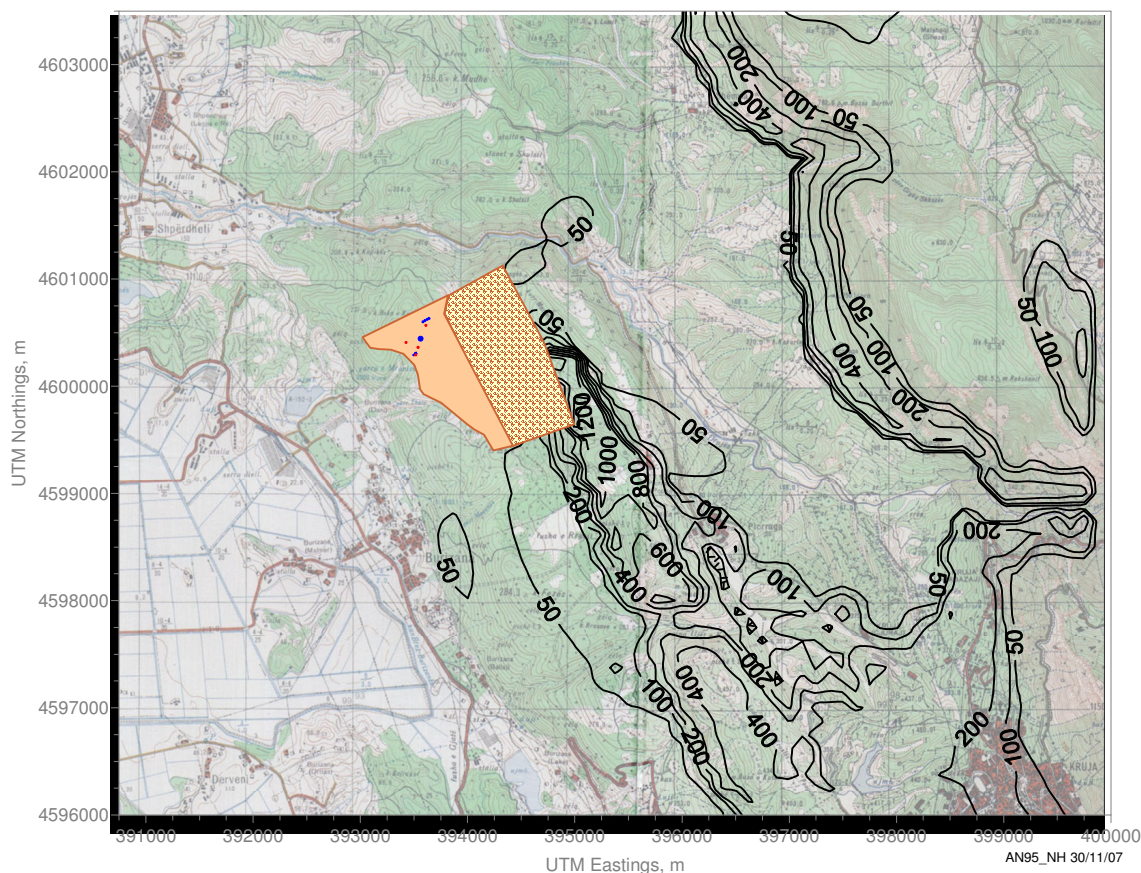


Figure 7.9 – Maximum Hourly Average Oxides of Nitrogen Concentrations, $\mu\text{g}/\text{m}^3$



Nitrogen Dioxide – Annual Average

- 7.40 Approximately 20% of the modelled increments to oxides of nitrogen concentrations react in the atmosphere to form nitrogen dioxide at the ground level receptor locations reported. On that basis, the results for nitrogen dioxide are as shown in Figure 7.10. The highest concentrations at residential receptors are $0.6 \mu\text{g}/\text{m}^3$ at Picrraga (Popaij) and $0.4 \mu\text{g}/\text{m}^3$ at Kruja (Pengile). Increments to annual average concentrations in Burizana are approximately $0.1 \mu\text{g}/\text{m}^3$.
- 7.41 It is concluded that, at all locations where there may be relevant exposure of the public, the modelled increments are an extremely low fraction of the $40 \mu\text{g}/\text{m}^3$ EU limit value for nitrogen dioxide. Given these small increments in terms of the air quality criterion, no adverse health effects are expected from exposures to long term increments to ambient nitrogen dioxide concentrations.

Nitrogen Dioxide – 99.79th Percentile of Hourly Averages

- 7.42 The EU limit value allows for 18 exceedences of the hourly criterion for nitrogen dioxide each year. This is equivalent to the 99.79th percentile of the hourly mean. The modelled oxides of nitrogen results have been factored to nitrogen dioxide equivalent and processed to provide this statistic to allow a comparison with the EU criterion. The 99.79th percentile results as nitrogen dioxide are presented in Figure 7.11.
- 7.43 The absolute maximum percentile concentration is just over 110 $\mu\text{g}/\text{m}^3$, again located on the uninhabited high ground to the east of the plant. At locations where there may be relevant exposure the highest increment is 53 $\mu\text{g}/\text{m}^3$ at Picrraga (Popaij). This is approximately 25% of the EU limit value. At Kruja (Pengile) the percentile increment is less than 30 $\mu\text{g}/\text{m}^3$, or almost 15% of the limit value. At the towns of Burizana and Kruja the results are considerably lower, just a few percent of the EU criterion.
- 7.44 The percentile results demonstrate the infrequent nature of the extreme meteorological conditions that give rise to the highest field-wide maximum hourly concentrations. Given that the existing background air quality is likely to be good in this otherwise rural environment, it may be concluded from the model results that there is no risk of human exposure at Picrraga exceeding the EU limit value. On that basis there are likely to be no adverse human health effects.

Figure 7.10 - Maximum Annual Average Nitrogen Dioxide Concentrations, $\mu\text{g}/\text{m}^3$

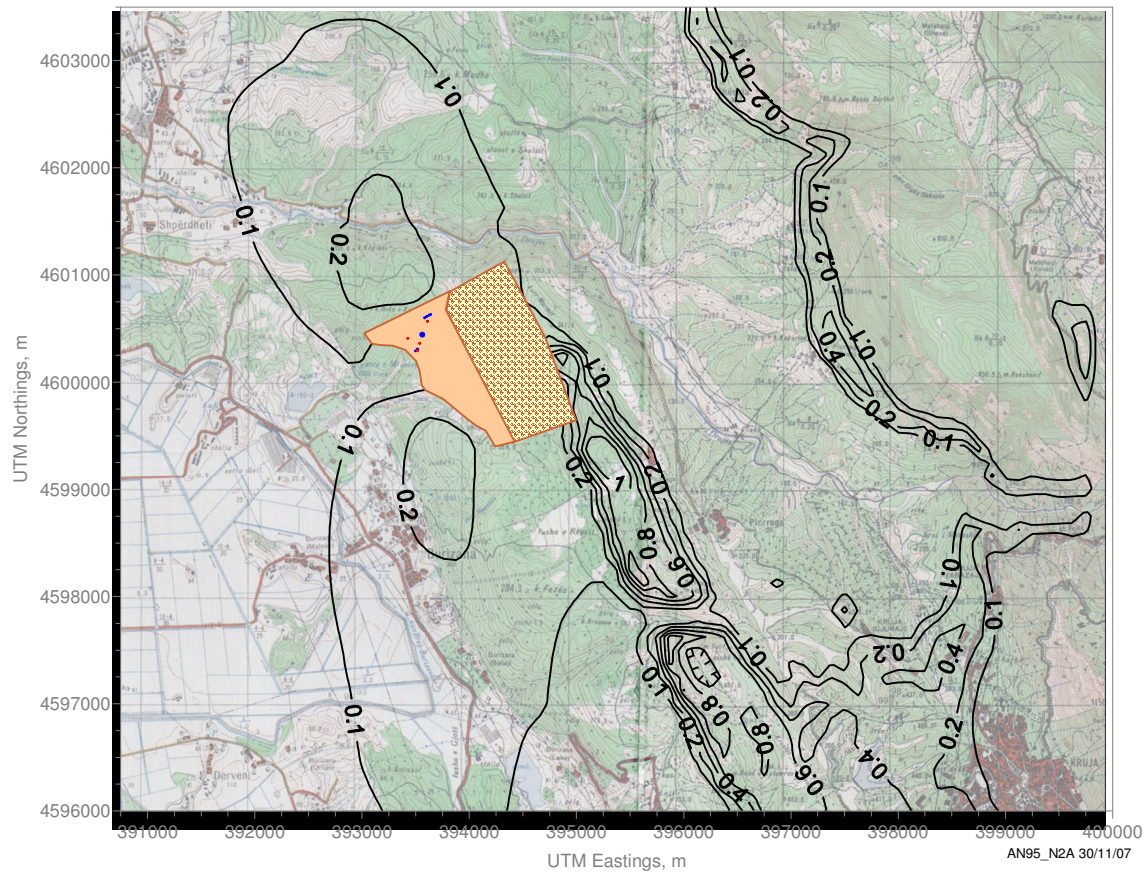
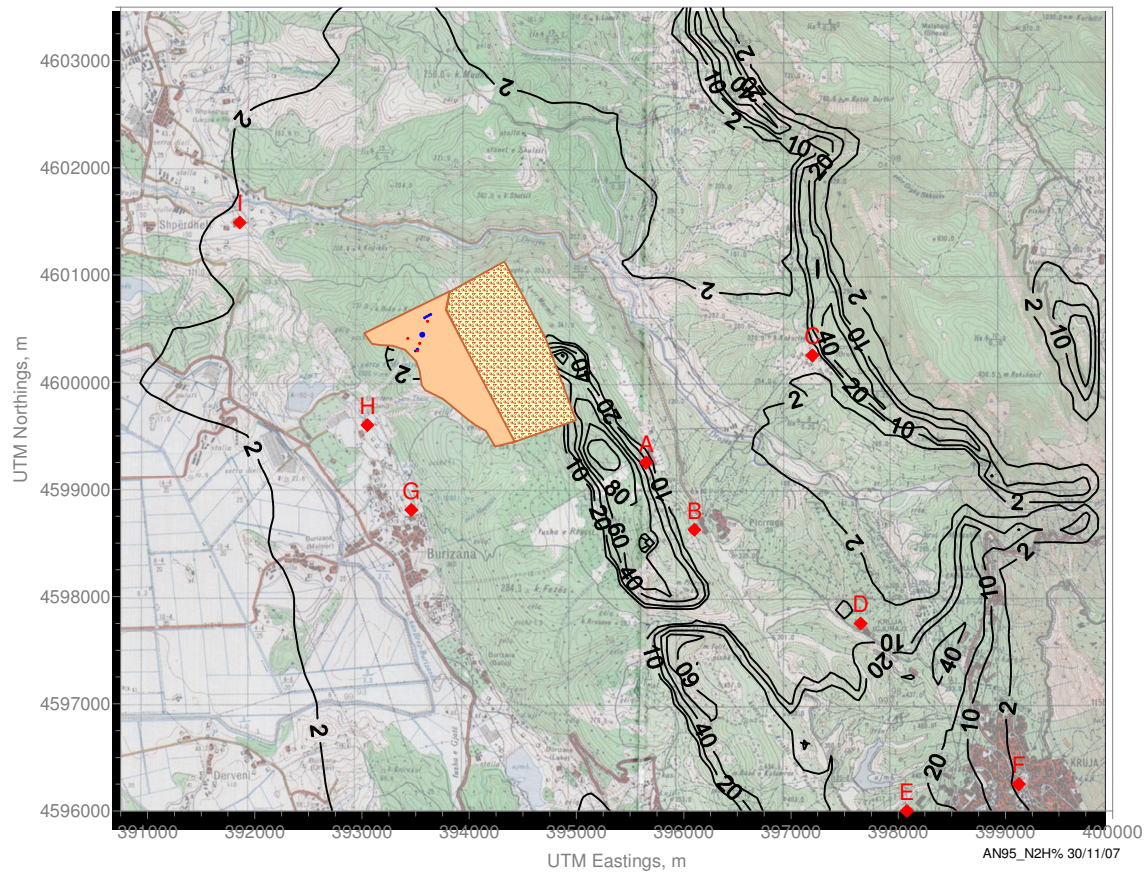


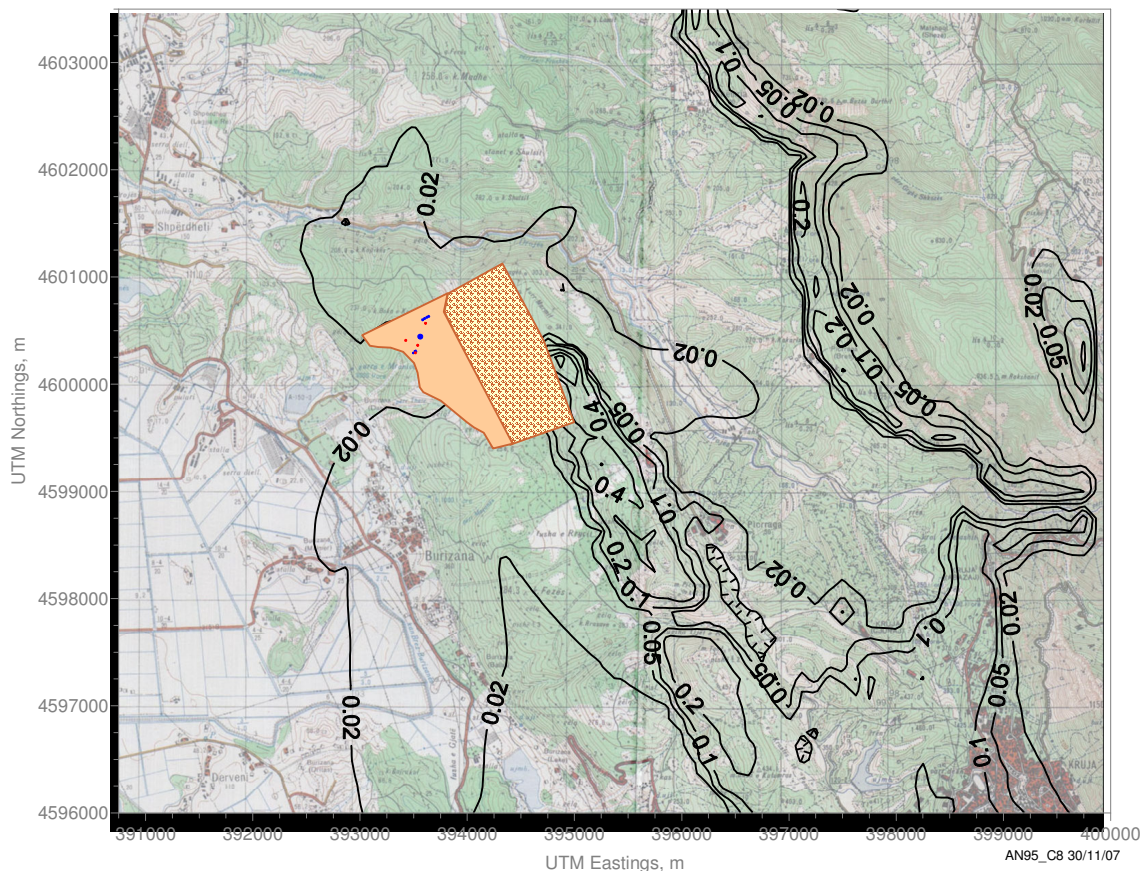
Figure 7.11 - Maximum 99.79th Percentile of Hourly Average Nitrogen Dioxide Concentrations, $\mu\text{g}/\text{m}^3$



Carbon Monoxide – Eight Hourly Average

- 7.45 The maximum eight hour average concentrations are shown in Figure 7.12. These are the highest concentrations at each receptor for the three eight-hour daily block averages over the four year period modelled. Note that the units of this figure are mg/m^3 . The maximum concentration is $0.95 \text{ mg}/\text{m}^3$ and occurs on the high ground near the quarry boundary at 394875, 4600250 approximately 1.4 kilometres to the east of the kiln stack.
- 7.46 The highest results at residential properties are at Picrrage (Popaij), $0.26 \text{ mg}/\text{m}^3$ and Kruja (Pengile), $0.12 \text{ mg}/\text{m}^3$. Typical maximum eight hourly increments at other residential properties in the surrounding area are less than $0.06 \text{ mg}/\text{m}^3$. All of these results are considered to be negligible in the context of the EC limit value of $10 \text{ mg}/\text{m}^3$.

Figure 7.12 - Maximum Eight Hourly Average Carbon Monoxide Concentrations, mg/m^3



Assessment of Traffic Emissions

Method

- 7.47 An assessment has been undertaken to examine the effects of the change in vehicle emissions as a result of the increase in vehicle movements arising with the plant. The assessment was carried out following the UK's Highways Agency's procedures as documented in their Design Manual for Roads and Bridges. The air quality screening model uses annual average daily traffic flows, the proportion of heavy duty vehicles, and average speeds to determine pollutant concentrations at nearby receptors.
- 7.48 Traffic data was taken from the Atkins' Transport Planning Study. Certain assumptions had to be made about the traffic data to ensure its suitability in the DMRB screening model. Existing 12 hour count data was assumed to represent 70% of the average daily flow, while the daily percentage of heavy duty vehicles was assumed to be the same as that calculated over the 12 hour period. The existing flows were given for 2007, and were factored to 2010 flows (the opening year) using standard UK National Road Traffic Forecast for rural motorways.
- 7.49 Once open the plant is expected to generate the following additional traffic:
- 4 buses and 120 cars per working shift (3 working shifts per day, one way movements only) and
 - 420 truck trips per day.
- 7.50 This leads to a total of an extra 1164 vehicles per day (444 HDVs and 720 cars). The only roads expected to be affected by traffic associated with the cement plant are:
- Burizane – Fushe Kruje (new road)
 - Fushe Kruje – Vore (new road)
 - Vore – Durres
 - Vore – Tirana
- 7.51 A conservative assumption was made for the purposes of the assessment that all the additional traffic generated with the plant would travel on all of these roads. Receptors along each of these roads were assumed to be at the closest distance which can be modelled, 5 m from the centre line. This would give the highest estimated concentrations, and is a conservative assumption.
- 7.52 In addition, the change in total carbon emissions over the road network was assessed.

Results

- 7.53 The estimated increments to pollutant concentrations resulting from the existing road traffic for the year 2007 are shown in Table 7.7. It should be noted that these estimates do not include the ambient background concentrations. However, the background concentrations in the local area are likely to be reasonably low.

Table 7.7 – Annual Mean Pollutant Concentrations for the Existing Situation (2007)

Location	CO mg/m ³	Benzene µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³
Burizane - Vore	0.07	0.06	11.77	3.83
Fushe Kruje - Vore	0.07	0.06	11.23	3.63
Vore – Durres	0.10	0.14	12.45	5.16
Vore - Tirana	0.10	0.14	12.23	5.10

- 7.54 The traffic estimates for the opening year 2010 both with and without the cement plant have been used to estimate pollutant concentrations for these cases and the results are shown in Table 7.8 and Table 7.9.

Table 7.8 - Annual Mean Pollutant Concentrations without the Cement Plant (2010)

Location	CO mg/m ³	Benzene µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³
Burizane - Vore	0.06	0.06	9.76	2.69
Fushe Kruje - Vore	0.06	0.06	9.41	2.59
Vore – Durres	0.08	0.13	10.46	3.93
Vore - Tirana	0.08	0.13	10.27	3.90

Table 7.9 - Annual Mean Pollutant Concentrations with the Cement Plant (2010)

Location	CO mg/m ³	Benzene µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³
Burizane - Vore	0.06	0.06	10.63	2.95
Fushe Kruje - Vore	0.06	0.06	10.28	2.84
Vore – Durres	0.09	0.13	11.06	4.11
Vore - Tirana	0.09	0.14	10.88	4.08

- 7.55 It is evident from the above results that the changes in annual average concentrations with the additional plant traffic are expected to be low for all pollutants. The most critical pollutant is nitrogen dioxide; however the traffic contributions are approximately only a quarter of the 40 µg/m³ EU Limit value. The estimated increases with the plant are less than 1 µg/m³, a negligible change.
- 7.56 The PM₁₀ concentrations are a small fraction of the 40 µg/m³ EU Limit value and the increments to PM₁₀ concentrations are less than 0.25 µg/m³, a negligible change in that context. Increments to benzene concentrations are 0.01 µg/m³ or less and the estimated concentrations are a very small proportion of the EU Limit value of 5 µg/m³.
- 7.57 There is an EU Limit Value for carbon monoxide of 10 mg/m³ as an 8 hour mean. Comparison with data from UK monitoring stations suggests that if the annual mean is less than 2 mg/m³ then this criterion should not be exceeded. The estimated CO concentrations can be seen to be well below 2 mg/m³, and hence it is extremely

unlikely that the EU Limit value will be exceeded. The change in concentrations with the cement plant is negligible.

- 7.58 The emissions from the road network are shown in Table 7.10, with the change in emissions with the cement plant provided in Table 7.11. Emissions can be seen to increase with the cement plant, with increases of between 4.1% for carbon monoxide and 10.4% for NO_x. Emissions are expected to be lower in 2010 with or without the cement plant than in the base case.

Table 7.10 – Pollutant Emissions from the Road Network

Pollutant	Base Case (2007)	Without Cement Plant (2010)	With Cement Plant (2010)	Units
Carbon monoxide	514,883	458,888	477,547	kg/year
Hydrocarbons	71,332	64,930	70,067	kg/year
NO _x	614,802	507,484	560,239	kg/year
PM ₁₀	19,226	15,059	16,165	kg/year
Carbon	43,954	44,136	47,019	tonnes/year

Table 7.11 – Change in Emissions with Cement Plant (2010)

Pollutant	Change in Emissions (kg/year)	% Change
Carbon monoxide	18,659	4.1%
Hydrocarbons	5,137	7.9%
NO _x	52,755	10.4%
PM ₁₀	1,106	7.3%
Carbon	2,883 (tonnes/year)	6.5%

Assessment of Quarry Traffic

- 7.59 The raw materials of limestone and flysch will be transported to the cement plant on new roads between the two quarries and the plant. Limestone will be transported in 90 tonne trucks. There are expected to be approximately 40 limestone truck loads daily. As the road from the limestone quarry is remote from residential areas, it is not expected that there will be any public exposure to emissions from these vehicles. Flysch will be transported in 22.5 tonne trucks, entailing approximately 50 loads daily.

Assessment of Quarry Dust Emissions

Approach to Assessment

- 7.60 The effects of quarry operation on air quality are considered in the context of the nature of dust dispersion from mineral extraction sites in general. The assessment then entails a brief discussion of the plant to be used on the site, and the mitigation measures generally deemed to be appropriate. The potential for dust from the site to affect the nearest residential properties is considered in the context of their location and the frequency of winds in the relevant directions.

Background to Dust Dispersion

- 7.61 Quarry activities in general have a potential to create dust. Dust emissions may be mechanically generated, or windblown from surfaces. When in proximity to residential properties or other sensitive properties, dust emissions have the potential to cause higher than normal levels of dust deposition on surfaces. Over a period of time the cumulative deposition may result in a loss of amenity or, in more extreme circumstances, be a nuisance to residents.
- 7.62 Although dust may include particles up to 75 µm in diameter, it is the larger particles of above 30 µm in diameter which tend to deposit within a hundred metres of the source. In general it is these particles that have the most potential to affect to local residents where properties are within range. The larger particles most capable of giving rise to a nuisance would be deposited relatively close to their source, whilst smaller particles travel further before settling to the ground. Due to these differences in dispersion across the range of particle sizes released, dust deposition rates fall markedly with increasing distance from the boundary.
- 7.63 Often mechanical disturbance of ground surfaces within a site is a primary source of dust, for example as a result of vehicles travelling on unpaved areas. Windblown dust may also arise from dusty hard surfaces or from disturbed ground. Materials handling such as loading and unloading operations may also release smaller amounts of dust. Dust emissions from blasting, although resulting in localised visible emissions, are infrequent and hence are generally a negligible contribution to overall quarry emissions.
- 7.64 In the context of large scale commercial mineral extraction, the latest UK guidance contained in the Minerals Policy Statement 2, Annex 1: Dust³⁰, notes that if not managed and controlled, dust from surface mineral operations can have a noticeable

³⁰ Office of the Deputy Prime Minister (March 2005), Minerals Policy Statement 2 (MPS2), Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Annex 1: Dust

environmental effect, and that “residents can potentially be affected by dust up to 1 km from the source, although concerns about dust are most likely to be experienced near to dust sources, generally within 100 m, depending on site characteristics and in the absence of appropriate mitigation”.

- 7.65 The points of note are the relatively localised nature of the effects due to dust and their potential elimination with appropriate mitigation measures.

Quarry Operations

- 7.66 The limestone quarry adjacent to the cement plant is estimated to have reserves of 70 million tonnes. The anticipated utilisation rate is 1.3 million tonnes per year. Over the projected 50 year operation of the quarry, 10 benches will be developed for mineral extraction. The quarry will operate eight hours daily from 07:00 to 15:00 and for five days a week, eleven months a year. The permitted mineral extraction area is approximately 107 hectares. On the basis of the local maps, there are no residential properties close to the site boundary; the nearest isolated properties are approximately 750 m to the south east of the quarry at Picrrage (Popaij).
- 7.67 The mineral extraction will be effected by conventional drilling and explosive techniques. The plant inventory includes two loaders, five 90 tonnes capacity trucks. An eight cubic metre capacity water bowser is specified for dust suppression. This is to be used for sprinkling roads and terraces during utilisation or loading operations.
- 7.68 The Flysch quarry is located to the east of the limestone quarry. The permitted quarry area is approximately 59 hectares. This quarry is worked at a much lower rate of mineral extraction as this material contributes less than 20% of the cement plant feed. The mineral is conveyed to the cement plant on a road from the north of the quarry which joins the Picrraga road north of the bridge over the River Droje. There are no settlements near this route although the local map may indicate an isolated property near the road intersection. The nearest property to the flysch quarry is at Picrrage (Breti), approximately 350 m to the south east of the quarry.

Mitigation

- 7.69 The most frequently used dust mitigation measure is the use of water bowsers or sprays on haul routes and on minerals during loading operations. In particularly sensitive situations chemical dust suppressants or wetting agents may be added to improve dust control on haul routes or stockpiles where surfaces are likely to remain largely undisturbed.

- 7.70 Maintenance and regular grading and compaction of unsurfaced roads will further reduce the potential for dust emissions, particularly in combination with periodic dampening. The hard-surfacing of semi-permanent sections of frequently trafficked haul routes will reduce dust emissions provided that the road surface is not allowed to become soiled.
- 7.71 The sheeting of lorries, and wheel and vehicle washing can assist in the control of dust from site traffic leaving the site and are widely used to prevent environmental nuisance on local roads.

Assessment of Potential Effects

- 7.72 Both the limestone quarry and flysch quarry permits include numerous measures to mitigate environmental effects including the following:
- *the rocky area should be wetted before explosions and during drilling for crushing the massive rock, and*
 - *clean trucks should transport the inert materials with special care to clean the mud (the tires should be cleaned before the truck exits into asphalted roads; during transportation the trucks should be covered with covers that prevent material falling on the street and emission of dust.*
- 7.73 Winds capable of transporting dust from the limestone quarry towards Burizana are limited to those from the north northeast to east sector. With reference to the meteorological data it is evident that winds from this quadrant are relatively infrequent, occurring for only 17.5% of the time. However, given the distance of over 1100 metres to the nearest housing in Burizana, no discernible effect due to dust from the quarry is anticipated.
- The prevailing northerly wind will carry dust to the south of the quarry towards Burizana (Baltaj). However, there are no properties in this direction for well over two kilometres, well beyond the range at which any effects would be observed.
- 7.74 The lower intensity of mineral extraction at the flysch quarry entails a lower potential for dust emissions in comparison with the limestone quarry. The quarry is located in an area largely remote from housing, other than at the property at Picrrage (Breti).
- 7.75 Winds from the west south west to the north west sector may transport dust from the flysch quarry towards Picrrage (Breti). The meteorological data shows that winds from this quadrant are particularly infrequent, occurring for only 13.5% of the time, compared with an evenly distributed frequency of non-missing winds of 22.8%.

- 7.76 Given also the separation distance of approximately 350 m from the quarry, it is unlikely that there would be any discernable adverse effect due to dust deposition at these residential properties.

Assessment of Cumulative Effects

- 7.77 The emissions from the cement plant at Fushe Kruja are likely to be similar to those from the proposed Antea plant. The principle pollutant will be oxides of nitrogen. With reference to Figure 7.8 it is evident that the annual average oxides of nitrogen concentrations on the low lying plain to the south of Burizana are less than $1 \mu\text{g}/\text{m}^3$, indicating a nitrogen dioxide contribution of less than $0.2 \mu\text{g}/\text{m}^3$, a negligible fraction of the $40 \mu\text{g}/\text{m}^3$ EU criterion. There will be a similar contribution in this region from the Fushe Kruja plant which will be additive. However, the combined effect on air quality will remain a negligible contribution to the criterion. On the higher ground the annual average concentrations are somewhat higher, but will remain a small fraction of the criterion.
- 7.78 With reference to the maximum hourly average oxide of nitrogen concentrations shown in Figure 7.9, the potential contributions from the Fushe Kruja plant are not additive. It is clear from the figure that the maximum concentration on the hill to the east of the plant arises during infrequent westerly winds. During such meteorological conditions there will be no additional contribution from the Fushe Kruja plant to the south.
- 7.79 Impacts to surface waters associated with the operation of the cement plant and quarries refer to:
- Increase of sediment content in surface waters due to fugitive dust dispersion from the plant and quarries sites, as well as stormwater direct discharge to River Droje without prior processing.
 - Degradation of surface water quality due to process water direct disposal.
 - Degradation of surface water quality due to leakage of polluting materials.
- 7.80 Stormwater direct disposal to River Droje is not considered an option. Instead, stormwater management in the cement plant will be undertaken through a network of ditches and/or internal road gutters (piping is usually avoided due to clogging), which will end up into two sedimentation ponds of 200 m^3 capacity each. The sedimentation ponds will serve the settlement of suspended solids drifted by stormwater and treated effluent will be discharged to River Droje by means of an open ditch.

- 7.81 Similarly, process water direct disposal to River Droje is not considered an option. Water used for cooling of equipment will circulate in closed circuit passing through a settlement tank of 200 m³ capacity and treated effluent will be recycled, by gravity or by pressure, back to the cooling system.
- 7.82 Further, other measures for the preservation of surface water quality will include:
- Storage of fuels used during the process of cement production in an enclosed building to minimise and/or avoid particulates and other polluting materials dispersion.
 - Tidying of the cement plant in order to minimize fugitive dust emissions. In particular, mechanical sweepers will be used to remove collected dust from the internal road network and respective gutters.
- 7.83 Incidents of polluting materials leakage during the operation phase (for example spillage of oils or spent lubricants during their transportation) will be immediately addressed to avoid migration to surface water. Polluted surfaces will be thoroughly washed and washings will be collected and disposed off as special waste.
- 7.84 With regard to quarries' operation, fugitive particulates consist an usual impact of materials extraction procedure. However, in the case of the examined limestone and flysch quarries, existing know how and mode of operation will ensure the minimisation of particulates content migrating to surface waters. In particular, the following mitigation measures are foreseen:
- Quarrying face will be kept as minimal as possible.
 - Gradual rehabilitation (through landscaping and planting) of the locations where extraction works have been completed.
- 7.85 Stormwater direct disposal to River Droje is not considered an option during the operation of the two quarries. Instead, stormwater management will be undertaken through a peripheral ditch of adequate dimensions, which will direct collected water to a settlement pond for further processing. Effluent will next be discharged to a natural receptor by means of an open ditch.
- 7.86 Appropriate collection and transportation of potential polluting materials (e.g. spent oils, lubricants, etc.).

LAND QUALITY AND GROUNDWATER

- 7.87 The proposed limestone and flysch quarries present a very low potential for accidental releases to ground and ground and groundwater contamination. The cement plant and supporting, ancillary activities present a low potential for accidental release to ground and ground and groundwater contamination. The operational activities which have the potential to release pollutants to the ground are listed below, together with the mitigating measures which will be adopted:
- accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during delivery, storage, handling and use, for example, re-fuelling, maintenance activities, etc. with subsequent leaching to groundwater;
 - accidental release of liquid wastes during storage, handling and removal, with subsequent leaching to groundwater;
 - accidental discharge of sanitary and other wastewater to ground and groundwater; and
 - discharge of pollutants in water used for plant, equipment and vehicle washing to ground and subsequent leaching to the groundwater.
- 7.88 Measures will be employed to reduce the risk posed by the potential sources of pollutants listed above.
- 7.89 Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during delivery to and removal from the storage areas.
- 7.90 Working procedures will ensure that these materials (raw and waste) are handled correctly. Working procedures will seek to prevent accidental release during the use of these materials, for example, vehicle refuelling and plant maintenance, especially with regard to waste oil. Procedures will be adopted to minimise the potential for accidental discharge of pollutants during the washing down of plant, equipment and vehicles.
- 7.91 Sanitary wastewater will not be discharged to either ground or groundwater. Wastewater pipes and sumps will be newly constructed. Pipework will be subjected to periodic inspection. The waste water treatment plant will be specified for peak load during the construction process when there will be 600 + workers on site.

During the operational phase of the cement plant the load is expected to be lower and therefore the potential for overloading negligible. No hazardous effluent will be released into the waste water treatment system.

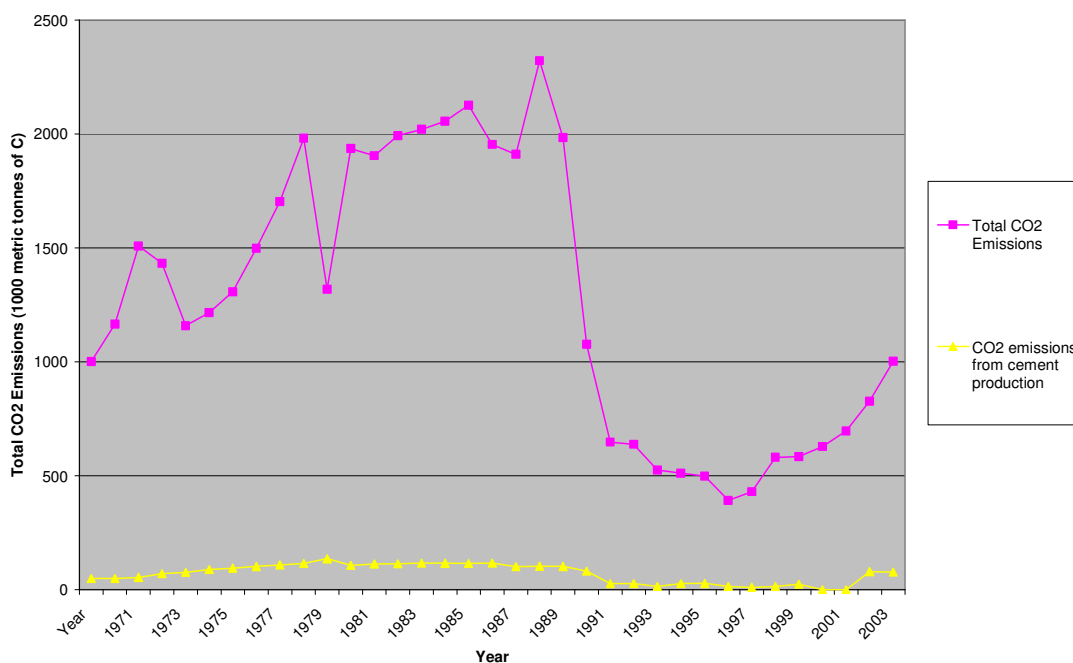
- 7.92 Groundwater depletion due to continuous water abstraction, which is necessary for the daily production activities of the cement plant, is not anticipated in the examined area.
- 7.93 Surface water abstraction is not considered an option due to the significant seasonal flow variations of River Droje and the likelihood of negative effects to the local ecosystem.
- 7.94 Therefore, the necessary water quantities will result from two or more water abstraction boreholes, which will be drilled within the cement plant site boundaries. The exact number of drillings is dependent to the borehole's discharge capacity and will be defined according to the results of the Hydrogeological Survey elaborated at the moment. However, based on the initial findings of the aforementioned Survey and the analysis in relation to groundwater availability, as included in Chapter 4, significant groundwater quantities are present at the examined area below a depth reaching 150 m.
- 7.95 Alternatively, if water requirements cannot be met through on-site boreholes, provisions will be made for the drilling of water boreholes downhill of the cement plant towards Burizana's plains, where groundwater is abundant, and subsequent water transportation to the site by means of appropriate pumping stations.
- 7.96 The assertion that existing groundwater quantities are sufficient to meet water demand for the operation of the cement plant and further, that water abstraction will not cause groundwater depletion is further qualified in Appendix 6 through a conceptual model outlining groundwater availability at the examined site.

ENERGY AND GREENHOUSE GAS BALANCE

- 7.97 This section presents the findings of an assessment of the use of energy and the emissions of greenhouse gases (GHG) resulting from the operation of the cement plant.
- 7.98 The 2002 Government of Albania joined the UNFCCC (United Nations Framework Convention on Climate Change) on January 1995. The country is not party to the Kyoto protocol and does not have any targets set to reduce its greenhouse gas emissions. Information concerning the status of the country in regards to climate change, both in terms of contributions to and impact from, was officially published in The First National Communication of Albania to the United Nations Framework Convention on Climate Change (UNFCCC), Ministry of Environment of Albania. 2002.
- 7.99 The report was placed in the context of data produced during 1994. Data published from other sources indicate that during this period Albania was (due to socio-economic reasons in period of producing low CO₂ emissions. Figure 7.13 below taken from data taken from CDIAC: Carbon Dioxide Information Analysis Centre, an information analysis centre of the US Department of Energy. Thus Figure 7.13, below shows that during the period of the officially published data, the CO₂ were particularly low.
- 7.100 Figure 7.13 shows that during 2001 and 2002 there were no contributions to the Albanian CO₂ emissions balance. This is because the single cement plant in the country, the cement plant at Fushe Kruja, was off line.
- 7.101 Since the mid-1990's the CO₂ levels have increased with the economic redevelopment of the country. CO₂ levels as a result of cement production remained level during 2003 and 2004 with the bringing back on line of the Fushe Kruja cement plant, after a refurbishment partly funded by the IFC and EBRD.
- 7.102 In comparison to other countries, the CO₂ emissions per capita are very low. The official figures produced in the aforementioned state sanctioned report, indicate that Albania emissions are 1.97 ton CO₂ / capita, compared with: Greece at 7.50; the UK at 9.20; and, the USA at 19.80. Conversely, CO₂ emissions per GDP are very high at 3768 ton / Million.USD, compared with: Greece 1026'; the UK at 595; and, the USA at 850. The reason for high rate of emissions per GDP is due to the use of technology which is old; productivity of Albania's society is very low compared to industrialized countries; and a large proportion of the energy consumed is for residential purposes and the service sectors rather than in the industrial sector, for producing higher value of GDP. For the aforementioned reasons, it is anticipated that

these figures are now in need of revision but still provide a useful comparison with other countries.

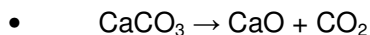
Figure 7.13 - Maximum Eight Hourly Average Carbon Monoxide Concentrations, mg/m³



Use of Energy and Sources of Greenhouse Gases Associated with the Antea Project

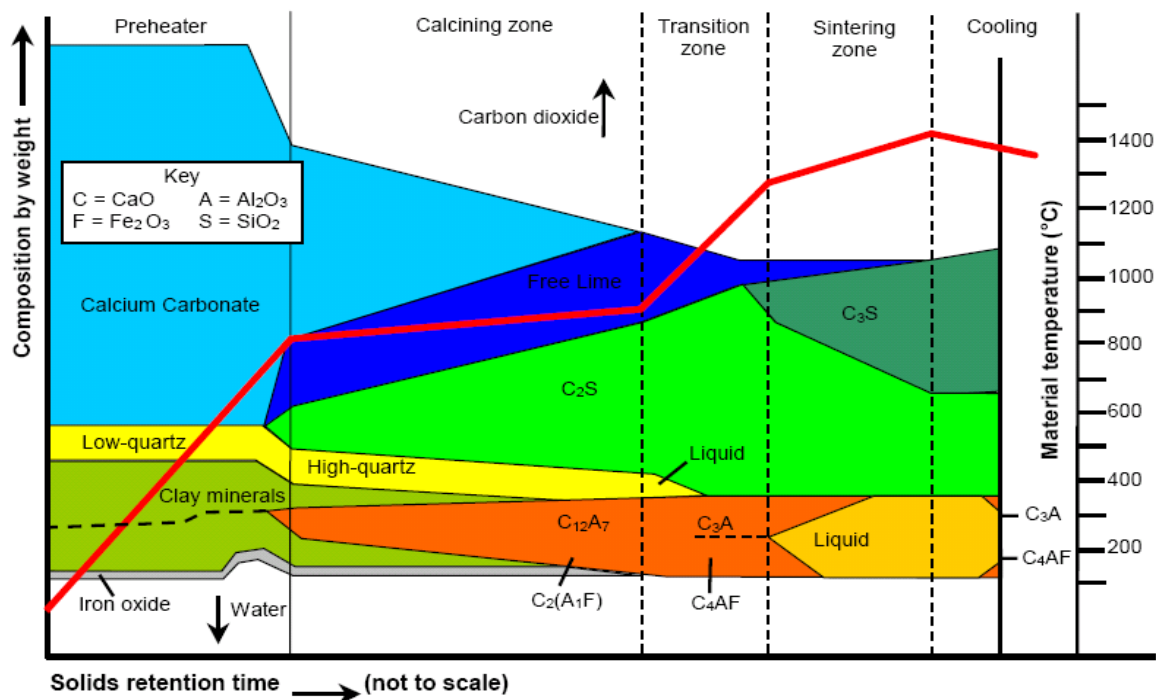
7.103 This assessment concerns the emissions of carbon dioxide only. No other greenhouse gases have been identified which will be released from the process in significant quantities at the time of writing.

7.104 The generation of CO₂ from the cement production process takes place mainly in the “calcining zone” of the thermal reaction by the reduction of calcium carbonate. The chemistry of this reaction can be simply represented as:



7.105 A more detailed view of how and where this occurs in the manufacture of clinker is shown in the diagram below, illustrating the transformations taking place in a typical pre-heater processing system. The figure below shows the rapid drop in the weight of calcium carbonate in the system in the calcining zone as CO₂ is liberated.

Figure 7.14 - Typical Pre-heater Kiln Processing System – Illustrating the Liberation of CO₂



Source: Environment Agency Sector Guidance Note IPPC S3.01 Guidance on Cement and Lime Sector.
April 2001 p 10

- 7.106 In the conditions described above, the EU average for cement production (according to the EU BREF) is that to produce 1 tonne of clinker, the typical consumption of raw materials (i.e. limestone – CaCO₃) is 1.57 tonnes. The difference is mostly released as CO₂. Therefore, for every tonne of raw material consumed, 0.57 tonnes of CO₂ is released. Based on these efficiencies, the expected CO₂ production for the proposed 1 million tonnes per year of clinker production, is 570,000 tonnes. Data supplied by Antea indicates that the actual direct emissions of CO₂ will be lower than the industry standard detailed in the previous section at 525,000 tonnes of CO₂ for every 1 million tonnes of clinker because of the state of the art nature of the design.
- 7.107 With regards to the consumption of fuels during clinker production, the theoretical energy use is about 1700 to 1800 MJ/tonne clinker. This is the theoretical minimum required for the necessary chemical reactions to take place. The actual fuel energy

use is about 3000 MJ/clinker for dry process, multi-stage cyclone preheater and precalciner kilns (source EU BREF). The BREF benchmark for kiln systems (with 5 cyclone preheater stages and precalciner) is 2900-3200 MJ/tonne clinker (equivalent of 0.88 MWh).

- 7.108 The main source of indirect greenhouse gas emissions associated with the operation of the installation is those released as a result of electricity use. All site support services will be driven by electricity supplied through the Albanian national grid. Theoretically, Albania power supply is based on 3.81% fossil fuel and 96.19% hydropower (CIA Factbook <https://www.cia.gov/redirects/factbookredirect.html>). The fossil fuel used is fuel oil (source: World Bank). The north of the country is primarily driven by hydroelectric power, particularly during peak hours. However, there have been problems with supply and programmes are in place to address this issue. Therefore, it is likely that in the short to medium term the proposed installation will be driven at least partly by imported energy. It is likely that this will be derived from power stations driven by fossil fuels. For the purposes of this assessment the published in-country figures have been used for the assessment as is standard practice.
- 7.109 The releases of GHGs as a result of the combustion of diesel for the backup generators is expected to be negligible because of their lack of use. Therefore, the source of emissions from the backup generators will not be included in the assessment.
- 7.110 As well as the emissions of GHG from the production of cement, there will be other indirect sources of GHG as a result of activities associated with the cement production process but taking place outside of the production process. The most obvious of these involves the transport of materials to the cement plant and product away from it. The production of CO₂ as a result of transport will be dependent on the volume of cement used in the country compared to that exported. In order to assess this it will be necessary to predict future economic activities. Such an assessment is unlikely to be accurate at present, although it will be possible to track this at each year end when the installation is in production. It is likely that the emissions presently produced to import cement into the country will be to be counteracted, in part, by the reduction in the need to import cement into the country. Due to the uncertainties, an analysis of CO₂ from this source has not been included in this assessment.
- 7.111 The key design parameters used in the GHG assessment are:
- Annual Cement Production: 1500000 tonnes per year
 - Annual Clinker Production: 1170000 tonnes per year (Based on 78% clinker in cement blend)

- Energy Requirement - Fuel Firing: 3.14 GJ/t clinker
- Electricity Consumption - per tonne of cement: 0.1 MW /tonne cement

7.112 The carbon dioxide emissions from clinker production and electricity use are summarised in the table below.

7.113 The calculations indicate that the process is in-line with the industry standards for maximising energy efficiency and minimising GHG emissions. Sections 3 and 4 provide more information of the details which have been incorporated into the design to maximise energy efficiency.

7.114 That the process is based around the production of blended cement at 78% clinker is key to minimising the energy requirements per tonne of material produced. The blend is set to reduce to 68% after three years of operation. Therefore, the process is considerably more energy efficient than processes producing Ordinary Portland Cement (OPC) at 90% clinker content because of the lower quantity of clinker content in the cement.

7.115 Antea is considering the incorporation of waste-heat-to-power generation. Estimations indicate that this equipment would be able to produce approximately 6 MW of electricity from captured waste heat at the new kiln. The effect of installing such units will be a public grid electricity saving equivalent to (58 kg CO₂/MWh X 6 MW X 7,500 hrs/yr) 2,600 tons CO₂ per year per unit. This option was not included in the initial contract entered between Antea and the Chinese supplier and it is not known at this time if installation is financially viable at this time. Antea have therefore agreed to commit to specific financial conditions according to which the implementation of such generating facilities will be mandated. The actual implementation criteria, including the need for local authority approval will be linked to grid electricity pricing (trigger value in the order of 0.06-0.07 US\$/kWh) and equipment and installation costs.

Table 7.12 - Antea Cement Plant Carbon Dioxide Emissions

CO2 emissions from Antea Clinker production (base data)		
	Value and unit	Data source
Calcinations process	525 kg/t clinker	The Cement CO2 Protocol, WBCSD working group Oct. 2001
Fuel firing	750 kcal/kg clinker = 3.14 GJ/t clinker	Design specifications for Antea plant
Electricity consumption	0.1 MWh/t cement	Design specification for Antea plant
Coal as fuel	96 t CO2/ 1000 GJ	Based on WBCSD latest version
Electricity production	58 kg CO2 / MWh	WBCSD, CO2 Accounting and Reporting Standards for the Cement Industry, June 2005. Albanian national data
CO2 emission from electricity production	58 kg CO2/MWh * 0.1 MWh/t cement = 5.8 kg CO2/ tons cement	
Clinker percentage in cement (base data)		
	Value and unit	Data source:
Cement average blend	78% clinker	Antea operational assumption
Fuel caused CO2 emissions at Antea (clinker based):		
Coal:	$96 * 3.14 =$	301 kg CO2 / t clinker
Combined calcinations and fuel caused CO2 emissions (clinker based):		
Coal	$301 + 525 =$	826 kg CO2 / t clinker
Final emissions per unit cement, including electricity caused emission:		
Coal based,average blend	$0.78 * 826 + 5.8 =$	650 kg CO2 / t cement
Total CO2 emissions based on average blended cement (78% clinker) and a total production of 1.50 M tons of cement per year:		
Coal	$1.50 * 0.650 =$	975,000 tons CO2 / year

RAW MATERIAL USE AND WASTE PRODUCTION

7.116 As discussed in the BAT assessment, the bulk of the raw materials used in the process are provided directly from the limestone and flysch quarries. Secondary raw materials will be received from elsewhere, brought to the site by bulk road container. The sources of these raw materials will be from both within and outside the country, necessitating the use of the ports.

7.117 The estimated use of the main and secondary raw materials is detailed in the table below:

Table 7.13 - Raw Materials Used (Tonne/year)

Raw Materials (Clinker)	Limestone (Burizana)	1,352,000
	Flysch (Burizana)	423,000
	Bauxite	27,000
	ILS	10,000
Raw Materials (Cement)	Gypsum (Local)	36,000
	Gypsum (Altsi)	36,000
	Limestone	64,000
	Fly ash - Wet	18,000
	Fly ash - Dry	160,000

7.118 The main impacts associated with the use of these raw materials are related to quarrying impacts. This is discussed in this Chapter particularly in the sections relating to the landscape, visual impacts and ecological impacts.

7.119 There are no mitigation measures recommended for the use of the main and secondary raw materials, information provided indicates that the process will use these materials efficiently and with the exception of the quarrying impacts, there are no significant issues that need to be raised in this section.

7.120 Other materials will also be used in the process as consumables, mainly for the maintenance of the installation. These will not be used in bulk and therefore are not expected to have a significant impact on the environment during normal operation. The use of consumables will involve the use of a relatively small volume of hazardous materials, including oils, particularly for maintenance. As a backup, diesel will be used in order to generate electricity. This will be stored in fuel tanks on site on standby. There is no potential impact during normal operations from any of these materials, however, there is a potential for releases during accidents and emergencies. Appropriate response to preventing and minimising impacts of

accidental releases is important. Information presented by the company for the purposes of the BAT Assessment (Chapter 4) and review of similar sites operated by the company indicates that suitable containment measures will be employed. The potential issues associated with releases of hazardous materials have been addressed in this Chapter, particularly in the sections relating to 'Surfaces Waters and Effluent' and 'Land Quality and Groundwater'.

- 7.121 The waste production per year is low. The largest volume of the waste, the waste refractories, will be recycled back into the process. Therefore, there will be no need to dispose of this waste off site. All other wastes are incidental and are produced as a result of the operation and maintenance of the process and are not 'process wastes'.

Table 7.14 - Wastes Produced

Waste Stream	Tonnes Per Annum
Iron and steel	0.8 - 1
Waste refractories	350 - 500
End-of-life tyres	30
Other scrap (excluding iron, steel, aluminium and cables)	50
Used oils (engine, gear and lubricants)	20 - 35
Cables	20
Absorbents, filter materials, oil filters, wiping cloths and protective clothing, contaminated by dangerous substances	15
Paper and cupboard packaging	10
Wooden packaging (pallets)	5 - 10
Batteries and accumulators containing dangerous substances (mercury, Ni-Cd, Pb etc.)	0.5 - 1,5
Aluminium	2 - 3

- 7.122 As with other materials, there will be a relatively small volume of hazardous waste materials produced. Information presented indicates that the company is capable of dealing with these wastes suitably. The same mitigation measures for other hazardous materials apply. In addition, the company must ensure that all waste contractors have the appropriate licences and that all waste are disposed of appropriately.

- 7.123 Proposed mitigation measures:

- Waste handling is an important issue because of quantities of waste. Establishment of processing techniques is included in the EMP.

- Filter dust disposal is also an important issue because of possible large quantities. Establishment of filter dust handling procedures is included in the EMP.
- Hazardous materials management and disposal techniques should be established. At present the routes of management and disposal of hazardous materials has not yet been decided.
- Identification of waste minimisation and recycling options of all incidental wastes should be undertaken. It will not be enough to ensure appropriate disposal only.

ECOLOGY

Impacts at Cement Plant and Quarry Sites

- 7.124 The main potential impacts on ecology associated with operation of the quarries are considered to arise from dust particles, released as a result of quarrying (including blasting at the limestone quarry) at both quarry sites and at the cement plant and transport of quarried materials and finished product. Dust will be deposited on the leaves of the vegetation and may affect plant growth and condition by reducing photosynthesis and damaging the leaf cuticle. Dust that settles on the soil could also change the pH of the soil and this can lead to changes in the species composition of plant communities. However, on the assumption that most dust deposition will be localised and the chemical composition/pH of the dust will be similar to that of the soil forming rocks where it falls (e.g. limestone dust falling on soils of limestone origin), such changes are likely to be minor.
- 7.125 Where the vegetation is negatively affected by the dust, this may have a secondary affect on the health and species composition of animal communities supported by the vegetation. The productivity and quality of the vegetation for herbivores may be reduced and the direct ingestion of dust with the leaves may affect their digestibility.
- 7.126 Noise from blasting (at the limestone quarry), from plant operating at the quarry and cement factory sites and from haulage vehicles transporting raw materials and finished products are likely to disturb wildlife, at least in the short term.
- 7.127 General human activity at these sites is also likely to deter certain wildlife species that are sensitive to disturbance. However, since the project sites do not appear to be especially rich in terms of wild fauna, perhaps as a result of existing human activities, the additional noise and human disturbance impacts from the project may not be great. Nevertheless, the construction and use of the access/haulage road from the flysch quarry site will open up a previously undisturbed area of semi-natural habitat. It is expected that the provision of employment at Antea will reduce the use of the land for lime burning or as a source of wood for fuel but is likely that the gathering of herbs will continue in the Burizana area as a whole. The transfer of these activities to adjacent areas and an increase in the work force in the neighbouring villages and towns may increase the pressure (both legal and illegal) on the local ecology.
- 7.128 Finally, there is an increased risk of wildlife “road-kills” along the quarry and cement plant access roads. There is little information available on the species that may use these areas and their movement patterns so it is not possible to quantify this risk in any way at present. Further studies by an ecologist are recommended during construction and operation of the facility.

Mitigation Measures

- 7.129 Other than planting belts of trees to provide local screening to reduce dispersion from the main sources of dust, little can be done to protect the vegetation and wildlife from deposition of dust from project activities. The main mitigation that can be undertaken relates to reducing emissions at source (filters, covering of trucks etc) and these are described elsewhere in this report. Particular attention should be paid to the quarry access roads as sources of dust, given the number of anticipated truck movements. If not already decided, consideration should be given to asphaltting the surface, which would also reduce wear and tear on vehicles; if this is not done then regular spraying/damping of the graded surface should be undertaken.
- 7.130 Similarly, measures to reduce noise levels over extensive areas (i.e. at receptor sites) are not practical and the main steps to be adopted to mitigate against noise impacts relate to achieving reductions in noise at or near the source.
- 7.131 To reduce impacts on the local ecology as a result of increased human presence, disturbance and exploitation, an educational programme is recommended to inform employees and their families of legal requirements and responsibilities towards wildlife. This should be conducted in a participatory manner since many of the local population may already be well-informed on the renewable natural resources of the area and be a useful source of knowledge. The environmental educational programme could be conducted / facilitated by the on-site specialist already referred to in the construction impacts section.
- 7.132 The ecological survey proposed in the Construction Impacts chapter under “*Access Road Alignment and Construction - Ecological Method Statement*”, should include observations on fauna and note regularly used trails of larger animals. If any such trails are evident, then road signs warning of their presence and imposing stricter speed limits can be erected at suitable locations. In practice such trails may not become obvious until the roads are used on a regular basis and additional signs may need to be erected at a later date. Depending on the wildlife that is detected, drivers should be given briefings to operate in such a way as to reduce road-kills and to report sightings of wildlife of interest (identification cards and report forms can be prepared).

LANDSCAPE AND VISUAL

- 7.133 The proposed cement plant and associated quarries have an anticipated 50 year operational life cycle. For the operational effects on the landscape resources it is reasonable to take into consideration the effects of the existing active plant and quarry located below Kruja, of which the effects will not be dissimilar to those of the proposals. The operational phase of the cement manufacturing facility will result in a dramatic change in land use and intensity of activity. In addition to the infrastructure, buildings and structures there will be sizeable stockpiles of raw materials. The proposed facility will be at a scale and density of development out of keeping with the local area. There are few existing prominent vertical features within the landscape, including within the local communities. This will impart an additional degree of severity to the effects on the landscape resources due to the taller structures associated with the plant. As an industrial facility, it is anticipated that a heightened level of security and health and safety measures will be required. This may include secure boundary and internal fencing, lighting and signage. As part of the operational processes is the associated transportation of raw and processed materials to, from and within the site as well as employee commuting. This will involve a regular, heavy flow of larger transportation vehicles, such as lorries, as well as significantly increased traffic of smaller personal vehicles. All of the above processes will result in a significant level of noise which is not currently experienced as part of the rural landscape character. It is also anticipated that the cement plant will also have an effect on the night time landscape resources of the area resulting from the lighting required to operate the facility after dark, especially relevant during the winter seasons. This will have a severe adverse effect on the landscape resources during the operational phase of the development.
- 7.134 Through the 50 year operational phase for the limestone and flysch quarries there will be ongoing physical alteration of the landscape resulting in permanent change in the natural landform due to the ground modelling to create the benched working face of the quarries. As part of the standard quarry operations, the landscape will experience a greatly altered land use and intensity of activity. The anticipated on site quarry processes will include extraction of the raw material including the use of explosives, on site crushing and transportation of the crushed materials to the cement plant. This will involve the use of larger vehicles and specialised plant. These activities will all affect the landscape character through the associated noise. Due to the nature of the development, the ground form will be continually changed throughout the operational phase with continued vegetation loss due to the expansion of the quarries. As such, the degree of exposure to the landscape effects will intensify over the 50 year quarry life span. However, the proposed management of the quarries involves a continuing programme of restorative processes which will reduce the cumulative nature of the negative effects. As with the cement plant development, the quarries will have the associated required infrastructure, both

permanent and temporary associated with access, car parking and movement within the site.

- 7.135 Differentiating the proposed locations for the two quarries is the special nature of the existing landscape. The proposed limestone quarry site is a positive contributor to the wider landscape character, though of limited special interest in itself. As such, the proposed development will have a moderate adverse impact on the landscape resources of the limestone quarry. The proposed flysch quarry site has the special nature of a unique and particularly interesting landscape in itself. As such, the proposed development will have a severe adverse effect on the landscape resources.
- 7.136 A necessary element of the proposed development is the transportation of raw and processed materials, as well as access to and from the site for employees. The anticipated effects on the landscape resources include both the physical construction of the required roads and offsite infrastructure as well as the levels of traffic, both larger vehicles as well as personal commuter vehicles, including the effects on movement, lights and noise on the rural landscape character. The severity of the effect of offsite infrastructure requirements will be dependant on the extent of the infrastructure required, however it is unlikely the established access routes will be decommissioned on completion of the plant resulting in a permanent alteration to the landscape. There is also a likely consequence resulting from improved access into the hillside areas of increased unauthorised removal of resources, such as for the local small scale limestone industries. As such it is anticipated that this will have a moderate adverse effect on the landscape resources.
- 7.137 The proposed cement plant facility is significantly larger than other structures in the area, being located in an open landscape with very limited, domestic scale only development. Over and above the main body of the plant there are a number of structures and stacks, rising to between 30m and 140 which will form significant vertical elements in views of the plant. In addition to the structures there will be stockpiles of excavated material, as well as the potentially less prominent, though visually contributory clutter of industrial workings such as security fences, lighting and signage. Both on and off-site there will be the ancillary operations, notable vehicle movements around the plant and in the local area including vehicles transporting quarried material, finished cement and importing fuel.
- 7.138 For the residential properties located within the lowland plateau they will be exposed to the taller structures relating to the cement plant facility with potentially glimpsed views of the larger lower structures, especially from receptors located further to the west of the plain. The exposed working face of the limestone quarry will potentially be visible to those with more direct views of the site area, with increasing potential for exposure as the works are expanded over the 50 year operational life cycle. These receptors will likely experience the impacts of vehicle movements where it contributes

to increased traffic along the plateau roads, or traverses the western face of the ridgeline. It is also anticipated that vehicles transporting materials from the flysch quarry to the cement plant will overtop the ridgeline, and at such point will stand out against the generally low growing vegetation along the ridge peak. At night, impact of the works may be severe due to the required lighting for the cement plant and quarry, as well as vehicle lights. They will have no exposure to the works relating to the flysch quarry. Though their sensitivity is high, the severity of the visual impacts is anticipated to be moderate to severe adverse, due in the intervening distance and topography of the ridgeline.

- 7.139 For the residential properties located within the hillside communities they will be exposed to the decommissioning activities relating the taking down and removal of the infrastructure and works compound for the flysch quarry, including night time impacts relating to lighting and the movement of vehicles. They would also be exposed to the decommissioning of the taller cement plant structures, in particular the stacks, with a potential height of up to 140. These activities will have no significant impact beyond that of the operational phase of the quarry. As such the decommissioning of the flysch quarry will have a moderate adverse visual impact on the hillside communities. The restoration programmes for the quarry sites, as with the cement plant, has the potential to contribute to some enhancements of the baseline visual amenity, however there are fewer opportunities for such due to the existing good scenic value of the area. This may involve reforestation, ground remodelling, and potentially the addition of scenic features such as the conversion of the flysch quarry into a water body. As such, the restoration phase of the flysch quarry will have a minor beneficial impact of the visual amenity.
- 7.140 Road users of the new national route and infrastructure of the lowland plateau will have views of the construction activities and construction machinery erecting the cement plant however their exposure to the view is for a limited period only. With a low sensitivity these receptors will experience a minor adverse impact during the operational phase.
- 7.141 There are several measures which should be implemented to provide mitigation to the landscape effects and visual impacts during the operational phase of works. Lighting has the potential to have severe adverse effects and impacts and measure should be implemented to reduce potential light spillage. This should involve cut off lighting sources and sensitive consideration of use of light. Colouration of all buildings and structures and style of any non plant structures should be in keeping the local style of architecture. Colour of vehicles should also be considered, avoiding the use of brightly or primarily coloured plant or vehicles.
- 7.142 Phasing of the quarry workings should be coordinated with the cement plant location and visual mitigation opportunities presented by the topography of the area. The

proposals for the quarry works include for an ongoing mitigation programme involving the staged restoration of the completed quarry phases. This programme should minimize the window between the operational phase and restoration to provide advance restoration. Materials excavated other than the raw materials for use in the cement production should be in collocation with the quarry to provide enhanced screening without additional excavation.

- 7.143 Mitigation requirements for access roads and quarry to plant material transportation should include false cuttings, advance structure planting and minimization of routes outside the immediate plant and quarry areas. Consideration should also be given the effects and impacts of vehicle movements and lighting. This may in part be limited by restricting hours of operation and frequency of transportation of materials to and from the site. Proactive management of the remaining access roads should also be undertaken to control access to the hillside areas and limit illegal excavation of limestone and the consequential environmental degradation.
- 7.144 Further measures may include off-site mitigation such as habitat restoration or planting, however it is important for these to be effective to demonstrate that long-term control and management is secured. Managed afforestation may provide a long term sustainable source of timber for the residents in the local area. Establishment conditions are difficult with a temperature range of +32 degrees centigrade down to -4 degrees in winter. The prevailing winds blow from the northwest to the southeast, following the course of the valleys. Annual rainfall is around 1280mm however 75% of this falls between October and May. As a result irrigation is likely to be required for the first 2-3 years following establishment of new planting. This must be considered given amenity mitigation costs and sustainability. Tree planting will also need to take account of fire risk, to provide designed fire breaks within the planting.

TRAFFIC AND TRANSPORT

Cement Plant Transport Needs / Forecasts

- 7.145 The plant related transport needs comprise internal movements of quarry material staff traffic and external movements to bring in raw materials and ship out finished products as well as staff ins and outs for the factory operation.
- 7.146 A key issue concerning the transport will be the construction of new local roads and the social-economic issues concerning the construction of the roads. The proposed route of the new main road which will link the cement plant to the main highway is illustrated in Figure 1.3. A discussion of the new roadways is introduced in the Traffic and Transport section of Chapter 5. In relation to these roads there will be safety issues during operation of the movement of heavy vehicles along these routes. The discussion of the location of the local roads and the socio-economic issues concerning these is discussed in this Chapter under the heading 'Socio-Economic Aspects'. The impact of the proposed development during operation through transport on the existing transport infrastructure is discussed in this section, below.

Local Movements

- 7.147 It is estimated that approximately 300 staff will be working at the plant. It is estimated that 50% will access the plant on company buses and 50% on private cars. Assuming private car occupancy (car pooling) of 1.25, the total movements in and out of the plant (per shift) will be 4 buses and 120 private cars.
- 7.148 In order to also accommodate visitors, future growth and other peaks the parking space available at the factory should be able to fit 200 private cars and 10 buses.
- 7.149 Truck traffic inside the plant will vary according to production requirements but the internal road network should be designed as to be able to accommodate demand without any problems. Truck parking spaces will be provided according to relevant needs which will be established during the plant design phase.

Longer Distance Plant Access / Egress Needs

- 7.150 The production of 4,000 tonnes of products per day will necessitate 200 movements of 20 tonnes trucks. In order to supply the factory with raw materials it is estimated that 2,300 tonnes of freight will be entering the plant per day – the equivalent of approximately 120 truck movements per day.

- 7.151 In total, 320 truck trips per day will be needed to adequately serve the factory in the period of full production. This figure is multiplied by 1.3 to provide for future growth and coverage of production peaks. The resulting figure comes up to 420 truck trips per day or an hourly demand of 35 truck trips (for a 12 hour period). The above figure translates to one truck movement every 2 minutes in each direction.
- 7.152 The following table provides the estimates for freight transport needs in and out of the port of Durres.

Table 7.15 - Cement Plant Import / Export Quantities

Port of Durres Characteristics				
Bulk Terminal				
Length	422	meters		
Draft	7.5-11.5	meters		
Approach Channel	8,5	meters	defining factor	
Max Size Ship	11,500	Dwt	~180m length	for coal, pozzolanas, cement
Min Size Ship	10,000	Dwt	~150m length	for gypsum, cement
Max Loading/Unloading time Bulk	5	days	} in all cases, an extra 8 hrs (0.33 days) are required for documents and ship entry/departure	
Min Loading/Unloading time Bulk	4	days		
Max loading time Bulk Cement	3	days		
Min loading time Bulk Cement	2	days		
Logistics for the Antea Cement Plant imported/exported Materials needs				
Solid Fuels	150,000	tons		
Required Ships	13.0	ships	assuming 11,500 dwt ships	
Needed berthing days	63	days	average time needed	
Other Imported Materials: 280.000t to 430.000t	280,000 to 430,000	tons		
Required Ships	28 to 43	ships	assuming 10,000 dwt ships	
Needed berthing days	135 to 208	days	average time needed	
Exported Bulk Cement	640,000	tons		
Required Ships	61.7	ships	assuming 75% 11,500 dwt & 25% 10,000 dwt	
Needed berthing days	159	days	min time needed	
Total Ships	103 to 118	}	ships	
Total no. of berthing days	357 to 430		berthing days	98% to 118%
Based on the above calculations it is expected that Antea will need the exclusive use of half of the eastern berth (quays 10 & 11) and use of the remaining part of the eastern berth for approximately 2.5 months per year on a priority berthing basis for the Import / Export activities of the new Cement Plant. In addition, Antea would require the exclusive use of one of the two planned 15t cranes that will be installed on the berth Appropriate cement loading & storage facilities will be constructed by Antea at the eastern berth				

- 7.153 In conclusion, the maximum traffic demand in and out of the factory is estimated to come up to 120 private cars and 40 heavy vehicles (buses and trucks) for the peak hour per direction.

Transport Impact Assessment on Surrounding Networks

Impacts to the Highway Network

- 7.154 The impacts of the additional traffic generated by the plant on the highway network vary by highway section.
- 7.155 The assumption is made that, if only highway transport is used to satisfy the plant needs, 20 % of this traffic will be related to areas north of Burizana and 80% to areas south of Burizana. It is further assumed that all of the south traffic will select the Vore itinerary at which point it will split to two equal parts in the directions of Tirana and Durres and other southern destinations.
- 7.156 The overall maximum hourly plant traffic estimated in Chapter 5 comes up to 120 private car and 40 heavy vehicle movements per hour and direction. The following table presents the estimated traffic impacts to the highway links in the wider area of the plant.

Table 7.16 - Plant Impacts to the Surrounding Highway Network

Highway Section	Max Peak Hour Traffic Increase (One Direction - %)	Max Truck Traffic Share Increase (%)
Tirana - Durres	$(160 \times 0.8 \times 0.5) / 1,800 = 3.5$	$(40 \times 0.8 \times 0.5) / 198 < 1$
Vore - Fushe Kruja	19.7	4
Fushe Kruja - Burizana (New Road)	19.7	4
Fushe Kruja - Burizana (Old Road)	0	0
Fushe Kruja - Tirana	0	0

- 7.157 It appears that the impacts are negligible on all highway sections with the exception of the links Vore – Fushe Kruja and Fushe Kruja – Burizana (New Road). Of course this is partly due to the assumption that all of the plant traffic will use this itinerary to access Tirana and that no traffic is going to use local roads. Even though with this conservative assumption the links under consideration are capable of handling the additional traffic. The same holds true for the grade separated interchange at Vore and the intersection complex of Vore.

- 7.158 It should be noted also that the above considerations take into account the construction of a new road link between the plant area and the new road Fushe Kruja – Burizana. If this link is not implemented then all of the plant generated traffic will need to be accommodated through the existing Burizana village local roads.
- 7.159 This is feasible from the traffic volume capacity point of view but undesirable from the road safety and traffic noise and air pollution points of view for the village inhabitants. It would also be a sub optimal solution possibly affecting the productivity of the plant.

Impacts to the Railway Network

- 7.160 As mentioned above, rail transport can be considered for the part of the plant production destined for export and the import of raw materials as this freight has to be transported between two very specific points (the plant and the port). The total freight quantity – candidate for rail transport - would come up to approximately 1,250,000 tonnes per year.
- 7.161 In general the use of railroad, if economically justifiable, is expected to have positive impacts both on the railroad and the environment. The railroad will benefit because of the necessary rehabilitation and improvements as well as from the income that will be generated for the railway company. The environment will benefit as a results of the diminishment of air pollution due to reduced truck movements.

Impacts to the Port Infrastructure

- 7.162 The impacts of the plant operation on the port infrastructure would be the exclusive dedication of half of the Durres Eastern Pier to the plant needs. The remaining half will also be occupied - on a priority basis - for a quarter of the year. As a result the port will receive considerable income and its infrastructure will be upgraded and modernised.

NOISE AND VIBRATION

Design Criteria

- 7.163 The WHO (World Health Organisation) 'Guidelines for Community Noise' state that 45 dB(A) or less should be achieved outside the bedroom of a dwelling during the 8 hour night period 23:00 – 07:00. This is to ensure that the occupants can have their window open for ventilation without experiencing sleep disturbance.
- 7.164 The Guidelines for Community Noise also describe limits for gardens and outdoor areas during the day and evening (07:00 to 23:00). These give limits of 50dB(A) for moderate annoyance and 55dB(A) for serious annoyance.
- 7.165 As measured noise data is not available, given the rural nature of the location, it has been assumed throughout the assessment that existing night-time ambient noise levels are at or below 45dB(A).

Transport

Noise

- 7.166 With the plant in operation there would be an increase in the volume of traffic on the existing road network. Measured traffic data and estimates of the additional traffic movements associated with the plant in full operation have been provided.
- 7.167 To enable a comparison of existing and future traffic noise levels the calculation method given in CRTN (Calculation of Road Traffic Noise, the UK method for predicting noise from road traffic), has been used to predict the Basic Noise Level (the roadside noise level at 10m from the kerbside, expressed in $dB_{LA10,18hour}$) for existing conditions and the future conditions, with the plant operational. See Table 7.17.

Table 7.17 - Noise on Road Network

Road Name	Basic Noise Level Existing (dB)	Basic Noise Level during Operation (dB)	Expected Increase (dB)
Burizana - North (new road)	71.5	71.6	0.1
Burizana - FK (new road)	71.5	71.9	0.4
FK –Vore	71.3	71.7	0.4
Vore – Durres	77.0	77.1	0.1
Vore – Tirana	77.1	77.2	0.1
Tirana - FK (old)	68.2	68.2	0.0

7.168 From the above it can be seen that noise level increases greater than 1dB due to the additional traffic on any of the roads are not predicted. A 1dB change in noise level is the smallest change that can be perceived by the human ear under laboratory conditions. This assessment shows therefore that traffic from the plant would not give rise to a perceptible change in noise.

7.169 The planned new link road connecting the plant to the main transport route will also generate noise levels due to the traffic using it. The Basic Noise Level is predicted to be 62dB(A) and it is estimated that residential properties within 100 metres of this road may be affected by increases in noise levels.

7.170 The link road between the flysch quarry and the plant will generate noise levels due to the quarry vehicles using it. The methodology in BS 5228:Part1:D.3.5.2 has been used to calculate the hourly L_{Aeq} alongside the road. The noise level at 10 metres is predicted to be 67dB(A) and it is estimated that residential properties within 200 metres of this roads may be affected by increases in noise levels.

Vibration

7.171 Vibration from road traffic is usually caused by the engines or exhausts of vehicles or can arise from irregularities in the road surface. The proportion of people bothered by vibration is related to the proportion bothered by noise. No changes in noise are predicted on the existing road network, so there would be no corresponding change in vibration.

7.172 For the new link roads residential properties within 40 metres of the roads may be affected by perceptible airborne vibration from traffic using the new link road. Properties closer than 5m may also be affected by ground-borne vibration.

Production Plant

- 7.173 A site boundary noise level of 65dB(A) has been estimated based on site boundary noise levels measured at a plant in Thessaloniki (Greece) in normal operation. It is assumed that the plant in Thessaloniki is similar to the plant proposed here, and that the noise levels generated would be similar.
- 7.174 The Thessaloniki data has been used to derive a notional sound pressure level for a point source located at the centre of the site. Using estimated source to receptor distances, a distance correction calculation has been used to estimate the noise levels at nearby local settlements (Table 7.18).
- 7.175 The following has been assumed in these calculations; an attenuation of 6dB per doubling of distance, no soft ground attenuation and a clear line of sight between plant and dwellings.

Table 7.18 - Noise from the Production Process

Settlement	Distance from Cement Works Site Boundary (m)	Noise level (dBA)	No of Households	Population
Picrraga	1700	40	75	453
Picrraga Brett	3000	35	35	212
Burizana	900	45	800	4200
Thumana	3500	34	500	2600
Shperdheth	1700	40	-	-

- 7.176 The estimated noise levels do not take account of any attenuation provided by natural screening from the intervening ground. Based upon the above it is unlikely that any of the listed settlements will be subject to noise levels above the night time criterion of 45dB(A) due to the operation noise from the plant.

Vibration

- 7.177 There is unlikely to be any vibration issues from the plant when in operation due to the large distances between the plant and the nearest sensitive receivers.

Quarrying Activities

- 7.178 An Leq noise level of 95dB(A) at 10 metres from quarry activities has been assumed as a typical noise level, representative of all quarry activities. The noise level has

been derived from levels given in BS5228, Noise and vibration control on construction and open sites.

- 7.179 Using the source level of 95dB(A) and estimated distances, a distance correction calculation has been used to estimate the noise levels at several local settlements (Tables 7.19 and 7.20).
- 7.180 The following has been assumed in these calculations; an attenuation of 6dB per doubling of distance, soft ground attenuation has been taken into account and a clear line of sight exists between the quarrying activities and the dwellings.

Table 7.19 - Noise from Flysch Quarry

Settlement	Distance from edge of Quarry (m)	Noise level (dBA)	No of Households	Population
Picrraga	900	44	75	453
Picrraga Brett	300	56	35	212
Burizana	3000	31	800	4200
Thumana	5500	24	500	2600
Shperdhet	3200	30	-	-

Table 7.20 - Noise from Limestone Quarry

Settlement	Distance from edge of Quarry (m)	Noise Level (dBA)	No of Households	Population
Picrraga	500	51	75	453
Picrraga Brett	1900	36	35	212
Burizana	1000	43	800	4200
Thumana	3500	29	500	2600
Shperdhet	1500	39	-	-

- 7.181 These initial calculations highlight that there may be noise issues at Picrraga Brett and Picrraga, due to operations at the flysch and limestone quarries respectively.
- 7.182 Should the quarrying be limited to day time periods only, the predicted noise levels from the limestone quarry would generally be below the 50dB(A) daytime guideline value for outdoor areas at all nearby communities, and this would be true at the flysch quarry at all nearby communities except Picrraga Brett. The noise levels here are close to the higher 55dB(A) day time criteria.
- 7.183 The estimated noise levels do not take into account any natural screening from the topography between the quarries and the settlements. Some natural screening is expected between the limestone quarry and Picrraga. The noise level attenuation of this intervening ground combined with the distance attenuation may be sufficient to reduce noise levels to achieve the 45dB(A) night time criteria. Natural screening may be limited between the flysch quarry and Picrraga Brett.
- 7.184 It should be noted that the noise assessment represents a worst case estimate, placing the noise source at the quarry perimeter nearest to the settlement concerned, and assumes a direct line of site to the community.

- 7.185 The noise levels at the nearby communities would be lower when the quarrying activities are further from the quarry boundary, and as the depth of the quarry increases, thereby obstructing the line of sight between the quarrying activities and the communities.

Vibration

- 7.186 There are unlikely to be any ground borne vibration issues from the quarries when in operation due to the distances between the quarries and the nearest noise sensitive receivers. Further, information available suggests that the operator will use appropriate noise and vibration minimisation techniques (sequential blasting) during blasting to prevent significant impact.
- 7.187 Minerals are expected to be extracted from the flysch quarry using excavation rather than blasting. Blasting from the limestone quarry will give rise to air over-pressures which can cause window and loosely fitted window panes to rattle at nearby properties.
- 7.188 BS5228 indicates that damage is unlikely to occur at air overpressures below 150dB, but indicates that overpressures as low as 120dB can be perceived. Predictions of air over-pressure cannot easily be made, but BS5228 indicates that over-pressures of around 120dB can be regularly generated at premises adjacent to a site. As residential properties are not located adjacent to the site, the nearest properties being located at 300 + metres, it is not anticipated that this will be an operational constraint.

SOCIO-ECONOMIC ASPECTS

7.189 The main areas of impacts that this work will consider are identified in relation to the different spatial components of the project and their affects on stakeholders. The issues identified are:

- Process of land acquisition for quarries and site
- Lime Quarry and Factory Site
 - Employment changes and employment opportunities
 - Improved opportunities for electric supply and other infrastructure
 - Project affected people (PAP) and loss of income in activities related to grazing animals, herb collection and lime production.
- Flysch Quarry
 - Employment changes and employment opportunities
 - Improved opportunities for electric supply and other infrastructure
 - Project affected people loss of income in activities related to grazing animals and herb collection.
- New Road Project Site to Thumana and National road
 - Project affected people and nature of impacts (loss of land, loss of home and relocation, severance - division of agricultural lands by new road).
 - Opportunities for those by the road including increased land values; commercial opportunities for road side land.
 - Wider opportunities for the community.
 - Road safety risks for road users (pedestrians, motorised and non motorised, company contractors and private users).
- Wider benefits related to changes in Municipal Revenue

Land Acquisition

7.190 Table 7.21 summarises the project related land acquisitions. Under the law on "Acquisition of land" No. 7980 (27/7/1995) foreign investors are entitled to lease land in state owned areas. There is no restriction on leasing of privately owned land. As a

result Antea has agreed to lease lands from a number of state and local government authorities for the purposes of developing and operating the quarries, the cement works, the construction camp and roads required to service these operations. Table 7.21 summarises the project related land acquisitions.

- 7.191 Antea has informed Atkins that the majority of land related to the quarry sites and cement factory is Forestry Land owned by the State. The Forestry Land is under the auspices of the Ministry of Environment, Forests and Waters Administration. In order that the land related to the quarry sites and cement factory can be used for construction and industrial purposes, the Council of Ministers by Decision no. 420 date 18/07/2007, proposed to the Parliament of Albania the draft Law. On Removal from the national forestry fund of the parcels, in the forestry economies of Krasta – Kruja and Shëmri – Brett, that will be utilized for construction of the cement plant and for quarries by “Antea Cement” Sh.a.”.

Table 7.21 Summary of Project related land acquisitions

	Type of land	Area of land in hectares	Year bought or leased	Person or entity bought/leased from	Tenure of land before purchase / lease	Type of agreement
Area1	Plant site	65.75 ha	2007	An Agreement between the Ministry of Economy, Trade and Energy (MTEE) and ANTEA Cement was approved by Decision of the Council of Ministers (25/07/07)	State Land under Ministry of Environment & Forests and Kruja Municipality prior to MTEE	A lease agreement which allows the right of utilization of 224.6ha of state owned land by the quarries and cement plant for a period of 99 years
Area1	Lime quarry	99.76 ha				
Area1	Workers camp	To be built on lime quarry				
Area2	Flysch quarry	58.95 ha				
Area 3	Link road, Thumana to Flysch Quarry	4.876 ha	2007	0.48 ha from private individuals 4.394 ha is land belonging to the commune	Private ownership Owned by the Commune	Purchase for market price identified by valuation agency and agreed by all participants. Antea has an agreement with the Commune of Thumana for reconstruction of the existing road and its extension. An agreement state "The Commune of Thumana has the obligation to put at disposal the land, property of the Commune, that is needed for improving, widening and enlarging the road and to issue the authorization for the implementation of works, in compliance with article 26 of the Roads Code of the Republic of Albania".
Area 4	Link road, Flysch Quarry to Plant	Xx requested	2007	3% of the area is privately owned 97% is controlled by Municipality of Kruja		Private land and assets will be purchased at market price identified by valuation agency and agreed by all participants For land owned by the municipality an agreement will be made with the authorities.
Area 5	Land related to Power line	3km length	2007/8			Private land will be purchase for market price identified by valuation agency and agreed by all participants For land owned by the communes, an agreement will be made with the authorities.

- 7.192 On 23/07/2007, the Parliament of Albania approved the Law "On Removal from the national forestry fund of the parcels, in the forestry economies of Krasta – Kruja and Shëmri – Brett, that will be utilized for construction of the cement plant and for quarries by "Antea Cement" Sh.a."
- 7.193 The community of Picrraga raised an issue relating to land under the administration of the Municipality. The issue relates to a specific parcel of land (No. 84). This was an area of approximately 17 ha of land (part of the proposed quarry area) which was offered for redistribution to 93 residents of Picrraga by the Office of Registration of Immovable Properties in 1994. The villagers rejected this land (the property No. 84. ZK. No. 385, see Appendix 2.9 as degraded and this was officially recorded by the registrar in 2000. This parcel of land is considered to be of negligible agricultural value.
- 7.194 This land was retained by the State under Law No. 8047 of 14 December 1995, On the Administration of Agricultural Land That Citizens Have Refused in Ownership and it is under the administration of the Council of the Commune or Municipality. Appendix 2.9 provides information on refused lands. The issue of land ownership appertains to the area under state ownership. As far as is known no issues are expected to arise concerning the development of the land, permission of which to do so has been granted to Antea through the appropriate planning process".
- 7.195 The new road connecting the new Cement Plant with the Tirana-Shkodra Highway is partly a reconstruction of an old existing rural road, which is the property of the Commune of Thumana. This will be widened, improved and extended to connect the new Cement Plant with the Tirana-Shkodra Highway. Land owned by the Commune will be made available at no cost to widen and extend the road. Land owned by private individuals will be purchased by Antea and adequate compensation agreed as appropriate.

Quarries and Factory Site

Employment Changes and Employment Opportunities

- 7.196 It is expected that a total of 225 full time jobs will be created at the cement plant and quarries and a further 105 full time jobs will be outsourced through sub contracts.
- 7.197 Table 7.22 provides information on planned employment requirements according to the general skill level. Four main levels of skill level are identified Senior management; professional and technical; skilled; and unskilled / semi skilled. Examples of the types of position which might be filled at each level are given in the table below.

Table 7.22 - Summary of Employment by Skill Level

Skill Level	Directly Employed	Subcontract	Examples of positions
Senior Management	20	N/A	Production Manager
Professional and Technical	52	N/A	Chief electrician, Assistant production manager Foreman Mechanical department Accountant
Skilled	53	35	Senior clerical and administration positions Warehouse administration
Unskilled / Semi-skilled	100	70	Construction workers Security Guards Canteen staff Clerical
Total excluding external transport	225	105	

7.198 Of the 225 employed by Antea, 55% will be employed in day time positions and 45% will be employed on shift work. Of the subcontractors 33% will be employed in day time positions and 67% will be employed on shift work.

7.199 In 2006, across all Antea's operations the percentage of women in total employment was 12% and their participation in management team was also 12% (at the corporate level). Antea is working to improve these ratios. It is expected that lower ratios of female employment will initially occur in Albania due the nature of work to be undertaken at the proposed facility and the limited number of administrative jobs available.

7.200 The Table above includes the employment of drivers providing internal transportation i.e. on-site. In addition to the employment identified in Table 7.22, it is expected that a further 60- 70 HGV lorry drivers will be contracted. Of these 40, will be involved in transportation of the final product using closed silo lorries. The availability of these lorries in Albania is very limited so it is expected that contracts with individual drivers will be undertaken by the company. A further 20-30 HGV drivers will be employed in the transport of raw materials in covered "open box" lorries. It is expected that this activity will be sub-contracted to a number of large haulage firms on a framework basis, contracts to be renewed periodically.

7.201 To ensure that the supply of closed silo lorries is forthcoming it is expected that Antea will provide lorries on lease terms. These terms, Antea expect, will be offered on favourable terms to allow drivers to purchase the vehicles over the course of their useful life. Drivers, if they are making such an investment in a sector with a limited

service demand will need some type of guarantee that their services will be required in the longer term.

- 7.202 Antea expects to provide wages and salaries with a 15%- 20% premium over similar positions in Albania (and well in excess of minimum wage requirements); the objective of this, being to select and retain good staff. It is recognised that wages in Albania are less than in neighbouring countries. As a result of this there may be a high staff turn over amongst those with opportunities outside of the country. Table 7.23 provides an indication of wages in Albania and the region taken from a publication of the Ministry of Economy

Table 7.23 - Comparison of Gross Annual Salaries - Regional Comparison (US\$)

	Management	Professional	Technical	Skilled	Unskilled
Albania	13,538	8,123	6,031	3,569	2,215
Serbia & Montenegro	11,967	10,649	6,497	5,715	4,293
Bosnia - Herzegovina	22,521	14,250	12,600	7,667	5,476
Macedonia	26,251	14,214	10,797	5,701	4,079
Croatia	35,283	22,317	16,862	11,408	7,714
Slovak rep.	21,189	n/a	11,273	5,152	3,699
Czech rep.	21,193	n/a	12,687	9,389	6,583
Hungary	37,170	n/a	17,860	8,744	7,618

Source: MIGA, World Bank Enterprise Benchmarking Programme, 2005 in ALBINVEST 2/2007.

- 7.203 Wage negotiations are carried out according to local industry practices. Pay structures in Antea are equal for male and female employees performing the same jobs.
- 7.204 Currently pension and disability insurance is paid by the employer (20% of gross salary) and employee (9.5% of gross salary) and health insurance is paid by both employer and employee who contribute 1.7% of gross salary, (ALBINVEST fact sheet 4, 2/2007), income tax is 10%.
- 7.205 Other benefits will be available, although not finalised at this stage. Antea expects to provide transportation for workers to villages, and towns and to Tirana. Workers will be free to negotiate changes in benefits packages on an annual basis, most probably through their unions.

- 7.206 Company workers are free to join a union (labour code, article 176). Unions are organised at the national level (according to industrial sector) and also at the company level. There are two main unions at national level Confederation of Trade Unions (KSSH) and the Union of Independent Trade Unions Albania (BSPSH).
- 7.207 Antea will meet and be audited to meet SA8000 standards. Antea's contracts with CMBI and other contractors include clauses to ensure compliance with ILO and IFC labour standards in relation to child labour and forced labour.

Recruitment and Training

- 7.208 Antea Cement expects to initially recruit the senior management from experienced staff within the Titan Group company. These are not expected to be Albanian. As far as possible all other employees will be Albanian. Due to the level of qualifications and skills required it is expected that the majority of these people will be recruited from the area in and around Tirana. A higher proportion of semi-skilled and unskilled work is expected to be more suited to local people from the villages. This would mean approximately 100 jobs through direct employment. Employment by sub-contractors will depend on the sub-contractors and any requirements identified by the Antea at the tender stage. In order to maximise the benefit to communities local to the works, Antea should require subcontractor to employ people working at the site(s) locally unless there are good reasons for not doing so. Targets should be set for the proportion of people to be locally employed by Antea and by the sub-contractors. These targets should not be static but should change over time reflecting increased opportunities for local people in better paid /career positions.
- 7.209 Efforts will be made to offer more skilled positions to local people. Antea will locate and contact young people from the villages who may be undergoing suitable training and education outside or elsewhere in Albania, (i.e. business management, financial, engineering or other related technical courses). In the longer term it may be appropriate, as negotiated by the unions, for Antea to offer sponsorship for a number of trainees / degrees aimed at members of workers' families.
- 7.210 Apprenticeship schemes will be offered to all workers. These schemes will operate for between 3 – 24 months prior to the plant start up to ensure all employees are familiar with the jobs they need to undertake and are adequately trained and equipped to deal with the work. More apprentices than needed will be employed to allow for the anticipated job turnover.
- 7.211 The apprenticeship schemes will involve a period of short courses and theory which will be arranged by Antea in Albania or its parent company Titan in Greece as best suited to worker and work needs. Apprentices will then spend a period of months (the duration will depend on the work position) shadowing and gaining work experience

abroad in a Titan Group plant. It is recognised that language may cause problems and Antea will examine means to resolve this issue.

- 7.212 Electrical and maintenance engineers will return to the plant approximately 3 months prior to its completion to shadow and understand the installation of the equipment being completed and undertaken by the foreign workers. This will help them to become familiar with the equipment and how it has been installed and assist in the future maintenance and operation of the equipment.

Municipal Taxation

- 7.213 The current budget for Kruja municipality is ~ ALL 100 million, or € 0.813 million. Of this 40% is a grant from Central Government, the remainder is from local taxes.
- 7.214 Local business tax will be paid to the Municipality of Kruja based on the area of land occupied. It is anticipated that new tax revenue from the cement works and quarries will generate an additional ALL 60 million/year or € 0.49 million /year to the municipal budget of Kruja.
- 7.215 The Municipal Council agrees the allocation of the budget based on competing requests from different parts of the municipality. The local villages of Brett and Picrraga receive 3% of the current budget. This mainly covers social assistance, teacher salaries and school maintenance.
- 7.216 No plan of how the increased future revenue will be allocated or used has been agreed by the Municipality or local council. Currently communities put forward their proposals for improvements and investments to the local Council which review them and according to the available budget, agree the schemes to take forward. The criteria for agreement are not defined.

Improved Opportunities for Electric Supply and Other Infrastructure

- 7.217 It is believed by the Mayor that as the plant will require 24 hour power supply, the quality of service to the locality may also improve. However, the facility will be connected to the 220kV national grid by dedicated line, completely independent from the local network. As a result, there will be no impact, positive or otherwise, in the quality of service to the locality, as a consequence of the Antea development.
- 7.218 It is expected that local roads and infrastructure (such as piped water) will be improved in the villages. This may be undertaken with Municipal money possibly

assisted by Antea. Titan has a community programme in each of the countries in which operates³¹.

Project Affected Persons (PAP's)

7.219 The criteria which can be used to identify if households should be considered as project affected persons in relation to the quarries and cement plant sites include:

- Loss or sale of private lands
- Activity on common grounds to be used for quarry
- Significant income effect as a result of quarry activities (i.e more than 10% of income from the affected activity)
- Cumulative importance of the activity or activities in household income (both cash income and overall consumption)

7.220 Case studies were undertaken from people who were using common lands, including those to be used for the quarry site. Table 7.24 summarises the main PAP's.

Table 7.24 Categories of people affected by the project (PAP) due to land acquisition

Category	Number of households	Key impacts	Commune	Tenure of land
Landowners	3	Loss of agricultural land.	Thumaya	Private
Resettlers	1	Loss of dwelling and other assets.	Thumaya	Private
Lime producers	4	Loss of income generating activity due to loss of land	Land in Picrrage	Private and State
Herb collectors	To be finalised	Loss of income generating activity due to reduced access to resources	Picrrage Brret Burizana	State Land State Land
Herders	4 3	Reduced living standard due to reduced access to grazing, lost production and lower income	Picrrage Brret	State Land State Land
Farmers	0	Loss of living standard due to lost access to agricultural land	-	-
	0	Loss of income generating activity due to loss of agricultural land	-	-

³¹ In the last 3 years, community infrastructure support (as opposed to other community programmes) have included the planning and implementation of a water reservoir for the municipalities around the Kamari plant in Greece; renovation of the Fire Department in Elefsis after its complete damage by an earthquake in 1999; and support of the Kosjeric Municipality Development Plan in Serbia and reconstruction of the Orthodox Church.

Potential Loss of Income from Lime Burning.

- 7.221 As described in Chapter 5 the lime burning activities in the project area are restricted to 4 main households and their sons, 3 of the households now live in Burizana. The lime production activities were undertaken in 2006 by these households. All four households were interviewed. The households interviewed undertook lime extraction, wood gathering and burning in 2006. It is understood from visits in November 2007 that the area of these activities will fall within the project site and, or project related road development.
- 7.222 Historically much of the project area had been used by these families for lime production. As a result of the economic trends and increasing cost and effort in obtaining wood and obtaining a timely market, production has moved from this area towards established roads. Current lime production by the households is near to the rural roads.
- 7.223 Lime production activities were not reported by the families as being undertaken in 2007. A number of reasons could have contributed to this including local employment by Antea, and migration by sons to work in Greece reducing the domestic work force and potentially improving household incomes.
- 7.224 Lime production has been a significant component of the cash income of these households (for 3 households it was in excess of 82% and for the fourth it accounted for 40%).
- 7.225 In addition to these households a number of households in Brett cut scrub and brush for sale to lime burners in other areas. In Picrrage a number of households are employed in traditional quarrying and lime burning activities. These activities can account for 50% or more of household income. These activities are undertaken in lime production areas near to Kruja, and are in areas that will not be affected by the project.
- 7.226 The activity of lime burning is discouraged by the government on environmental grounds and its legality.

Potential Loss of Income from Herb Collection

- 7.227 Herb collection is undertaken by approximately 75% of households in Picrraga. However as discussed in Chapter 5 there is a smaller number of women who gather large quantities and who rely on a second gathering area. Based on discussions with the women and local reference points and sketch maps it is thought that potentially 12% (1/8th) of the primary sage gathering area and up to 50% of the secondary herb

gathering area lies inside the project site. Women who invest considerable time in this, and for who this is a major activity can be identified as gathering large quantities, i.e. equivalent in value to ALL 100,000 / household or more³² Those gathering less than this amount tend to gather over a more limited period (May and June, when growth is best and prices are highest) and/or for shorter periods of time (e.g. an hour in the morning and an hour in the afternoon) so keeping to the main gathering area and staying nearer to the village (i.e. not near the project area). Only those gathering large quantities need the extended areas to maintain their activity and so would be affected by the project.

- 7.228 The project could have the potential to reduce incomes of larger gatherers by 25%. It should be noted that there is no restriction for people to continue gathering in other areas adjacent to the development site. See Table 7.25

Table 7.25 Summary of representative impact on larger herb gathers

	Picragga	Brett
Income from Principal Gathering area as % of all income	67%	70%
Income from secondary areas as % of all income	33%	30%
Area affected of principal area	12%	50%-100%
Area affected of secondary area	50%	20%
Income effect before compensatory picking	25%	41%-76%
% allowance for increased in picking in other areas	0%	50%
Income effect as % of herb income lost	25%	21%-38%

- 7.229 In Picragga, 7 of the larger herb gathering households, who were most dependent on income from herb gathering were considered as vulnerable households, i.e. disadvantaged³³ households with low incomes.
- 7.230 A definitive list of herb collectors in Picragga earning more than ALL 100,000 in 2006 will be needed for the purposes of finalising decisions for the compensation process. Antea should obtain this either through a base line survey or through a request for information from the

³² This is the income that can be made from full time employment for 1 person over the main gathering period of 5 months. The main gathering period runs from May-September

³³ Being female headed and, or comprising elderly or physically less able people with no supporting sons.

- 7.231 The villagers in Brett village use the area of the flysch quarry as their principal area for herb (sage) gathering and also as a main grazing area for sheep and goats.
- 7.232 There are two areas for gathering herbs, the second area is a radius around the village and provides a mix of different herbs. The quarry area is the main area for gathering sage.
- 7.233 In Brett, 25 of 35 households are independently identified³⁴ as collecting more than ALL 100,000.
- 7.234 Between 50-100% of the primary herb gathering area will be lost to the flysch quarry. This typically provides 70% of income from herb collection. It is considered that income reductions here, can be replaced by gathering in the secondary and other alternative areas³⁵. Up to 50% of incomes may be replaced, resulting in estimated potential losses of herb related income of 21-38% (see Table 7.23)

Potential Loss of Income from Large Flocks

- 7.235 There are four graziers with large sheep flocks or goat herds which graze most of the area around Picrraga indicated in the maps of Appendix 2. It is considered, based on discussions using land marks and sketch maps that between 15 - 25% of the grazing area may be covered by the project site. To confirm this estimate Antea staff knowledgeable of the project boundaries would need to walk the Northern extent of the main grazing area and Western extent of the secondary grazing area.
- 7.236 The reduction in grazing area is unlikely to stop the livestock producers grazing their herds but may have a number of impacts related to nutrition depending on the change in grazing intensity and the ability of the grass sward to recover, and the implications this might have on flock / herd productivity and in particular the quantity of milk produced and available for dairy products. The impacts are estimated in Appendix 2.8.
- 7.237 In households with large flocks the whole family is involved in the activity. One or more sons will graze the animals and transport the produce, whilst the women milk the animals and process the dairy produce and sell it in Kruja.

³⁴ Based on information from herb buyer intermediary

³⁵ It is recognised that some of these areas

- 7.238 One grazier interviewed with a herd of 80 goats, earned an estimated ALL 350,000³⁶ to ALL 500,000 from dairy products and sale of young kids for meat. Of this 30-50%³⁷ is accounted for by all year dairy product sales. In this household the grazing activity accounts for approximately 80% of the identified household cash income. Based on calculations set out in Appendix 2.8, it is estimated that the impact of a 25% reduction in area and nutrition would be between 21-35% of income related to losses in milk yields, and a 15% reduction in area and nutrition would be between 12-21% of income related to milk yields. A further reduction of 5-10% might be caused by losses in market weight of kids. In monetary terms a value of ALL 90,000-140,000 / flock of 80 goats.
- 7.239 However it is stressed these impacts are illustrative estimates only. They assume that the area is already fully stocked, and nutrition would be affected in proportion to grazing land lost. To be more precise a more exact estimate of land lost, the quality of the land lost and the general condition of the grass sward and grazing / stocking potential of the area is required.
- 7.240 A reduction in productivity due to poor nutrition could either be offset by feeding concentrate, the least costly but with limited nutritional value is bran from the mills.
- 7.241 As productivity falls graziers may give up production helping to restore the existing nutritional balance.

³⁶ The lower value is based on estimates of milk production, product prices and animal sales, the higher figure is a total value identified by the producer.

³⁷ The difference is due to stated income from the flock is 1.4 times the amount estimated based on the quantities of milk produced and animals sold.

Flysch Quarry

- 7.242 The villagers in Brett village use the area of the flysch quarry as their principal area for herb (sage) gathering and also as a main grazing area for sheep and goats.
- 7.243 Grazing is important in the quarry area – in particular for those with sheep as they are less able to graze the higher rougher grounds.
- 7.244 There are seven flocks whose grazing will be affected. These include goat herds with 80 to 120 animals and flocks of sheep ~30 -130 adult animals. Goat herds of this size provide and income in the order of ALL 500,000 -175,000. Flocks reported incomes of ALL 200,000 to 400,000 or more.

Livelihood Impact Mitigation Measures

- 7.245 Incomes and livelihoods of households in Brett and Piccraga will be impacted by the project. Cumulative impacts on household income, for those case study households impacted, range from 7% to 50% in Piccraga. In Brett the range was 14% to 33%
- 7.246 Cumulative impacts on lime burners households were between 33% to 50%. For large graziers households impacts were 14% to 33% in Brett and 7% to 18% in Piccraga. For herb gathers household cumulative impacts were 14% to 33% in both Brett and Piccraga. A Table providing greater detail for these case studies is provided in Annex 2.11 and this is also discussed in more detail in the compensation plan.
- 7.247 There are three alternative means of mitigation available to reduce livelihood impacts. These are:
- (i) Lump sum payment, which the affected household can use for alternative investment, preferably and income generating investment, or to pay increased costs over a defined period;
 - (ii) Annual payment which takes account of increased activity / livelihood costs;
 - (iii) Employment in an alternative activity with income equal or better than that lost.

The Preferred Option

- 7.248 These options and alternatives were discussed with village representatives and the affected peoples and other household members. The affected peoples said that they

would prefer to have permanent employment with the new works. The interviewees said that jobs should be directed at the younger people and male members of the household, even if it were earnings from women that were being displaced. The reasons for this were based on traditional roles, and views expressed by male members of the groups, who were concerned for the women's safety in travelling and entering new environments.

- 7.249 Households with only female earners would not be in a position to nominate a man for such a position. Such households have problems due to high work loads on the women – of earning income as well as meeting family obligations and domestic chores. Younger daughters who might welcome the opportunity to become an employee may marry and become part of their husband's family.
- 7.250 When discussed in more detail women said that in some cases they would be able to take up the opportunity of employment, however it was indicated there might be difficulties for other women related to transport, child care, other domestic duties or permission of the husband. If Antea is to offer meaningful work to those affected i.e. in particular women herb gathers, they will need to ensure that safe and secure means of transport is provided, consider the possibility of providing a crèche or child care, but most importantly look at options for part time and / or flexible working or job share schemes which would facilitate female working and / or allow 2 family members to participate / share a single job. It was also thought by men and women that suspicion relating to women working outside the village would diminish once a small number of women had demonstrated the feasibility of the option.
- 7.251 From the information presented above it would appear that each affected household should have a member of the family employed full time (or 2 members though a job share scheme) to ensure that livelihoods reductions are met. These reductions or changes differ between households in potential loss of revenue and also in terms of activity sustainability. For example:
- For large herb gathering households, this should mean that any lost income can be replaced at equal levels or better.
 - For graziers, this will compensate for the loss of productivity and income from the flock. These earnings can be used to pay any additional costs to ensure that nutritional status of the herd and its productivity is maintained if so desired.
- 7.252 In allocating employment, priority should be given by Antea to project affected households. Some of these households, in particular vulnerable households, may not be aware or think to apply for jobs / employment. Project affected households, specifically vulnerable households, should be invited to a private interview to discuss

specific opportunities that might meet household needs. Particular attention will need to be given to ensure that all households in these villages are adequately informed of opportunities.

- 7.253 Careful planning will be needed to ensure allocation of employment locally is not divisive within a community or between communities. All villagers should understand clearly the criteria on which compensation (be it employment or some other form) has been allocated.

Alternative Options

- 7.254 The community representative in Picrraga proposed a periodic payment to those vulnerable women who might be affected by the project (i.e. option 7.244 (ii)) However, in practical terms this might cause misunderstanding and division within the village, especially where other households now or in future fall into the “vulnerable” category but are not eligible for the same consideration.
- 7.255 Alternative self and household employment schemes were discussed with the villagers, and in particular the women. Such schemes could potentially offer training and a lump sum payment to assist with the investment in materials etc, and assist with market identification and micro business planning, for example supporting the implementation of option (i) identified in 7.244. Schemes such as jam making, handicrafts or other such employ were discussed. However limited interest was expressed by women. This might be due to the problems of marketing, lack of women’s time to learn, master and then undertake an alternative activity (and possibly less remunerative activity). In Brett we were told some women already made handicrafts, those interviewed stated their preference for herb gathering. Neither a lack of skills or money was identified as constraints in this particular village. However, one younger women expressed the need for younger people (and women especially) to have vocational training and improved opportunities for earning income / self employment.
- 7.256 Titan have in other countries introduced such schemes. Here if such a scheme were to be introduced it should be done as part of a social programme identified by the community³⁸. It should not be seen as a means of mitigation for losses in livelihoods. PAP’s have a strong preference for the employment option.

³⁸ Considerable attention would first need to be given to assessing market opportunities; the financial viability of such schemes; as well as the opportunity costs of the scheme(s) in terms of the current activities which might need to be given up.

New Road Project Site to Thumana and Tirana-Shkodra Highway

- 7.257 The new road is partly a reconstruction of an old existing rural road, which is the property of the Commune of Thumana. This will be widened and extended to connect the new Cement Plant with the Tirana-Shkodra Highway. The expected route for the road is shown in Figure 1.3. The route design is nearing completion but is still to be confirmed. A safety assessment has been conducted and is appended to this report (Appendix 7). The details of this assessment are presented in this section of the report, below, entitled *Road Safety and Risks for Road Users*.

- 7.258 For approximately 1.5 km the road passes near to properties in Thumana. For the remaining distance (3+ km) the road passes through rural countryside with no nearby properties. The road passes close to the cemetery of Thumana. The cemetery is joined to the road by a short driveway (~ 50m). The route has been designed and reviewed a number of times to minimise the impact on houses and properties.
- 7.259 An alternative route closer to the reservoir and dam using the existing route to the cemetery was considered. This was rejected as it would run too close to the reservoir and it was considered could impact on the stability and sustainability of the dam.
- 7.260 The road will be widened to 12m to allow 3 lanes of traffic. It is expected that it will affect some properties. Details of the ownership of the land and the quantity of land required for road development are provided in Appendix 2.11.
- 7.261 Depending on the final design and location of the road a maximum of 9 households might have land which could be acquired for purposes of the road. The present plan identifies that 4 households will be directly affected in this way. The land required for the road will affect the household in one of three ways
- a) Loss of arable or garden or orchard land
 - b) Loss of land and division of the arable plot by the road
 - c) Loss of land and family house
- 7.262 Information has been provided to the Chairman and council of Thumana Commune and the proposal has been discussed and agreed by council members (which include community representatives) in a series of meetings. See Table 7.26.

Table 7.26 - Meetings Held in Relation to New Road

Date	Purpose of Meeting	Participants
October 2006	Introduction of the project and implications for the Thumana Commune (the building of the road in commune territory)	Antea and Commune representatives
January 2007	Antea express officially the interest for building the road to the Commune Chairman	Antea and Thumana Chairman
May 2007	Council of Commune Thumana take a decision (in principle) for approving the request for having the road.	Council of Commune members
June 2007	Discussion of road plan with objective to find the best solution for road location in order to affect as few people as possible	Chairman and Community representatives

- 7.263 The Commune is very interested to have the new road and the direct connection with the highway. It is considered that these changes will improve communications for the village. It may bring an opportunity of new business and increased demand for road side and other services to the village. The new road will make it easier for the pilgrims and visitors to journey to the site of Boke e Kuge potentially increasing visitor numbers and again allowing increased opportunities for commercial activity along the improved road.
- 7.264 An Agreement has been signed between Antea and the Commune of Thumana for the reconstruction and extension of the road. Article 3 "Rights and Obligations of the Commune Thumana", point 2, provides that: "The Commune of Thumana undertakes to assist the Company (Antea Cement) when the expropriation procedures are initiated and implemented ". The Commune of Thumana will act as an "arbiter" of this transaction process.
- 7.265 The road will be used by the public and by Antea Cement. Antea Cement will be responsible for maintenance of the road.
- 7.266 Preliminary discussions have taken place with households to ascertain their willingness to sell their properties. The Chairman of the commune and representatives of Antea have been involved in discussions with individual households. Discussions are on going between the Local Authorities of Thumana and households and land holders to understand the preferred and least disruptive route.
- 7.267 The details of any transactions are yet to be agreed. All property purchased will be bought at market prices. Arable land in this area is considered to be good quality being relatively flat and much of it being irrigated or having access to irrigation (if owners were to chose to install pumps). Land values are said by local people to be in the range of €1,500 – 3,000 / 1000m²
- 7.268 The Commune will assist local people with legal advice and the Commune lawyer will be at their disposal.
- 7.269 There are a number of real estate agencies qualified in the valuation of immovable properties and which have a "License for valuation of Immovable Assets" by the Ministry of Public Works, Transport and Telecommunication. Antea Cement will utilize one of these offices to determine the value of the land and properties to be purchased for the road.
- 7.270 Recent reference cases exist to assist this process of land valuation for the purposes of road construction. Most recent is the experience of the nearby (~1km distant)

Tirana-Shkodra Highway. Land from the Commune of Thumana was expropriated by the Albanian State for this Highway.

- 7.271 In addition the Cadastre Office of Kruja keeps the records of all the land or other immovable properties transactions to date. This will be utilized as a reference for the prices of land and of the house. However these examples may not represent the actual open market price due to reasons of tax avoidance and other such issues. This should be recognised in the negotiations.
- 7.272 The number of houses which might need to be demolished and households relocated has been identified by Titan / Antea as one house. The house is in poor condition and is owned by a widow. We were not able to interview the lady during the field visit. A further property to be purchased has only foundations.
- 7.273 Discussion with the Chairman identified that people who would loose their homes or any partial construction would receive cash compensation for house and land or could be provided with alternative housing. It is proposed that alternative housing would be located in the centre of Thumana or in Fusche Kruja town. Antea agree that the alternative option of housing can be considered. However details of how this should be undertaken need to be discussed further and the terms made transparent to the affected people and agreed. To date from discussions held by the Chairman it is reported that people approached would prefer a monetary settlement.
- 7.274 In assessing compensation requirements the entitlements of the different owners should be determined in a transparent manner. Entitlements that the different categories of land and property owners and users are entitled to should consider compensation for:
- The loss of the structure (e.g. a building / or property)
 - The loss of assets (e.g. land, water points, fences, or other infra-structure, crops or trees)
 - The loss of income (e.g. temporary or permanent losses in agricultural use or business income – either as a result of the road or for example during construction)
 - Moving allowance (e.g. for moving house, or moving specific assets to a new site)
- 7.275 This set of entitlements should be systematically assessed and applied to each case. The reasons and criteria used to determine the entitlement should be explained to the PAP.

- 7.276 One land owner interviewed whose land would be divided by the road said he would be happy to receive the market value of the land. The affected land is currently used for Alfalfa and he has a fig orchard. All production from the garden, orchard and alfalfa cultivation for the livestock is principally for home consumption purposes. Income is received from a small agriculture input business. The owner explained that he could increase the use of fertiliser and inputs to overcome any reduction in Alfalfa yields. The orchard is only used for domestic purposes and for friends. He felt no other compensation was needed as he expected land values on either side of the land to increase hugely and to offer him the potential to open some form of commercial activity. The owner may need to cross the road with machinery to prepare his land, but this will be infrequent and should not pose problems. There will be no particular need to cross the road with for example herds of animals.
- 7.277 To date no issues or complaints have been raised with the Commune or the Chairman.
- 7.278 Once the compensation and relocation agreements are reached, the director of the Department for Services of Thumana Commune, Mark Koceku and Commune lawyer Muharrem Roli, will be responsible for monitoring the process and ensuring that it is undertaken in the agreed manner.

New Road Project Flysch Quarry to Cement Plant

- 7.279 This road will be managed in the same manner as that of the main section of road. It will be built and maintained by Antea but will be owned by the Municipality of Kruja. The proposed location of this route has not yet been finalised. It is anticipated that it will approximately follow the route described in Figure 1.3. Approximately 3% of the land in private ownership. The remainder is under the control of the Municipality of Kruja. Compensation for land will be mediated by the Municipality of Kruja.
- 7.280 The area along the route of the proposed new road is sparsely populated. There is a single house near the river which may be affected. The proposed route is a significant distance from the villages of Brett and Picrraga villages. Presently there is a route over the mountain towards the location of the proposed cement plant but is little used.
- 7.281 As with the new road link between the cement plant and the Tirana-Shkodra Highway, there will be similar road safety issues, although the risks are not likely to be as significant as with the road between the cement plant and main highway. In the case of the road between the flysch quarry and cement plant, the vehicles will be large, slower moving bulk carriers. It is also not likely that this road will be as wide as the link between the cement plant and highway.

Road Safety and Risks for Road Users

- 7.282 A number of different stakeholders already use and / or in future will use the roads. These include:
- Pedestrians use the road between neighbouring properties. This will increase with any commercialisation along the road e.g. small shops or other ventures;
 - Motorised and non motorised vehicles. This currently includes or will include company haulage contractors with large HGV's and private users with small farm machinery (tractors), mini buses and cars. This will include those making up funeral processions or visiting the pilgrimage site (estimated at 10,000-15,000 visitors a year based on independent key stakeholders). Non motorised traffic can include pack animals/ donkeys, possibly horse and cart, though none was noted during the visit.
- 7.283 The current existing junction linking Thumana and other near by villages East of the highway is a rough stone road. It crosses the Tirana – Shkodra single track rail line and already has a constant passage of traffic. During a field visit a vehicle (cars, minibuses and lorries), from either direction was crossing a reference point every minute. Speeds were low due to the road surface and there were long distances between vehicles. The signage relating to the rail way is limited and with poor visibility. There is no barrier at the railway crossing (although there are few trains).
- 7.284 The new road although (and because) it will be 12m wide with 3 carriageways will take much more traffic.
- 7.285 An assessment of the route has been undertaken and has identified inconvenience and health and safety issues to stakeholders. The study is appended to this report (Appendix 7 Road Safety Assessment Study).
- 7.286 The study was undertaken by Atkins Highways and Transportation Team in Athens, Greece. It encompassed the proposed roads between the Antea Cement Plant Site and the National Highway Fushe Kruje – Lezhe (NH-PS Road) and between the Flysch Quarry and the Cement Plant Site (FQ-PS Road). The study was conducted according to the Methodology for Road Safety Assessment, November 2007, approved by ANTEA CEMENT S.A. Company and the EBRD-IFC. The study was conducted to UK Highway Agency and Department of Transport approved standards.
- 7.287 The report identified high risk issues associated with preliminary design and therefore has been used to provide additional safety measures into the road design process. The issues identified in the report and their associated mitigation measures are summarised in the table over the page.

Table 7.27 - Level of Risk (LoR) Estimates of Proposed Road Links and Proposed Mitigation Measures

LoR	Issue Identity	Issue Description	Proposed Mitigation Measures
High	Slope Cuts for Construction	Cuts with high slopes along the length of both roads are a concern because of the risk of falling rocks or slope instabilities.	Ensure the appropriate level of safety is provided throughout, taking into account the likely severity of any accident that involves falling rocks or slope instabilities. This is normally accomplished through wire fencing or other appropriate protective measures.
High	Accidents at Intersections	There is a potential for accidents at all intersections, particularly the intersection with the National Highway because of the significant traffic volumes and high percentage of HGV	Re-examine and improve intersection furniture such as road markings (especially striping), cat eyes, lighting and signaling.
High	Risks to pedestrians along road routes	Pedestrian crossings and walkways: Along the road and especially at intersections and major access / egress locations such as the cemetery and the pilgrimage site. No pedestrian facilities are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV.	Design and provide pedestrian facilities at locations
High	Accidents cause by lack of lighting	Lighting: Throughout the road but most importantly at the intersection locations. No lighting is shown on drawings. Absence of lighting will create deteriorated road safety conditions at night or bad weather especially at the location of intersections, crossings and major accesses.	Design and implement road lighting.
High	Incidents arising at congested areas along routes.	Access to Cemetery and Pilgrimage Sites (National Highway – Cement Plant): Parking along the curb can be unsafe especially when mixing with the movement of HGVs along the road. Access to the site needs to be designed marked and signed.	Design and provide appropriate parking and access facilities to the pilgrimage site.

LoR	Issue Identity	Issue Description	Proposed Mitigation Measures
		Bridge (Flysch Quarry – Cement Plant): This bridge will serve a high volume of HGVs. It will also serve pedestrians, equestrians, animal movements and other means of transport. This mix of traffic is a concern to road traffic as no special provisions (such as walkways) are shown on the bridge.	Ensure the appropriate level of safety is provided on the bridge through the design and implementation of appropriate facilities for other bridge users.
High	Risks to pedestrians along route	No pedestrian facilities are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV.	Design and provide pedestrian facilities where needed
Med	Embankments	The embankments along the route, which are generally supported with retaining walls, are a concern due to the severe implications of any incident that could result if vehicles were to leave the carriageway. Although guardrails are shown in the “typical cross section” drawings, it is not clear where they are installed along the road.	Ensure the appropriate level of containment is provided throughout, taking into account the likely severity of any accident that involves a vehicle leaving the carriageway. This is normally accomplished with the installation of guard-rails. Although these are included in the design, their locations are not clearly marked in the relevant drawings.
Med	Risks to cyclists and equestrians	No facilities for cyclists and equestrians are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV. These trip makers could share the same facilities with pedestrians with proper design. Some provision also needs to be made for movements of animal herds (i.e. either explicitly forbid them from moving on the road or provide certain crossings).	Design and provide suitable facilities where needed.

LoR	Issue Identity	Issue Description	Proposed Mitigation Measures
Med	General Alignment	The embankments along the route, which are generally supported with retaining walls, are a concern due to the severe implications of any incident that could result if vehicles were to leave the carriageway. Although guardrails are shown in the "typical cross section" drawings, it is not clear where they are installed along the road.	Ensure the appropriate level of containment is provided throughout, taking into account the likely severity of any accident that involves a vehicle leaving the carriageway. This is normally accomplished with the installation of guard-rails. Although these are included in the design, their locations are not clearly marked in the relevant drawings.
Med	Intersection with Thumane - Mamurras Road	This junction will accommodate high percentage of HGV	Re-examine and improve intersection furniture such as road markings (especially striping), cat eyes and lighting.
Low	Railway Line Crossing	This crossing is designed to be unguarded because of the low level of traffic on the line. No other furniture (such as moving barriers) is provided. The associated could develop to LoR high in the future if traffic on the railway increases.	At present none are proposed. Re-examine and improve crossing furniture such as barriers, automatic control, road markings (especially striping), cat eyes, lighting and signaling.
Low	Lack of signs and markings	The level of signing and carriageway marking appearing on the drawings needs to be increased to serve non motorized users and to provide better information and regulation for motorized users. Visibility restrictions and local access control must also be addressed.	Design and provide additional road signs and carriageway markings.

In addition measures to the physical measures to manage road safety detailed in the transport study, the following measures should also be incorporated into transport management:

- Implementation of education (road safety awareness) programmes and liaison with the local communities. The accident, awareness campaigns should be conducted during implementation and before and during operation in schools, local public offices, and community meetings as well as local media (e.g. radio) to inform for local road users of the risks associated with the likely changes in speeds and increased traffic movements and to advise on safety measures and codes.
- To minimise the risk of accidents by HGV drivers working at the cement plant, contracts agreed by Antea should ensure that incentive and payment schemes for HGV drivers do not conflict with road safety (e.g. encouraging over long periods of driving, or excessive speed) and should enforce local speed limits on the rural public road. Likewise framework contracts with large haulage companies should consider and address at tender stage issues relating to maximum hours, trips and speeding. In addition, driver training programmes should be implemented as should procedures to report near-miss/accidents.
- Commune to consider need for any additional safety bylaws or regulations for local business activities near roads.

Power Supply Line

7.288 The potential route of the power line is still being discussed. Where the route passes through people's property, the appropriate compensation and resettlement procedures will be undertaken in the same manner as compensation for the roads.

ARCHAEOLOGY AND CULTURAL HERITAGE

- 7.289 The principal heritage sites identified are the cemetery at Thumana and the site of pilgrimage at Boke e Kuge.
- 7.290 Once the road is widened and extended to the cement works more traffic will pass by the cemetery, and it will be less tranquil. Accessibility should remain unchanged, the old road running beside or close to the new road. However adequate planning and estimates of parking should be made to avoid the need for any funeral processions to park on or obstruct the new road.
- 7.291 Likewise we understand from in-field discussion that the new road will avoid the pilgrimage site, and it will be connected to the road by a drive way of 0.5 km. Due to the better ease of access it is thought many more visitors will visit this site in future.

SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS AND PROPOSED MITIGATION MEASURES.

- 7.292 The residual effects of the proposed development subject to the proposed mitigation measures are summarised in the table below. Mitigation measures are inherent in the design of the plant and where appropriate additional operational practices have been suggested in order to prevent or minimise environmental and socio-economic effects.

Table 7.28 - Summary of Impacts and Proposed Mitigation Measures

AIR QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Release of combustion gas emissions from the kiln stack	Primary operational management control techniques.	Local air quality will be well within the EU limits and WHO guidelines specified for the protection of human health at all relevant locations. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.	Not significant
Release of particulate emissions from the kiln, the clinker cooler, the coal mill and the cement mill.	Bag filters.	Local air quality will be virtually unaffected in Burizana and will remain well within the EU limits and WHO guidelines specified for the protection of human health.	Negligible
Release of dust emissions from the quarry operations.	Use of best practice management techniques during extraction and loading.	It is unlikely that there would be any discernable adverse effect due to dust deposition at any residential properties.	Negligible
Release of combustion emissions from transport associated with transport of materials to and from the site.	Use of new, efficient vehicles, driver training to minimise emissions (e.g. prevention of over revving, shut off engines when vehicles not in use), rationalisation of traffic management system to optimise transport efficiency.	Localised minor effects on air quality at properties very close to certain roads, but increments a very small fraction of air quality criteria.	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increase of sediment content in surface waters due to fugitive dust dispersion.	<u>For cement plant:</u> - Stormwater management through ditches and/or gutters and settlement ponds. <u>For quarries:</u> - Quarrying face will be kept minimal. - Gradual rehabilitation (through landscaping and planting) of the locations where extraction works have been completed. - Stormwater management through peripheral ditches and settlement pond.	None	Negligible
Degradation of surface waters quality due to process water direct disposal or leakage of polluting materials.	<u>For cement plant:</u> - Process water circulation is closed circuit including settlement tank for treatment. - Storage of fuels for cement production in enclosed storage area. - Tidying the plant on regular basis with mechanical sweepers removing dust collected on the streets and gutters.	None	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	- Thorough washing of surfaces in case of polluting materials spillages and further processing of collected washings as special waste. <u>For quarries:</u> - Appropriate collection and transportation of potential polluting materials (e.g. spent oils, lubricants, etc.)		
Pollution of surface water due to release of harmful/untreated sewage.	The sewage treatment system will be peak for peak demand during construction phase and therefore will cope with the demands during operational phase. No hazardous liquids will be released in to the sewage treatment system. The provision of a large balancing tank before final release will act as a storage unit in the event of accidental release into the sewage system.	None	Negligible
Soil Erosion	<u>For cement plant:</u> - N/A <u>For quarries:</u> - Gradual rehabilitation of locations where extraction	Soil erosion will be limited on-site the quarries.	Minor adverse

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	works have been completed.		
Ground and Groundwater contamination.	<u>For cement plant and quarries:</u> - Secondary containment for potential polluting materials. - Any contaminated land removal and disposal to appropriate hazardous waste sites.	Potential contamination will be limited on-site.	Minor adverse
Groundwater depletion.	<u>For cement plant and quarries:</u> - Surface water abstraction to cover process water demand is not viewed as an option, as existing groundwater reserves are considered adequate. - Controlled water abstraction either through boreholes located on-site or through boreholes located towards Burizana plains.	Existing groundwater reserves exploitation rate for water supply and irrigation purposes, exceeds by far water requirements for cement production.	Negligible

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater and wastewater to ground	Sanitary wastewater will not be discharged to the ground Wastewater sumps and pits will be newly constructed. Pipework will be inspected periodically	None	Negligible/Nil
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse

ENERGY AND GREENHOUSE GAS BALANCE			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Use of solid fuels and direct and indirect greenhouse gas emissions	Ensure that combustion and processing is as efficient as possible by appropriate maintenance activities.	Emissions of greenhouse gases	Moderate Adverse

MATERIALS USE AND WASTE MANAGEMENT			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Storage of solid and liquid wastes	Inspection of all waste storage areas to ensure appropriate segregation and containment	Potential releases into the environment.	Minor Adverse
Waste management	Arrangement of all solid waste management licences and permits Establishment of waste management disposal/recycling techniques and appropriate choice of contractor Establishment of filter dust handling procedures and choice of the contractors Hazardous waste disposal techniques to be established Review of waste minimisation and recycling options for all wastes	Waste management will be covered by internal procedures and will be regulated through local state regulations. Increased quantity of waste will be disposed of off site. Increase in recycling/reuse of waste generated	Minor Adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Dust deposition on leaves leading to loss of vegetation productivity and health Productivity and quality of vegetation for herbivores reduced	- Belts of trees to provide local screening - Reduce dust emissions at source - Asphalt quarry access roads	Some dust emissions at the quarry sites, associated with blasting etc, are inevitable, but emissions and impacts can be kept to an acceptable level by use of latest technologies and best working practices	Minor Adverse
Disturbance of wildlife by noise	- Reduce at source	There should be some habituation to lower reduced noise levels by some wildlife, but more sensitive species may avoid the project areas	Minor Adverse
Disturbance of wildlife by human presence and activities	- Environmental educational programme - On-site ecologist	Full compliance is unlikely and some illegal hunting and gathering can be expected. There should be some habituation to human presence by some wildlife, but more sensitive species may avoid the project areas	Minor to Moderate Adverse
Wildlife “Road-Kills” along access roads	- Ecological Survey - Ecological Method Statement - Road Warning Signs - Driver Briefings	With compliance, road-kills should be reduced but some are still inevitable	Minor Adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Durres Port			
Pollution of marine environment leading to habitat degradation and mortality of marine life, from illegal disposal of solid waste, discharge of liquid waste and fuel spills	- Apply monitoring and enforcement mechanisms to vessels - Investigate and make sure that shore-based disposal facilities are satisfactory	Some non-compliances can be expected	Minor Adverse

LANDSCAPE AND VISUAL			
Residual Impact Rating	Residual Impact Rating	Residual Impact Rating	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	- Cut off light sources and minimise night time workings - Sensitive colouration of plant and vehicles - Minimise the window between working and restoration phase of quarry operations	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

TRAFFIC AND TRANSPORT			
Residual Impact Rating	Residual Impact Rating	Residual Impact Rating	Residual Impact Rating
Increased heavy vehicles traffic both locally and nationally	Maximise the use of the rail network for bulk deliveries and abnormal loads.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration	Minor Adverse

TRAFFIC AND TRANSPORT			
Residual Impact Rating	Residual Impact Rating	Residual Impact Rating	Residual Impact Rating
	Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion; Heavy construction traffic will be subject to a traffic management plan, as necessary.	nuisance on a local basis. However, the transport study indicates that there will not be indicates that there will not be a significant impact.	

NOISE AND VIBRATION			
Residual Impact Rating	Residual Impact Rating	Residual Impact Rating	Residual Impact Rating
Noise from cement plant	None recommended unless the plant and various installations differ significantly from similar established plants used as a reference.	None expected	Nil
Noise from quarrying activities	Good site management; Appropriate choice of machinery; Methods of working including sequential blasting; Hours of working; Efficient material handling; Construction of noise barrier or baffle mound;	There may be noise increases at residential properties in proximity to the quarry site boundary.	Minor Adverse
Noise from increases in traffic on the local and wider road networks	None recommended on existing roads due to no predicted perceptible increases in noise	None expected on existing roads. Noise level increase possible for residential properties in proximity to the new link	Nil

NOISE AND VIBRATION			
Residual Impact Rating	Residual Impact Rating	Residual Impact Rating	Residual Impact Rating
	levels due to the extra traffic.	roads.	
Noise from traffic on new link roads	A possible need for noise barriers on the new link roads depending upon their proximity to residential properties and the number of properties likely to be negatively affected.	There may be noise increases at residential properties in proximity to the link roads alignments.	Minor Adverse

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increased Employment (positive change)	Measures to maximise local employment and improve local skill base recommended. - Local recruitment of young people currently being trained outside the area - Enhanced apprenticeship / training for some local people whose skills could be improved - Positive selection and prioritisation of employment of PAP's - Identification of targets of local people to be employed by skills level - Publication of local employment	This depends on skills of the young people and interest to return to home area, and on the opportunity offered by Antea and targets set.	Major beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	targets in local newsletter. Recruitment policy to extend in future to limited sponsorship BSc (or equivalent) for workers / local people children		
Increased municipal tax and budget (positive change)	Assistance to villages to formulate projects and strengthen advocacy if requested by Liaison committee. Money from improved budget can be used to realise these objectives. Antea cement may be prevailed on to offer skills training for improved planning and project formulation	Increased municipal budget for Kruja district Residual impact will depend on effectiveness of allocation process in favour of affected villages. A poor process would cause conflict / discontent	Major beneficial
Electric and other infrastructure improvements (neutral or positive if realised)	None identified. This will be a "windfall" benefit (or benefit external to the project) if it occurs.		Neutral / Minor beneficial
Loss or reduction of livelihoods for: Lime Producers (negligible / minor adverse) Herb Gatherers (medium adverse) Graziers (minor adverse)	Confirmation of potential impact on animal nutrition and impacts on production and budgetary implications' by grassland specialist/livestock productionist following pasture (and livestock) inspection and assessment of stocking density and energy requirements. Confirmation of earnings from herbs to be obtained from wholesaler records, or by base line	PAP's have in the main identified a preference for employment rather than other forms of compensation. No household will loose their livelihood, and the income from employment (full or part time) of one or more household members, or alternative compensation, should be sufficient to compensate for expected reductions in the affected activities.	Neutral / minor beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	study. Prioritisation of employment or other appropriate form of compensation for each affected household (identified in the confidential Appendix (See Appendix 2) and confirmed by the measures above). Antea to consider feasibility of job share schemes, and gender sensitive arrangements (e.g. for child care arrangements). Annual monitoring of change in activities and incomes related to herb gathering, lime burning and grazing herds as well as other dynamic changes in activities and incomes from employment by Antea cement to be monitored annually during construction and in the first years of operation. Reporting to investors and via CSR report and Liaison forum. Specific attention to be given to vulnerable households.		
Extended and Improved Road and implications for local economy (minor/moderate beneficial)	Regulations relating to roadside and commercial activities to be adhered to by business persons and enforced by Commune.	Improved opportunities should be seen in increased opportunities and wealth of village. It may be difficult to apportion this only to the new road or cement works given the current increasingly dynamic	Minor (/moderate) beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Monitoring of health, road safety issues. Curative and preventive action to be taken if issues identified by monitoring.	economic environment.	
		Residual impacts of noise and dust for local residents near the road and indirectly affected.	
Loss of land and property for 4 -9 households and compensation (minor beneficial / minor adverse)	An appropriate compensation plan should be developed and agreed. See separate compensation plan framework document.	No negative residual impact should be incurred by PAP's. The assessment should include <u>all</u> applicable entitlements Monitoring process to review and report.	Negligible / minor beneficial
Hazards associated with development of new roads from main intersection to the cement plant and from the flysch quarry to the cement plant.	With regards to identified 'high' risks: - Design measures to ensure landslips/falling rocks do not cause accidents - Inclusions of pedestrian walkways and crossings - Lighting, particularly at intersections. - Planned access and parking, specifically in relation to the cemetery and pilgrimage site. In addition measures to manage cyclists and equestrians shall be incorporated.	Some residual impact is expected but should be limited by implementation of aforementioned mitigation measures.	Moderate adverse – possibly severe adverse if there is disregarded for safety issues by the road users.

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Risk of accident shall be reduced by implementation of education (road safety awareness) programmes and liaison with the local communities as well as driver training programmes and implementation of near-miss/accident reporting procedures. As part of the exercise proposed closed silo lorry lease agreements and contractual terms should be reviewed. Commune to consider need for any additional safety bi laws or regulations for local business activities near roads.		
Roadside residents health and quality of life	Risk assessment to cover these aspects and identify mitigation.	Depends on both cases	Minor/ moderate adverse
	Health records of dust related disease to be maintained by local health workers. Quality of life questionnaire to monitor noise and disturbance Further mitigation to be decided on basis of noted impacts via monitoring.	a) effectiveness of monitoring undertaken b) corrective measures taken – depends on severity of case e.g. treatment may not solve the problem – extreme health issue may require re housing However numbers involved are expected to be no more than 20 households at most though consequences for individuals may be severe.	

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Cultural and heritage site: Boke e Kuge (positive impact)	The pilgrim site Boke e Kuge will be more easily accessible by motorised transport. However the road should not pass next to the site, but allow for a connecting access road / drive.	Improved easier and faster access	Minor beneficial

Impact Rating Scale – Definition

Very severe adverse
Severe adverse
Moderate Adverse
Minor Adverse
Negligible / Nil
Minor Beneficial
Moderate Beneficial
Substantial Beneficial

8. IMPACTS ASSOCIATED WITH CLOSURE AND DECOMMISSIONING

INTRODUCTION

- 8.1 It is currently expected that the operational life of the cement plant will be in excess of 50 years. The actual length of operation of the cement plant will be determined by the reserves in the associated quarries. Information concerning the extent of these reserves cannot be released for commercial reasons. However, it can be reasonably expected that there are sufficient reserves for at least 50 years of operation. Also, it can be expected that during this period the cement plant will have one or more major refurbishment and several minor refurbishments.
- 8.2 When the decision to close the plant and associated quarries is made, details of how the plant will be decommissioned will be determined and a site closure plan will be agreed with the local regulators. As this point is anticipated to be many years in the future, it is not possible to determine the exact decommissioning technique(s) that will be used and the contents of the plan. Future legal regulations are also impossible to predict. In the absence of specific information, Atkins has provided a summary of best practice, based on experience from the decommissioning of facilities in western Europe and the requirements of the IPPC Directive. In general decommissioning is expected to require the:
- Removal of all surface plant and equipment;
 - Removal of hardstanding and surface cover;
 - Abandonment of sub-surface utilities or filling and abandonment as appropriate.

SITE CLOSURE PLAN

- 8.3 It is recommended that a site closure plan is developed in the first two years of operation. This plan should be updated periodically throughout the life of the project. The plan will address the methods to be used in decommissioning and site restoration and will not include consideration of the socio-economic impact of plant closure (the issue will be managed by Antea but they consider that it cannot be

realistically reviewed until plant closure becomes a reality). The methods used and standards applied must be consistent with local legislation in force at the time of decommissioning and recognised international standards (e.g. World Bank), EU IPPC guidance and industry best practice. The plan should include arrangements for decommissioning the plant in a manner which avoids any pollution and returns the site to an acceptable state, and should include (inter alia):

- Plans of all above pipes and vessels that contain or may have contained hazardous or harmful materials;
- A methodology for the removal of all pipelines and vessels. The methodology should include for the complete emptying of any potentially harmful contents and flushing out where appropriate. Any hazardous materials removed from pipelines or vessels must be recovered for sale or disposed of off-site by appropriately authorised waste disposal contractors;
- The method and resource necessary for the clearing of lagoons (particularly those used for the settlement of process wastewaters);
- The method of ensuring that any on-site landfills are closed and capped in compliance with permit conditions or European best practice standards (or whichever is the most stringent);
- The removal of all potentially harmful materials from site (for sale or disposed of off-site by appropriately authorised waste disposal contractors);
- Methods of dismantling buildings and other structures; and
- A waste management plan.

8.4 At this stage the environmental impacts associated with decommissioning can not be predicted with any detail. However, in broad terms, the process of decommissioning gives rise to impacts that are similar to those that can be expected in the construction phase, and proposed mitigation measures will be similar to those employed in the construction phase. Broad impacts and likely mitigation measures are summarised below.

Risk Management: Non-standard Operating Conditions and Emergencies

8.5 All safety procedures effective during plant construction and operation should be applied also during decommissioning period. Proper safety arrangements should be incorporated into the decommissioning plan.

8.6 Special safety procedures need to be developed and implemented for:

- Demolition of high structures (buildings, stacks), especially if explosives are used;
- Demolition of natural gas networks;
- Removal of tanks.

8.7 The company services and procedures will need to be applied and supervision of Emergency and Occupational Health and Safety specialist will be necessary.

8.8 Involvement and communication with municipal fire, environmental, work safety authorities are required.

MATERIALS USE, WASTE AND EFFLUENT

8.9 Waste streams that are likely to be generated during demolition include:

- Non-hazardous non-biodegradable/combustible solid wastes such as concrete, masonry and scrap metals;
- Non-hazardous biodegradable/combustible solid wastes such as wood, cardboard, paper;
- Aqueous wastes – sewage from demolition workers;
- Hazardous solid wastes such as paint cans and chemical containers;
- Hazardous liquid wastes such as oils.

8.10 The decommissioning plan will include a waste management plan which will:

- Identify waste streams likely to be generated;
- A waste minimisation / storage / treatment / re-use / disposal strategy for each identified waste stream. It is expected that inert, non-biodegradable demolition materials will be disposed of in an appropriately designed landfill in the limestone quarry;
- Methods for properly managing wastes (including training, storing, labelling, transporting and disposing of wastes). The disposal of hazardous waste on-site or the burning of combustible wastes on-site will be forbidden;

- Identify the landfills / storage sites that will be used for wastes which cannot be reused or recycled.

AIR QUALITY

- 8.11 Levels of dust generated in decommissioning may be higher than those generated during construction due to activities due to the 'aggressive' nature of demolition activities such as concrete and masonry breaking and the possibility that on-site crushers will be used to process demolition waste. Dust will also be generated by traffic movements and the stockpiling and transportation of materials.
- 8.12 Air emissions will be generated by vehicle movements and the use of demolition equipment; no information on the scale of vehicle movements is known, but they are likely to be on a similar scale to the construction vehicle movements.
- 8.13 Mitigation measures that are likely to be employed include:
- Sheeting vehicles taking dusty materials from site;
 - Enforcing speed limits;
 - Using dust suppression on crushers; and
 - Dampening-down of roadways and other surfaces with fine water sprays.
- 8.14 As with the construction phase, the magnitude of dust impacts is expected to be low and of temporary duration if appropriate mitigation measures are used.

SURFACE WATERS AND EFFLUENT

- 8.15 Potential impacts on surface waters and effluent from decommissioning are similar to construction impacts. The main risks come from:
- water running over disturbed land and materials stockpiles entraining silt and / or contaminants (particularly following heavy winter rainfall), and
 - potential the escape of polluting materials and stored wastes entering the surface water system, for example from flushing of pipework etc.
- 8.16 As the site is level, the risk of significant sediment transport is considered low.
- 8.17 Good practice measures must be employed to reduce the risk of escapes of polluting materials (such as oils) used in the decommissioning process itself. This includes the provision of adequate storage areas, complete with spillage protection, for

storage of fuels, oils and chemicals. It is recommended that hazardous materials storage areas (with proper mitigation measures applied) including maintenance of equipment of machines used for demolition should be removed in the final phase of works.

LAND QUALITY AND GROUNDWATER

- 8.18 There is the potential that contaminants present in the ground generated during plant operation could be released during demolition either as windblown dust or mobilised to them enter the groundwater. However, it is fully expected that any major losses of oils, fuels or other hazardous materials occurring during the operation of the facility would be contained, removed and the ground remediated at the time of the spillage. It is therefore considered that the risk of releasing contamination during demolition is very low. Should any areas of gross contamination be encountered during decommissioning then this should be removed and disposed of at appropriate hazardous waste sites.
- 8.19 Materials used to construct the development will be specified to ensure that low hazard materials are used wherever practicable. This will minimise the risks to human health and the environment connected with the potential exposure of hazardous materials during decommissioning. For example, asbestos will not be used in any part of the cement plant.
- 8.20 Decommissioning activities involve the use of machinery and storage of oils and wastes. There is the potential for these substances to escape and cause ground and groundwater contamination. This risk will be mitigated by the use of appropriate storage facilities for potentially polluting materials, including secondary containment.

ECOLOGY

- 8.21 The decommissioning of the cement plant and its out-buildings is not expected to have significant negative ecological effects. However, at the time of decommissioning an assessment should be made to determine whether any animals such as bats or birds may have colonised the structures; if so appropriate ecological surveys will be carried out prior to demolition works.
- 8.22 Even though some back-filling with inert spoil material from the quarry workings can be expected, reinstatement to pre-construction conditions will not be possible at the two quarry sites. Nevertheless "abandoned" quarry sites can provide features of value for biodiversity conservation, both flora and fauna. The opportunities the sites provide for long term biodiversity conservation purposes should therefore be investigated as part of the site closure plan.

- 8.23 There are no identified ecological sites outside the development site that should be affected by decommissioning activities, though consideration will need to be given as to the long term use of the access roads to the two quarries. This will depend on their future use. It may be necessary to remove the roads and “re-instate” the ground and vegetation, but maintaining vehicle access or foot access only are also possibilities. Alternatively the roads could be a valuable asset for future developments at the site.
- 8.24 The site closure plan and preceding rehabilitation plans will need to be reviewed and updated in the light of experience with implementing the ecological mitigation and compensation measures already outlined in the Construction Impacts Chapter – especially the “Habitat Restoration” proposals. These habitat restoration activities will need to be monitored, during the course of the project, so that lessons can be learned and applied prior to and at the time of final site closure. Comments on how rehabilitation measures that had been proposed earlier, and submitted with the quarry planning application, can incorporate ecological requirements are provided in the following paragraphs.
- 8.25 As part of the planning proposals, Antea submitted a 50 year work programme with an on-going rehabilitation programme. The programme is phased at 10 year intervals according to the quarry areas being exploited. At closure of all quarry areas the reinstatement of top soil and planting will commence. The plan has been accepted by the planning authorities but Atkins suggests that this scheme is enhanced and facilitated by a local ecological expert (perhaps with short-term international support) in order to ensure that the rehabilitation plan incorporates the needs of the local ecology. The aim will be to achieve a net benefit to the local ecology rather than simply a “reforestation” of the area upon closure; reforestation measures based primarily on use of exotic species should be avoided, unless there is clear economic justification, as discussed previously.
- 8.26 Subject to the results of monitoring studies (ecology/horticulture), the main stages of rehabilitation can be expected to consist of:
- Preparation of surfaces for sowing, using recovered stripped surface materials where appropriate.
 - Sowing/planting of surface with plants typical of the area with the aim of improving the ecology of the area.
 - Maintenance of planted areas to encourage growth of desired species and prevent invasion of undesirable species.
- 8.27 Rehabilitation of the quarried area will take place in stages during the development of the quarry. When an area of the quarry has been exploited, rehabilitation works will

follow and the success of the rehabilitation/restoration monitored so that the best techniques can be adopted for future stages of restoration.

8.28 For the enhancement of woody vegetation, the following approach might be undertaken i.e. where reforestation with tree species is the objective (and these should be native unless there is good reason for use of exotics). This approach has been adopted with success by Titan at other quarry sites:

- Fertilization, to be performed during cultivation as well as in February-March of the second year of sowing.
- Removal of invasive species. Where appropriate, invasive species will be removed in order to prevent competition with the planted species. It is proposed that this will take place mid to late spring. Removal of ground cover outside of this time may lead to negative impacts on the water regime.
- Creation of a water reservoir. The local water regime will be channelled into a small reservoir in order to supply water for irrigation during dry spells. The channelling of water into a reservoir will also reduce the volume of water running off the hillside which will cause erosion where the ground layer is exposed.
- Moisture retention around plants will be maximised by the use of natural and/or synthetic mulch.

8.29 For further protection of planted species, the following measures may also be required:

- Fire protection: Undertaken in liaison with the Forest Service and/or Local Government. Water used for irrigation will be used as a source of firewater if necessary.
- Enclosure. Where necessary, seedlings and young plants will be protected from herbivores by the use of appropriate fencing.

LANDSCAPE AND VISUAL

8.30 The visual impact of cement plant buildings is considered to be a significant negative impact of the project. The removal of these structures will therefore have a beneficial impact on the landscape.

8.31 Overall, decommissioning activities are transitory, and are likely to be similar in magnitude to construction effects; however the processes of decommissioning will be less disruptive when compared to the existing activities of the operational plant

phase. As such, decommissioning of the plant is anticipated to have a moderate adverse effect on the landscape resources.

- 8.32 The final stages of decommissioning will be a restoration programme aimed at reinstatement of the cement plant site to pre-construction conditions. In its existing condition the proposed plant location is classed as an ordinary example of the landscape character area, and subject to significant soil erosion due to extensive deforestation. It is anticipated that the restoration plan will involve measures to reinstate the area to a better than existing condition through potential sensitive restoration/reforestation and landscape management, e.g. using native species as described in the previous section. As such, the restoration phase of the cement plant will have a minor beneficial effect on the landscape resources.
- 8.33 The decommission activities relating to the quarry sites will be significantly less intensive than those of the cement plant due to the lack of on site plant and permanent structures and hardstanding to be removed. It is anticipated that the decommissioning activities will have no noticeable effect beyond that which the operational phases experienced. Giving consideration to the effect of noise from the operation of the quarry on the landscape character, the ceasing of excavation activities in itself will abate the negative effects of the quarries. As such the decommissioning of the quarries is anticipated to have a minor adverse effect on the landscape resources.
- 8.34 The restoration programmes for the quarry sites, as with the cement plant, has the potential to contribute to landscape enhancements to the baseline landscape condition. This may involve the reforestation of the area, ground remodelling, and potentially the addition of landscape amenities such as the conversion of the flysch quarry into a water body. As such, the restoration phase of the limestone and flysch quarries will have a minor beneficial effect of the landscape resources.
- 8.35 On completion of the operational phase of the development it is unlikely that the upgraded access routes will be demolished or maintained to their functional quality. As such, these routes may provide unauthorised access to currently remote areas resulting in degradation of the landscape. Therefore, the access routes are anticipated to continue to have a minor to moderate adverse effect on the landscape resources.
- 8.36 For the residential properties located within the lowland plateau they will be exposed to the decommissioning activities of the cement plant, which may involve the use of machinery visible above the lip of the upland depression. The works will also involve the movement of large machinery and plant equipment to and from the site, which will have a temporary adverse impact on the visual amenity of the area. As such, decommissioning of the plant and quarries is anticipated to have a moderate adverse

impact. The restoration of the cement plant site, involving scenic enhancements such as sensitive reforestation has the potential to improve upon the visual amenity of the site in its existing condition. However, the topography of the upland depression that acts to screen view of the works will also screen views of the restoration measures. The final condition of the visual amenity will also be affected by the access roads leading to the cement plant site. As such, the final condition of the site will be of minor beneficial impact of the visual amenity of the area.

- 8.37 For the residential properties located within the hillside communities they will be exposed to the decommissioning activities relating the taking down and removal of the infrastructure and works compound for the flysch quarry, including night time impacts relating to lighting and the movement of vehicles. These activities will have no significant impact beyond that of the operational phase of the quarry. As such the decommissioning of the flysch quarry will have a moderate adverse visual impact on the hillside communities. The restoration programmes for the quarry sites, as with the cement plant, has the potential to contribute to some enhancements of the baseline visual amenity, however there are fewer opportunities for such due to the existing good scenic value of the area. This may involve reforestation, ground remodelling, and potentially the addition of scenic features such as the conversion of the flysch quarry into a water body. As such, the restoration phase of the flysch quarry will have a minor beneficial impact of the visual amenity.
- 8.38 Road users of the new national route and infrastructure of the lowland plateau will have views of the construction activities and construction machinery decommissioning the cement plant however their exposure to the view is for a limited period only. With a low sensitivity these receptors will experience a minor adverse impact during the decommissioning phase. Despite the limited exposure to the view, the restoration of the cement plant site and limestone quarry is likely to result in a minor beneficial impact of the visual amenity.

TRAFFIC AND TRANSPORT

- 8.39 The closure of the facility will clearly remove the large numbers of vehicles from the roads taking finished materials from the cement works. Following closure of the cement plant the local road infrastructure will remain in place but the number of vehicles using it is likely to decrease sharply. However, the general development of the designated industrial area (where the plant is to be located) cannot be predicted at this stage (for 50 years hence).
- 8.40 No estimates of decommissioning traffic are available, however, the transport requirements and amount of traffic generation is likely to be similar that experienced during the construction period. However, as there will not be the need to remove large quantities of construction materials from site (with the exception of materials

recovered for recycling, such as steel) it can be expected that the number of vehicles movement during demolition will be lower than during plant construction. This situation may vary however should if the decommissioning programme is shorter than the construction period.

NOISE AND VIBRATION

- 8.41 Noise levels associated with decommissioning activities can not be established until details of the programme, methods used and plant and equipment are established.
- 8.42 Noise levels will be controlled on the site and appropriate measures will be used, as in the construction phase, to mitigate noise impacts. Noise mitigation measures will be incorporated into the decommissioning plan.

SOCIO-ECONOMIC ASPECTS

- 8.43 The decommissioning of the plant is highly likely to have an impact on the local community through the loss and/or relocation of jobs associated with the running of the plant; although there will be the creation of short-term employment in order to execute the decommissioning programme.
- 8.44 The company should therefore devise an exit and communication strategy to address these issues prior to decommissioning. Key issues will relate to job losses and the use of local suppliers. The severity of this will depend on the buoyancy of the local economy and in particular the labour market at the time of decommissioning. The exit strategy should minimise employment losses and assist redeployment. It should include options for early retirement; "natural wastage"; retraining and re skilling; assistance for employees who start up their own small company; assistance in job searches and applications; identification of jobs within the group and relocation assistance; as well as internationally acceptable redundancy terms for those unable to find alternative employment.

ARCHAEOLOGY AND CULTURAL HERITAGE

- 8.45 There are no archaeological or cultural heritage features identified on or in the vicinity of the site that are likely to be affected by decommissioning.

Table 8.1 - Summary of Site Closure Impacts and Mitigation Measures

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Emission prevention	- development of Site Closure Plan	Updated information on risks and requirements is available at site closure	Minor Beneficial
Dust emissions during ground works	- water spraying roads - sheeting vehicles carrying dusty materials - speed limits on unmade surfaces - dust emission monitoring in selected points	Dust propagation will be limited to demolition area and will not influence local community. However, workers should be supplied with dust masks especially in dry days	Minor adverse
Discharge of silty and contaminated storm water to surface water. Ground contamination by leakages from machines	- potentially polluting materials will be stored in dedicated storage areas - machines and equipment technical condition will be reviewed periodically - machines and equipment will be sited on hard surfaces - all storm water will go via sedimentation ponds and oil separation - procedures for finding contaminated material during excavations will be established - covering and damping of excavated materials	Ground contamination and storm water contamination will be limited on site by proper handling and storage of materials and equipment. Storm water will be treated in sedimentation ponds, the impacts on overall quality of discharge waste water will be minor	Minor adverse

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	- appropriate storage of contaminated material if found		
Disturbance of bats or birds that may have colonised the cement plant structures	- Survey, translocation, demolition at appropriate times of year	Some disruption of breeding still possible while adapting to new sites	Minor Adverse
Some loss of flora and fauna that are re-colonising quarry	- Quarry Restoration Plan incorporating habitat creation and use of native species	Depending on proposed future use of quarry, habitat creation could lead to significant improvement for biodiversity over value when used as an active quarry	Moderate to Substantial Beneficial
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Restoration of the plant and quarry sites including a reforestation programme	Return of the sites to existing to better than existing condition	Minor beneficial
Solid waste generation	- segregation and recycling of waste and proper storage in isolation from the ground	Solid waste will be passed to contractor's sand disposed according to their permits.	Minor adverse
Noise and emissions generated by vehicles	- traffic management plan - use of rail traffic for bulk transportation for abnormal loads	Local traffic congestions problems avoided.	Moderate adverse
Noise from decommissioning of plant and quarry	Good site management; Good choice of machinery; Methods of working, including sequential blasting; Hours of working; Efficient material handling; Construction of noise barrier or baffle mound; Maximising separation distances	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Emergency situations during construction works	- local fire and emergency squads available on-site - availability of Antea and contractors inspectors on site	Procedures for prevention of handling with emergency situations will be implemented. Proper training and equipment need to be delivered to the staff.	Minor adverse
Social impacts - There will be job losses	An exit strategy should be devised to minimise losses and assist redeployment. It should include options for retraining / early retirement / assistance in job searches and positioning / identification of jobs within the group and possible relocation assistance.	Plans to re-deploy workers will be developed	Moderate adverse

Impact Rating Scale – Definition

Very severe adverse
Severe adverse
Moderate Adverse
Minor Adverse
Negligible / Nil
Minor Beneficial
Moderate Beneficial
Substantial Beneficial

9. OUTLINE ENVIRONMENTAL MANAGEMENT PLAN & MONITORING PROGRAMME

INTRODUCTION

- 9.1 This outline environmental monitoring plan (EMP) has been developed in order to ensure the mitigation measures recommended in the Environmental Statement are delivered at each stage of the development, covering the construction, operation and decommissioning phases.
- 9.2 Monitoring falls into two general groups; qualitative assessment and quantitative assessment. Qualitative monitoring activities include audits and inspection of works, for example during the construction and demolition phases. Quantitative monitoring techniques will include consideration of:
- Concentrations of pollutants in exhaust gases from the plant.
 - Waste water quality, including site drainage.
 - Waste management, including recording the type and amount of wastes generated and reuse/recycling/disposal route.
 - Energy and water use and management.
 - Fuel consumption.
- 9.3 The outline EMP is intended as a framework document that will form the basis of detailed EMPs for each development phase. At this stage of the development programme, monitoring techniques, standards and locations have not been specified. These details will be progressively developed as the project proceeds. Measurement equipment and methods will be selected to comply with international, European or Albanian monitoring standards.
- 9.4 In addition, some of the monitoring requirements and emission limit values will be specified in permits and licences granted to Antea by environmental regulators. They

will specify the monitoring techniques, measured parameters, frequencies of monitoring and the location.

Table 9.1 - Mitigation Measures / Enhancement Plans - Construction Phase

Environmental Impact	Mitigation / Enhancement Measure	Responsibility
Air emissions	During the seasons when there is no dust suppression on the site roads, construction site shall be carried out using watering in the working areas and the roads as required. All diesel and petrol vehicles, plant and machinery shall be allowed to operate only after their check for conformity to technical standards for emissions and safety.	Antea / Contractor
Noise Emissions	Boundary noise measurements shall be made at the sanitary protection zone periodically during the construction process. This shall include when piling operations are in progress. Provision shall be made for the operation of environmental control of fulfilment of the measures on observance of the permissible level of noise impact.	Antea / Contractor
Protection of ground and groundwater	Groundwater pumped from excavations and storm waters will be discharged into reservoirs. This water will then be used for dust suppression and fire fighting. Fuels, chemicals, liquid wastes and potentially hazardous materials will be kept in designated storage areas. The following containment methods shall be employed: - Secondary containment for all storage tanks and containers above 20-litres in total capacity (including loading areas) must be used. These must have impervious surfaces, free of voids; gaps, cracks and the material used must be compatible with the materials contained. The total bund capacity must be at least 110 % of the volume of the largest container or tank in the storage area; - Proper maintenance of the secondary containment must be undertaken to keep debris, vegetation, leaked hazardous materials and storm water from accumulating; - Roofs or covers should be constructed over transfer areas to minimize contact with surface water; - All storage areas should be located in areas away from main construction activities and heavily trafficked routes; - Areas must be kept dry and free of combustible materials; entrances, exits and aisles must be clear and unobstructed;	Antea / Contractor

Environmental Impact	Mitigation / Enhancement Measure	Responsibility
	- Adequate lighting and ventilation must be provided; - The areas must be secure from unauthorized access; - All spills and leaks must be cleaned up promptly; - Hazardous materials should be stored away from other storage areas. - Suitable spill kits should be provided at all storage areas and at other suitable locations across the site. Workers should be trained in their use. - All storage areas must be visually inspected at least monthly and the inspections recorded. Refuelling will be effected with a mobile bowser with suitable secondary containment and spill protection equipment. Plant maintenance and plant/vehicle washing will be carried out in dedicated areas with spill containment	
Ecology	- Translocate soil and some vegetation to help restore neighbouring eroded areas - Habitat Restoration Programme including “Habitat Survey and Management Study” (especially of neighbouring areas, to be defined, and in close co-ordination with local ecologists and communities); Seed Gathering; Nursery Establishment - Survey and Ecological Method Statement for Access Road Construction - Further ecological/fauna survey of quarry sites, at appropriate seasons, and translocations as appropriate - Appointment of Project Ecologist (with some international support, since experience with ecological restoration may be limited in Albania) - Education, monitoring and enforcement programme for Chinese workforce	Antea
Visual Impact	Advance tree planting with the aim to achieve canopy closure within 5 years of the initiation of construction. Planting scheme to achieve reforestation of the area wider than the site limits. Sensitive colouration of plant and vehicles, avoiding bright or primary colours	Antea

Environmental Impact	Mitigation / Enhancement Measure	Responsibility
	Minimise the extent of offsite works, including vehicle movements within, to and from site Minimise the use of unnecessary lighting utilising cut off light sources to reduce light spillage	
Effect on the transport movement	Transport movements shall be carried out inside the construction site on the temporary roads and the approach roads under design. Limitations in the motor transport traffic speed on the construction site shall be enforced to 20kmph.	Antea
Waste management	Waste management procedures for all waste streams shall be implemented for the construction process. This will include a waste minimization plan. Records shall be maintained of all wastes generated at the site, including types, quantities, contractors used and treatment/disposal site used. All transporters and contractors used for waste collection, re-use, treatment or disposal shall have a current licence for the given type of activity. Contracts for the construction wastes (signed between Antea and external organizations) and the necessary licenses obtained for the related activities shall be provided to the Lenders	Antea
Waste waters	All domestic waste water from the workers camp and the site shall be drained via the temporary networks to the waste storage tanks and then shall be transferred to the biological waste water treatment plan according to a written agreement. The Construction Contractor will provide the Lenders with this document. Washing of motor transport and construction equipment on open ground or hardstanding on the site is not allowed.	Antea
Construction materials	Areas used for open storage of materials shall be located in the direct vicinity of the construction site in designated areas. Storehouses and sheds for temporary storage of construction materials and equipment shall be located on hardstanding or other impermeable materials where there is any risk of ground contamination (e.g. from cement) The location and configuration of the areas for temporary storehouses, their purpose and composition shall be agreed with Antea.	Antea

Table 9.2 - Environmental Monitoring Plan - Construction Phase

Items	Measures	Responsibility	Schedule	Limits
Noise/vibration from construction traffic	Ensure construction traffic only uses pre-determined routes to access the sites until completion of the link roads. Once link roads are completed, all construction traffic to/from the site should only use the link roads.	Contractor	During construction phase	No specific limits at present. The aim is that there shall be no noise nuisance.
Dust	Constant visual vigilance of dust issues throughout the construction phase is necessary. All activities should be assessed for the potential for dust creation prior to their undertaking. Observation of the weather conditions is particularly important.	Contractor/ Antea	Throughout the construction phase but particularly when undertaking activities or handling materials which may lead to dust creation problems.	No specific limits. No dust nuisance shall be created.
Communications	Compile and maintain register of environmental and social communications including complaints. These can be made through the existing grievance mechanism.	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.	N/A
Accidents and Incidents	Compile and maintain register of environmental accidents and incidents	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.	N/A
Waste	Visual inspection of waste storage, collection and disposal areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required	N/A
Waste Effluent	Ensure that the proposed effluent treatment plant is of an appropriate specification to prevent significant impact to the receiving water way. When details of the effluent treatment plant are	Antea	As soon as the design of the effluent treatment plant is available and before it is commissioned for use during the construction phase of the rest of the development.	

Items	Measures	Responsibility	Schedule	Limits
	available the operator is required to submit full details of the water treatment plant (including its management requirements) the expected loads, the quality of emissions, the emission point, the quality of the receiving water and the potential impact on that water.			
Storage areas	Visual inspection of all materials (including fuel) storage areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required	N/A
Ecology - Terrestrial	Belts of trees to provide local screening - Environmental educational programme - Access Road Wildlife Monitoring - Quarry site monitoring - Monitoring of Habitat Restoration Programs	Antea/Titan Specialist Drivers Ecologist	Every 2 weeks Every 2 weeks Every 2 weeks and prior to clearance Monthly with annual reports	N/A
Ecology – Marine (Port)	Monitoring of vessels (waste disposal practices) Monitoring of shore-based solid and liquid waste disposal facilities	Antea/Titan Antea/Titan	Routine review of documentation and spot checks Every 6 months and occasional spot checks	N/A

Table 9.3 - Social Action Plan - Construction Phase

Action	Implementation points	Responsibility	Phase / Schedule
Establish liaison forum	• Agree the need for forum, its objectives, scope of work, and powers of the forum members; • They should confirm member representation; • Agree regularity of meetings and meeting protocol; • Identify means of publicising role of forum; • Identify and announce communication process residents / forum ; • Identify process for escalating issues identified as priority or emergency in the absence of a meeting; • Receive, review and comment on early information on camp specification, • Identify list of community issues /concerns to be monitored, key indicators and baseline situation. A number of items for information, comment and monitoring are identified in the ESIA including the Camp specification and code of conduct, transport and health situations, grievance reporting / monitoring and issues related to the work camp.	Antea, CBMI, Mayor, Chairman Thumana health authority representative -----“----- Forum Forum Forum Forum Forum Forum Forum	Before Construction
Health Awareness and prevention programme	• Agree need for awareness programme • Consider different groups / audiences and identify target groups • Appoint organiser/ co-ordinator • Liaise with public health institute • Develop programme plan, identify staff, materials and budget requirement • Agree budget costs with Health service director and with Antea • Train staff • Implement (education programme (and feed back), materials supply,) • Review implementation • Develop 5 or so monitoring indicators (quantitative and qualitative)	Antea, Health Service & Local Government. Director Health Service Co-ordinator Co-ordinator Co-ordinator Inst. Public Health (IPH) Co-ordinator & Service Co-ordinator / IPH Co-ordinator / IPH	Before Construction

Action	Implementation points	Responsibility	Phase / Schedule
Support and strengthening of health recording	- Discuss with Director of Health Services need to strengthen local health records system – specifically in areas related to project. - If agreed identify what assistance needed if any - If not agreed discuss alternative early indicators /monitoring issues	Antea Social Advisor	
Road Safety Measures	- Implementation of physical measures proposed in Road Safety Study to minimise road safety issues. - Implement awareness campaign of road safety issues. Resident comments to be included and considered in the final design/safety issues; - Ensure driver contracts are contiguous with responsible driving. Implement road safety awareness/training to drivers prior to operation.	Antea	Design and construction of roads, before operation.
New Road, PAP's and compensation	- Leaflet or brief statement to be prepared for PAP'S informing different stakeholders* them of their potential rights /entitlements. - Sources of advice and process to be followed clearly specified to PAP's and residents near the road, a written statement should accompany verbal explanation to all stakeholders. This should include Grievance mechanisms; - Albanian Valuation firm (AVF) to be employed by Antea - AVF to establish compensation values in general and for specific plots and properties. The basis for these valuations and any calculations to be clearly stated in written format; - Lawyer experienced in Albanian and EU road development compensation practises to be employed at Antea's expense to work with valuation firm to:		

Action	Implementation points	Responsibility	Phase / Schedule
	a) establish the range of entitlements for each category of directly affected PAP; b) establish for each PAP preliminary entitlements for their specific case, for review consideration pending final risk assessment & confirmation of design; c) review entitlements in the light of confirmation of design, PAP concerns and issues and Arbitrator comments; Chairman and Commune lawyer to review process and arbitrate if process seen not to be equitable or if complaints arise. * those losing land, having land divided by road, losing property, potentially inconvenienced due to proximity of road	Lawyer employed by Antea (see below) Antea / Chairman of Thumana Commune Antea AVF Antea } } Lawyer } } } } Chairman and Commune lawyer	} Immediately and before road design finalised } At an early stage – in next month Immediately Immediately Before risk assessment completed. Once design confirmed. Through process

Table 9.4 - Social Monitoring Plan - Construction Phase

Item/ Performance Criteria	Measures	Responsibility	Schedule
Camp planning	Provision of camp specification and plans against international "norms" Review of specification and identification of amendments Codes of conduct developed /agreed and provided for information to Liaison Forum	CBMI Antea to review with advice from Liaison forum CBMI	Prior to development of camp Prior to development of camp Prior to development of camp
Standard of Construction worker accommodation*	Worker questionnaire and inspection	Antea	Quarterly
Standard of Construction worker catering*	Worker questionnaire and inspection	Antea	Quarterly
Construction worker quality of life*	Worker questionnaire, Site visit This and other questionnaires to be undertaken Chinese speaker trained and experienced in labour standards and issues.	Antea	Quarterly
Construction worker quality of life*	Construction worker accommodation suggestion box	Antea and CBMI contractor	On-going
Resident quality of life	Liaison forum to monitor a list of potential issues /concerns (including road accidents, local transport availability, health aspects, potential conflict and others issues) on a regular basis, identify early preventative measures and emergency actions.	Antea and CBMI contractor and Mayor of Kruja and Chairman Thumana	Monthly
Health monitoring	Identify indicators and provide statistics of worker health	Camp Doctor	Monthly
New Road PAP's compensation process	- Verification that: - Entitlement leaflet - Process statement	Chairman and lawyer of Thumana council. Chairman	At times specified for information production in Table 8.6

Item/ Performance Criteria	Measures	Responsibility	Schedule
	- AVF valuation document - Entitlement table - Produced, with adequate detail and distributed to all stakeholders • Grievance processes – number of complaints / issues identified and their status • Monitoring of compensation transaction process to be undertaken by Commune. Report to be provided to Antea for annual reporting to investors and to local inhabitants	Reporting to Commune council & Forum Director of Services Department, and Lawyer Thumana Commune	Monthly till end of construction. On dates agreed in compensation process.

Table 9.5 - Environmental Monitoring Plan - Operational Phase

Items	Measures	Responsibility	Schedule	Limits
Emissions to air from main stack	Constant monitoring of the key parameters and spot sampling of secondary parameters. Monitoring equipment and methods shall be in accordance with: ➤ National Albanian requirements ➤ The EU BAT Reference Document for Cement and Lime Manufacturing Industries. ➤ The guidelines set out in the IFC's EHS Guidelines for Cement and Lime Manufacturing.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.	Emissions to air from main stack
	The daily averaged air emissions from the main stack shall not exceed the following primary limits (mg/Nm³): ➤ Particulate Matter: 30 ➤ SO₂: 400 ➤ NO_x: 600 The operator shall also observe the limits for secondary parameters (HCl, hydrogen fluoride, dioxins-furans etc) as stated in the IFC's EHS Guidelines.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.	IFC EHS Guideline Limits
	Consideration of the necessity for installation of abatement equipment significant emissions from the cement plant. The operator is required to present a report which considers the emissions from the installation against	Antea	The report should be submitted to the IFC and EBRD within three years of start up of the cement plant.	NO _x :600 mg/Nm ³ ,

Items	Measures	Responsibility	Schedule	Limits
	the benchmarks, the potential reduction of local air quality as a result of the emissions and the impact on sensitive receptors. The assessment should also take into consideration the proposed future operations of the plant, particularly the main fuel to be used.			
Emissions from other parts of the installation	Dust Emissions from clinker cooling, cement grinding etc shall not exceed 50 mg/Nm ³	Antea	Throughout the operation of the plant from commissioning to closure of the plant.	IFC EHS Guideline Limits
Fugitive emissions to air	Constant vigilance and regular visual assessment of dust emissions.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.	To be agreed
Operational Noise – Health & Safety	Noise Monitoring programme. Noise levels in operational areas of the plant should be measured, and the risk of damage to hearing arising from high noise levels. Staff working in areas of high noise levels should undergo training and regular hearing checks.	Operator	High Noise Levels areas should be identified when expected noise levels are available, and verified once the plant is operational. Staff training and hearing checks should be ongoing.	To be agreed, if necessary.
Protection of ground and groundwater	Fuels, chemicals, liquid wastes and potentially hazardous materials will be kept in designated storage areas. Refuelling will be effected with a mobile bowser with suitable secondary containment and spill protection equipment. Plant maintenance and plant/vehicle washing will be carried out in dedicated areas with spill containment	Antea	The following containment methods shall be employed: Secondary containment for all storage tanks and containers above 20-litres in total capacity (including loading areas) must be used. These must have impervious surfaces, free of voids; gaps, cracks and the material used must be compatible with the materials contained. The total bund capacity must be at least 110 % of the volume of the largest container or tank in the	To be agreed

Items	Measures	Responsibility	Schedule	Limits
			storage area; • Proper maintenance of the secondary containment must be undertaken to keep debris, vegetation, leaked	
			hazardous materials and storm water from accumulating; • Roofs or covers should be constructed over transfer areas to minimize contact with surface water; • All storage areas should be located in areas away from main construction activities and heavily trafficked routes; • Areas must be kept dry and free of combustible materials; entrances, exits and aisles must be clear and unobstructed; • Adequate lighting and ventilation must be provided; • The areas must be secure from unauthorized access; • All spills and leaks must be cleaned up promptly; • Hazardous materials should stored away from other storage areas. • Suitable spill kits should be provided at all storage areas and at other suitable locations across the site. Workers should be trained in their use.	

Items	Measures	Responsibility	Schedule	Limits
			All storage areas must be visually inspected at least monthly and the inspections recorded.	
Landscape and Visual	Monitor soil erosion and establish a planting scheme, including advance planting with the aim to reduce erosion due to deforestation Monitor the establishment of on and off site planting with a permissible failure rate of with no more than 10% per year Manage access via the proposed access roads to reduce illegal stone mining Phase the quarry works and localised restoration to minimise the extent of exposed quarry face and window between extraction to restoration Monitor biodiversity enhancement through annual surveys Monitor the impacts of lighting through night time surveys	ANTEA	To be agreed	To be agreed
Waste	For all waste streams (solid and liquid) data should be kept of: - Waste quantities - Physical form and containers used/packaging - Disposal/treatment route - Final disposal point - Recycled/reused quantities All in house waste disposal/treatment facilities suitable monitoring/inspection in accordance with the	Antea	Monitoring data and a statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders.	To be agreed with regulators

Items	Measures	Responsibility	Schedule	Limits
	relevant permit/license and legislation. Any breaches of legal requirements, including permits must be reported immediately.			
Waste waters	Regular inspection of drainage and all waste storage tanks (including domestic) will be included in the wastewater monitoring plan.	Antea	Frequency and methods will be determined before the beginning of the work of the plant. Monitoring data and a statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders	To be agreed with regulators and lenders
Energy	Regular internal energy inspections on the plant; testing and tuning of burners, boilers etc and so on will be undertaken annually by competent experts. Ensure that energy management is as efficient as possible. Undertake detailed study of the plant efficiency once the plant is operational to assess whether waste heat recovery for power generation or any other purpose is viable.	Antea	Monitoring data and statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders Recommended that this assessment be undertaken and submitted two years after the plant has become fully operational.	N/A

Table 9.6 - Social Action Plan - Operational Phase

Social issue	Mitigation / Enhancement Measure	Responsibility	Phase / Schedule
Determination of impacts on PAP's	- Identify number of PAP's collecting large quantities of herbs with a significant value in Brett and Picrraga in the last 3 years. PAP's to be requested to register with Antea SCP team during the SCP preparation stage. - Pasture specialist/ animal productionist to quantify the impact of grazing loss. Report to include evidence on: - Quantification of grazing area lost and impact on grazing patterns (frequency and seasonality of use) - Grazing capacity and current stocking density, sward recovery rates - Impacts on milk production and animal growth of changed land use, - Partial budget of impact of change on livestock related gross margin - Confirm with communities the boundary of plant and quarries. Communities to be offered opportunity to undertake a boundary walk so that villagers are in a position to raise comments on this in relation to their activities during consultation phase.	Antea Antea, to procure services of specialist Antea	} } } By 8th April 2008 } } } } }
Policy of compensation of PAP's	- Establish firm criteria and company policy on compensatory employment and other means of compensation. - Antea to provide a compensation plan identifying numbers of registered beneficiaries, the processes undertaken, criteria used and description of compensation packages agreed, timetable and costs for implementation. Particular consideration will be given to vulnerable households. - Antea to provide a compensation framework outlining the main components for ESIA consultation	Antea in discussion with Mayor & village representatives Antea management including Social advisor	By 8th April 2008 For ESIA consultation
Employment Policy	- Antea to consider part time and job share working in particular for women; - Report policy relating to employment and the community. Establish targets for the numbers of local people to be employed at different skill levels. This should consider employment at initial start up and in future. Disclose and disseminate this information	Antea Antea	during general recruitment phase, till 2010 In the next year

Social issue	Mitigation / Enhancement Measure	Responsibility	Phase / Schedule
	to the local Councils and community ; As part of the recruitment policy consider including sponsorship for children of local employees / or local families. In both case the definition of who qualifies as local would need to be considered in the short and longer term.	Antea Antea	In the next year In the next year
Communication policies and stakeholder engagement	- Review forum membership, role and processes (See Table 9.3) in relation to operational phase of project and longer term phases - Establish local newsletter and circulate widely; - Clarify in a newsletter at an early stage how job opportunities (including construction jobs) will be announced and with how much advance warning; - Consider, in line with EITI Source book (additional action 9), high level civil society membership on committees and decision making bodies. - In the spirit of EITI engage an EITI specialist provide awareness training / seminars to Mayor, Chairman, community representatives and selected council representatives and Forum members on case studies of good practice in terms of local employment, communications and stakeholder engagement and other social issues.	Antea, mayor, and commune chairman, director health, village heads. Antea Antea Antea social advisor and Forum Antea Social Advisor / EITI specialist engaged by Antea	During 2009 (prior to quarry and plant operation) Immediate In next 6 months In next 6 months In next 9 months

Table 9.7 - Social Impact Monitoring - Operational Phase

Item/ Performance Criteria	Measures	Responsibility	Schedule
PAP's	- Monitor vulnerable household cash income over process of construction and operation - Livestock production/pasture expert to undertake baseline study and quantified pre project assessment of impacts., monitoring questionnaire, plan with indicators	Antea Antea to employ production specialist	Bi annual Immediate.

Item/ Performance Criteria	Measures	Responsibility	Schedule
	and schedule. - Livestock income and production impact monitoring - Grievance mechanism or early indicator system to be established via forum and village representative member.	Specialist Liaison Forum	Quarterly or bi annual as identified by specialist Quarterly report – more frequent if identified by representative
Employment and other compensatory measures	- Monitor local employment and skill levels against targets established by Antea employment policy and compensation policy - Monitor uptake of compensation measures (e.g. jobs or other measures implemented and mapped to identified individual PAP's. Forum to review. - Interviews with a sample of PAP's to assess status, effectiveness and impact of compensation measure using qualitative and quantitative indicators**	Antea, Liaison forum Antea to monitor and report to Liaison forum Antea to monitor and report to Liaison forum	Annual Monthly until all PAP's employed or compensated, Bi annual summary report there after. Annual for first two years after compensation
Communication policies and stakeholder engagement	Satisfaction and use questionnaire to all attending Activities identified on communications to be completed and summarised by forum and questionnaire results to be reported in Titan CSR activities and appropriate Antea reports	Liaison Forum /Antea	

Item/ Performance Criteria	Measures	Responsibility	Schedule
New Roads	- Monitoring of the health of residents near road in relation to dust and associated diseases. - No. of visits and no. cases diagnosed. - By age group - Monitoring of the quality of life of road side residents (noise and disturbance) - Questionnaire (developed by independent specialist) - Asked and analysed and recommendations by independent organization paid by Antea.	Director, Health Centre, Thumana reporting to Liaison committee Antea / Commune Thumana to instigate. Reporting to Liaison Forum to consider action.	Quarterly
	- Monitor the number of near misses / incidents associated with transport to and from the site on both roads. - Identify accident/potential accident hotspots - Detail measures undertaken to make further improvements to road safety.	Antea H&S/EHS Co-ordinator	Annually

10. PUBLIC COMMUNICATION STRATEGY AND INFORMATION PROGRAMME

INTRODUCTION

- 10.1 The purpose of a communication strategy is to identify, at each stage of the project, the key stakeholders, their communication and information needs and the means most appropriate for implementing this.
- 10.2 This section contains a summary of the public information and communications work undertaken by Titan and Antea Cement to date. It identifies the stakeholders who are affected by or interested in the project, describes the consultation undertaken, identifies key concerns of the stakeholders and provides information on the enquiry line / grievance mechanism by which stakeholders can register comments or concerns on issues related to the project.
- 10.3 A public communications plan document covering the initial stages of the ESIA can be found on the Titan web site (www.Titan.gr). This is supplemented by a communications strategy for the construction and operational stages of the project discussed in this section.
- 10.4 The communications strategy and plan should allow for appropriate means of stakeholder engagement, disclosure of project information, grievance mechanism(s), and monitoring and reporting.
- 10.5 The main components of communications and stakeholder engagement are discussed in the following sub sections:
- Stakeholders
 - Stakeholder engagement in the ESIA process including:
 - Planning and disclosure for National EIA and quarries and plant permit and for new road development;
 - Scoping for social impact assessment of quarries, cement plant and new road development;

- Impact Assessment, mitigation and compensation alternatives assessment;
- Construction Phase
- Operational Phase
- Decommissioning Phase

STAKEHOLDERS

- 10.6 Stakeholders have been identified in relation to the proximity of their homes, lands and activities to the project components and their potential interests. Stakeholder groups and representatives have been compiled in conjunction with Titan/Antea project staff, local consultants to the project, community representatives and the Mayor of Kruja.
- 10.7 The different stakeholders are identified in a stakeholder matrix showing potential stakeholder interests and contacts (Appendix 2.12).
- 10.8 The main groups identified included:
- Residents of the villages of Picrraga and Brett including: village representative; teachers, municipal and communal health staff, herb gathers (village women and young people), grazier/herders, lime producers.
 - Residents of Thumana including: the Chairman of the Commune, the village representative; municipal and communal health staff; private land owners close to the road whose land might be purchased for the road; other residents with homes or business near the potential route.
 - Officials in Kruja including the Mayor and director of District Health Services, the district directors of Agriculture and Food, and of Forestry Services.
 - Work camp, foreign workers and contractor.
 - Residents of all four villages (and outside the district) who are interested in project progress, potential impacts on local services and in particular in possible temporary and permanent employment.

STAKEHOLDER ENGAGEMENT: THE ESIA PROCESS

Stakeholder Engagement

- 10.9 Table 10.1 summarises the main stakeholder engagement and communication activities undertaken in the course of planning and disclosing the intended investment in the quarries and cement plant and in assessing impacts and identifying and considering alternative and preferred mitigation and compensation measures. Table 10.2 summarises similar information for the new road which connects the cement plant with the Tirana-Shkodra highway.

**Table 10.1 - Stakeholder Engagement Through ESIA Processes
(Quarries and Cement Plant)**

Date	Activity	Participants
	Planning and disclosure for National EIA, quarry and plant permits	
23/06/06	Press release published in all major Albanian news papers, announcing the intention of Antea to invest in a new Cement Plant	General public
19/09/06	Open public meeting - Kruja Town Hall Meeting purpose was to provide information on the intention of the company to develop limestone and flysch quarries, summarise EIA conclusions relating to the quarries re: potential environment impacts and the mitigation measures that the company would undertake.	16 heads of families for Brett and Picrraga and Local government and Village representatives
10/01/07	Open public meeting - Kruja Town Hall Meeting purpose was to provide information and findings of the EIA on the cement plant, its potential environment impacts and the mitigation measures that the company would undertake. Scoping for social impact assessment of quarries and cement plant. A copy of the presentation is available from Antea on request.	32 heads of families for Brett and Picrraga and Local government and Village representatives
05/2007	Collection of local statistics and information on economic activities, village and household structures; Interviews with stakeholder representatives from Brett and Picrraga. Provision and explanation of project leaflet and grievance mechanism.	Village representatives, teachers and medical staff, the district directors of Agriculture, of Forestry and of Health.
05/2007	Scoping meeting to gather general information on villages, identify potential concerns and interests and to provide information available on project and new road in form of leaflet for distribution to residents and	

Date	Activity	Participants
	explanation of grievance mechanism and provision of grievance forms to representatives. At their suggestion further forms were left at Kruja Council Office	
05/2007	Confirmation of local opinions, views and concerns with local residents, male and female including young people involved in farming, lime burning and herb gathering. Impact assessment, mitigation and compensation alternatives assessment	Picrraga: 6 residents including 3 young people (i.e. <18 years) and 2 women (herb gatherers), 1 man (farmer and lime burner). Brett: 2 women and 1 man (farmer and lime burner). Burizana: 3 women and 4 men.
07/2007	Interviews with PAP's - lime producers (Picrraga). Covering budget and financial return from lime production, areas of extraction and working, current and future trends in production, household income and preferred mitigation measures	2 Households of 4 identified in lime production activities in the project area (Picrraga)
	Interviews with PAP'S - herb gatherers (Picrraga). Including mapping of gathering areas, quantities gathered and returns, herb price trends, household income and alternative and preferred mitigation measures, issues for female employment	3 households of 7 vulnerable households in Picrraga. Contributions from 3 other herb gathering households
	Interviews with PAP's- Graziers (Picrraga). Including mapping of grazing areas, herd production and sales, livestock and dairy product prices and market demand, scope and interest in herd expansion, household income, and alternative and preferred mitigation measures	1 large herd owner interviewed (3 others may face reduced grazing)
	Interview with Village representative on impacts and alternative forms of mitigation, confirmation of vulnerable households. Verification of quantities collected - representative was also local wholesaler intermediary collector last year. Interviews with PAP'S - herb gatherers (Brett) as above Interviews with PAP's- Graziers (Brett) as above ESIA Disclosure of Final Findings	Village representative Picrrage Discussion with 3 ladies, and 1 interview 1 medium grazier - 3 others affected
09/2007 & 10/2007	It is proposed that the findings of the ESIA will be disclosed to the public through an exhibition and brief presentation and question session held in 2 locations. (Kruja Municipal Council offices, Thumana Commune Council offices). The exhibitions should be left in place for 3 or more days to provide the public with opportunity to view at their leisure. The exhibition should in addition to panels on technical /environmental information include panels	Public, stakeholders and PAP's, Local and National government officials

Date	Activity	Participants
	providing clear information on: - the work camp and its possible impacts on local communities; - potential impacts on PAP's; - criteria for compensation, proposed compensation and process that Antea will follow to contact individuals; - the key benefits relating to the scale of employment and type of employment and local municipal tax; - the communication mechanism; - local liaison committee, its role and examples of planned involvement; - new road and compensation. A comments and suggestions box or book should be available at the exhibitions to record views. A summary of the main findings including the social aspects above should be available as a hard copy. This should be provided for villagers (e.g. women and family members) who may be unable to attend the exhibition or meeting.	
	A presentation and question / answer session will be held at during the exhibition (time to be announced and circulated to District and Village officials, and invitations issued to key persons	

Table 10.2 - Stakeholder Engagement Through ESIA Processes (New Road)

Date	Planning and disclosure for the new road	Participant
10/2006	Meeting With Commune and council representatives	Antea and Commune representatives
01/2007	Introduction of the project and implications for the Thumana Commune (the building of the road in commune territory) Submission and approval of the road project by Thumana	Heads and members of Thumana community
05/2007	Meeting with Burizana and Thumana representatives - office Chairman Thumana Commune Scoping meeting to gather general information on villages, identify potential concerns and interests and to provide information available on project and new road in form of leaflet for distribution to residents and explanation of grievance mechanism and provision of grievance forms	Heads of Villages Burizana and Thumana

05/2007	Council of Commune Thumana take a decision (in principle) for approving the request for having the road.	Council of Commune members
06/2007	Discussion of road plan with objective to find the best solution for road location in order to affect as few people as possible	Antea, Chairman and village representatives
09/2007	Disclosure of ESIA findings	Public, stakeholders and PAP's, Local and National government officials

Communication and Grievance Mechanisms

- 10.10 Communications (concerns, grievances or clarification relating to any aspect of the project, i.e. its planning, consultation means, construction or operation, or the workers camp) about the project can be made directly in writing and or using the communication form with:

Mrs Dobi, Antea, Rruga luigi Gurakiqi, P. 89, Seksioni A, Kati I 10, Tirana or by telephone to Mrs Dobi on Tel: 569 2090547.

- 10.11 It is the responsibility of Antea Cement in Tirana to register all communications received. Each communication should receive a reference number or code. This number should be used in all monitoring / reporting to ensure the confidentiality of the communication. The communications received will be discussed with Antea senior management within a 1 week period, and Antea will respond in writing within 2 weeks of receipt, informing the person concerned relating the outcome and what action, if any will be taken. A record of the issues and concerns and actions identified will be maintained. This will be reviewed by Antea cement managers and the record will be passed onto Atkins to ensure that the issues are considered in the ESIA. After the completion of the ESIA, senior managers of Antea and the Titan Corporate Social Responsibility manager will be responsible for monitoring the summary of grievances and decisions made and actions taken relating to construction, or operation, or the workers camp. The summary of issues raised and actions should be reported to the Liaison forum, on a monthly basis. Reporting should at all times maintain confidentiality, all names, contacts and personal details should be excluded.
- 10.12 In addition to this mechanism, people of the commune can provide written concerns to their community representative or to the Kruja Town Hall, Office for Public Complaints. These will be discussed and passed onto the Mayor and onto Antea.
- 10.13 The main mechanism for communication in relation to the construction phase, work camp and later operational phase is through the Liaison Forum. The forum must be provided with key monitoring information if they are to actively engage and be perceived by local communities as to be effective in the function of liaison

10.14 The grievance mechanism should be reviewed at the end of the ESIA by Antea and the Liaison Forum (to be established). The review should cover usage, awareness and views of the local residents and village representatives. Any amendments identified should be made as necessary to improve its effectiveness. The mechanism should be continued through the life of the project as an alternative and confidential mechanism direct with Titan / Antea.

STAKEHOLDER ENGAGEMENT & COMMUNICATION: CONSTRUCTION PHASE

10.15 Analysis of the different stakeholders and their likely interests and concerns during the construction phase has identified a variety of different communication needs. These are summarised in Table 10.3.

Table 10.3 - Potential Communication Requirements of Stakeholders during the Construction Phase

Stakeholder	Interest / Concern	Communication means
Community / village residents	Employment opportunities, Disturbance and potential disruption to water, electric, transport or other services, unforeseen incidents or inconveniences	Newsletter, local notices, national and local newspaper, radio and other media announcements,. Complaint to Liaison Forum (committee) - local representative
Medical Services	Trends in the demand for local services and provision of services by camp workers and in target communities	Direct and early meeting of Director of District Health Service with CBMI to organise potential needs
Local Businesses	Interest in commercial opportunities, supply chain and provisioning, transportation contracts, sale of local produce	Early and advance meeting with camp procurement officers with local business representative(s) Facilitation by business support consultant
Foreign Workers	Employment and living conditions Intra-camp conflict minimisation and resolution Quality of life and camp facilities Worker representation with management	Quarterly monitoring - questionnaire, camp inspection visit, camp grievance mechanism /suggestion box. Quarterly monitoring by Antea/Titan and annual reporting as part of CSR and bi-annual investor reporting /briefing. Worker established process for arbitration and written communications of codes of conduct provided to all workers. Quarterly monitoring - questionnaire, inspection visit, grievance mechanism /suggestion box Worker forum established and

		processes for communication with workers and with management agreed and established
	It is assumed that internal communication practices have already been established by CBMI although we have no information on this. Communication processes and organisation should be verified by Antea/Titan.	

10.16 Various communication channels are identified in Table 10.3 including:

- Quarterly newsletter for local communities to be produced by Antea reporting information on, and progress with the construction of the plant, running of the camp and other interesting items related to the camp and construction work;
- Notices (identifying key information and where additional information can be obtained) to be placed on communal notice boards in Thumana, Picrraga and Brett.
- Liaison forum or committee of local representatives, local government officials (e.g. health services representative and a senior council representative), Antea and work camp representatives to channel suggestions, concerns or complaints directly and speedily between camp and local communities.

STAKEHOLDER ENGAGEMENT & COMMUNICATION: OPERATIONAL PHASE

10.17 The main stakeholders in this phase include: local communities (residents, potential and actual employees, local businesses), the wider public and including pressure groups, regulators, investors, contractors and unions.

10.18 Titan has a number of established communication plans and practices undertaken in its various operations and plants. These and others are recorded in Table 10.4.

Table 10.4 - Communication Strategy During Operation

Stakeholder	Interest	Mechanism
Employees	Worker /management communications and representation Lateral (worker to worker) Organisational and operational communication	Union representation and negotiation with management of pay and benefits on an annual basis according to local practices Union representation on key committees including health and safety Annual CEO presentation to staff including question and answer session Worker / union conference with topics of interest to workers According to operation structure and organisation.
Individual contractors (closed silo drivers)	Negotiation and agreement of contact terms, lease agreements, health and safety etc. on individual basis	Individual negotiation

Stakeholder	Interest	Mechanism
Local Community	On going changes, progress, environmental and social (especially health, employment, training) issues and opportunities. Partner arrangement and community programmes	Quarterly newsletter, local media announcements, open days and educational visits (schools). Continuance of grievance mechanism with clear responses provided in a timely manner to stated response standard Liaison forum to be maintained but frequency of meetings and scope of the forum to be reviewed in light of local representative requirements. This may for example be a good vehicle from which to develop an interactive programme with the community.
Investors	In the performance, profitability and good practices (including social practices) of the firm. Any changes which might change these aspects	Annual report, financial report, CSR (possibly reported as part of the Titan group),
Regulators	Regulatory requirements /audits /new and innovatory practices /best practice	Newsletter, reports as requested by regulator, contact and discussion through periodic meetings or annual industry seminars