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Accounting Report on the Albanian Chromium Industry

The report is in a preliminary stage and presently represents the information gathered during a nine day trip to Albania in January 1993 by a KPMG financial team. The information has also been analyzed to produce information for use in a model designed to assess the industries profitability and value.

We have compiled financial reports using information obtained at Albchrome and provided by the various reporting enterprises. There are many significant figures contained in these reports which we have estimated as accurately as possible. The information available often conflicted or was incomplete without adequate explanation. In such cases we have made estimates based on prior period information, information from other enterprises and knowledge of other related circumstances.

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SECTION A GENERAL INFORMATION

Introduction - Accounting Methods at Albchrome

Albanian accountants are classified as one of two groups. Firstly "economists" who are what we would refer to as management or cost accountants. These people monitor input and production data are prepare information useful for management of the mines. Secondly "financiares" who are what we would refer to as financial accountants. They are responsible for financial reports, cash flows etc.

There are two distinct reporting levels at Albchrome: the enterprise level and the consolidated Albchrome level. At the enterprise level reports are prepared quarterly by the financial accountants at each enterprise. These reports contain a balance sheet, a summarized schedule of production and expenses, a profit statement, a "budget" statement (cash flow statement) and various supporting schedules. At the Albchrome level a similar report is prepared for the Head Office function. Information from the enterprise reports is then used to prepare or update plans/budgets for Albchrome. The accounting format used in Albania and at Albchrome is Soviet and as described in the report by Coopers and Lybrand.

The accounting system has many inherent problems that hindered this process and will hinder effective management by a foreign participant in the industry.

1. *Difficult communication between Head Office and enterprises.* While the distances are not large by international standards, poor telecommunications, poor roads, and lack of transportation mean that there is no regular contact with some enterprises.

2. *Lack of office facilities.* There are no photocopying services nearby, all records are manually prepared or occasionally typewritten.

3. *Lack of accounting controls.* There is little evidence of procedures being performed to ensure that information is accurate or complete. We did note that documents were sometimes stamped and signed as being official and that inventory of ore was measured quarterly and compared to accounting records. However, many reports contained obvious significant discrepancies that had not been addressed by the accountants. There does not appear to be any review of the enterprise reports submitted to Albchrome or any follow up of differences or unusual items.

4. *Reporting is not complete and timely.* Nearly all of the reports submitted to Head Office were incomplete in many respects. There is also no sense of the value of obtaining this information as quickly as possible after the balance date has passed.

In summary, information that we would consider critical in managing a business such as Albchrome is not available at Head Office.

The accounting personnel interviewed at Head Office seemed generally competent considering the above difficulties and that they are now having to consider profit and reporting in a new way.

After addressing operational objectives, a foreign participant in the industry would probably want to oversee a complete revision of the accounting system as a matter of high priority.

Exchange Rates

The exchange rate for the Lek has been as follows for the period since January 1992 were as follows:

1.01.93	$1:25Lek
1.31.93	$1:50Lek
7.01.93	$1:92Lek
11.1.93....	$1:80-100Lek

The exchange rate ceased being controlled by the State on July 1, 1992. Rates since that date have fluctuated, but a true economic rate is difficult to establish as there is no international demand for the lek. For the purposes of this report an exchange rate of US$1=100lek has been used.

Enterprise Description

Albchrome is organized into twenty reporting enterprises. These enterprises include groups of mines, ferrochrome facilities, beneficiation facilities, a transport enterprise, mine development facilities and others. Appendix I gives details of each enterprise, and appendix II gives further information on the mines within the enterprises.

Pescope Workshop

This workshop is a separate enterprise and it carries out the repairs and maintenance for the other enterprises. At present, this enterprise charges the other enterprises for the work it performs. Albchrome wishes for the state to take over this enterprise and use contractors to perform the work instead. Most of the repairs could be performed at the mine sites if the spare parts were available as each enterprise has its own mechanics.

Enterprise Equipment

Klos Heavy Media separation

The Klos Heavy media separation plant was constructed in 1990 with the assistance of the Swedish firm, SALA International. This has a capacity of 500,000 tonnes per year. Its advantage is that it can add up to 6% concentration to the chromium. The ore of 30-38% grade can be processed to bring it up to a concentrate of 40% or higher to be used in the Ferrochrome Plants or for export.

North Bulqiza Mine

The North Bulqiza mine is constructed of predominantly Chinese and Polish equipment. There is however some European and American equipment at the mine. The major equipment at the mine is:

Lifting machinery - Chinese/Polish
Winches - Chinese/Albanian
Trolleys - Albanian/Chinese
Air compressors - Chinese 90%/ Polish 10%
Incline ramp - Underground version : VOLVO L70 (Swedish)
Truck - VOLVO A20
Drilling machinery - Atlas Copco, Sanvic.
Electrical equipment - Chinese
Ventilation tubes - Ventiflex (Sweden)
Water pumps - Chinese/Polish

In addition there are approximately 15 microscoopers in use for removal of the ore from the mine walls. These are French made(Secoma) and were purchased over the past 10 years. They also have 10 in inventory.

South Bulqiza Mine and the other mines

Most of the equipment at the other mines is an assortment of Chinese, Polish and Albanian equipment. That is that the Lifting machines, winches and the air compressors are Chinese, the trolleys are locally made and some minor Polish equipment is used.

The drilling machinery at the Batra mine is a mixture of Chinese and Atlas Copco equipment. the other mines do have some Swedish drills.

The South Bulqiza development enterprise does have four of the Microscoopers in use and a further two in inventory.

Since 1987, efforts have been made to move away from the Chinese equipment to use the western equipment. This is considered very expensive though. For the cheaper price, the Chinese equipment is seen as very good value. In some instances it is up to 4 times cheaper.

Elbasan and Burrel Ferrochrome plants

The furnaces at both plants are Chinese made. Currently, only two are operational at Burrel and one at Elbasan. The Burrel plant is completely Chinese built. The Elbasan plant does have some locally made components.

Beneficiation plants

The beneficiation plants have been made up of components from many different places. For example, the Spirals are Australian made, the distributors come from Romania, the Jigs from England, and Chinese and local concentrate tables.

At the Bulqiza beneficiation plant, German testing and control apparatus has been installed. This is currently being checked before it goes into operation.

A contract was made with Atlas Copco during 1991 for the purchase of the following equipment:

Description	*Type*	*Qty*	*Price*	*Total price*
Shuttletrain	HRST-90AB	6	812,000	4,872,000
Drawbar	8541 0377-05	4	35,000	140,000
Drawbar	8541 0375-06	2	8,000	16,000
Diesel Locomotive	GIA DHS 60	4	695,000	2,780,000
Rail-bound Shovel Loader	LM 57H	6	262,000	1,572,000
Wagner LHD Machine	EHST-05	6	520,000	3,120,000
Pusher Leg Drill	BBC 17W	40	20,100	804,000
Pusher Leg	BMT 51	40	7,725	309,000
Lubricator	BLG 30	40	1,010	40,400
Air hose 1"x3m	9030 0002 00	40	400	16,000
Flushing hose	9030 0005 00	40	165	6,600
Integral Drill Steel	Assorted	4000	-	1,491,250
Centrifugal Pump	DIP 65 KIT	12	11,400	136,800
Rubber Hose	Assorted	48	-	42,180
Ventilation Tubes	CS Diam 600/800	3000mm	-	237,400
Chisels	Assorted	160	-	396,600
Drill Steel	Assorted	60	-	17,560
Pionjar Water Pump	9238 2899 22	4	7,334	29,336
Pionjar Concrete Vibrator	9238 2898 81	4	9,110	36,440
Drill Jumbo	Boomer 126/925 DC11E	1	1,424,800	1,424,800

The total value of the contract including freight and interest was SEK 20,924,410. This approximately _____.

Christmas wish list

The following items are considered to be required most urgently by Albchrome:

1) A further 35 trucks are needed immediately. The enterprise is finding that it cannot move the ore to the port quickly enough and it is being stockpiled at the mines and the beneficiation plants.

2) Spare parts are required for the Renaults purchased.

3) New trolleys are required for the mines. The local manufacturer has gone out of business. The enterprise would like to purchase Chinese ones as they are cheap and their quality is reasonably high.

4) Air compressors at all the mines require spare parts for the Chinese equipment. The local manufacturer of the spare parts is now out of business.

5) Spare parts are required for the lifting machinery. This machinery is very old. Some of it is almost twenty years old.

6) Spare parts are needed for the Microscoops. The older ones were purchased in 1982/3

Transport equipment

There are a total of 25 trucks owned by the Albchrome enterprise. This includes 15 French built Renaults and 10 Czechoslovakian Skodas. The Renaults were purchased in January and the Skodas have been in commission since _____. Albchrome also requires the use of outside transport facilities as it does not have enough trucks in service to meet all its road transport needs.

In October 1991, Albchrome entered into a contract with Renault for the purchase of 60 trucks. These have 16 tonne capacity. As of January 1993, only fifteen trucks had been delivered. The other 45 have not arrived because Albchrome is unable to finance the purchase of the vehicles. The first 15 received have been paid for in full. The terms of the contract are for the delivery at a price of FF 395,000. This is approximately $73,000 per unit. However, based on recent discussions with Renault, the price will increase at a value of 1% every month until the trucks are delivered and the trucks are paid for. This is to take effect from October 1992. The enterprise is in immediate need of 35 more vehicles. The current trucks purchased are under a two year warranty and have one year left.

Albchrome have recently placed an order for the purchase of spare parts for the Renault trucks. At present, they are relying on the warranty for the replacement of parts.

There are 17 Leyland (Made in India) buses owned by Albchrome. In addition, there are_____ Czechoslovakian buses which have Albanian cabs. There are also 6 IVECO buses_____.

A contract has also been signed for the purchase 50 buses from the Italian company IVECO. The buses are 49 seaters. The contract was signed in July 1992. The buses are to be purchased for 89,600,000 Lira (approximately $61,000). The contract was negotiated through Minreagoimpex.

The respective cost of transport in Albania is very low. Use of Albchrome's trucks costs approximately 7 cents per tonne per kilometer. The current cost of road transport is between 8 to 10 cents per tonne per kilometer when other enterprises are used to

transport the Chromium. As of January 1993, diesel costs about 25 Leks per liter. For rail transport, the cost per tonne per kilometer is approximately 2.5 to 3 cents.

Ferrochrome from the plants at Elbasan and Burrel use only road transport as there is a lot of waste in using rail transport with the ferrochrome ingots. due to the fragile nature of the product. To use rail transport requires much loading and unloading. This results in fines falling off the ingots which results in waste of the product which is ready for sale. Therefore, all ferrochrome production is transported to Durres by road.

Depreciation Rates

	Rate of depreciation
1. Production buildings	
Ferro-concrete framework	1.0
Stones and bricks made	1.3
2. Single floor buildings	1.6
3. Multi floor buildings	1.3
4. Mining gallery	9.0
5. Mining shaft	5.0
6. Mining machinery and equipment	8.0
7. Screening machinery and equipment	8.0
8. Smelting machinery and equipment	5.0
9. Inner transport means	7.0
10. Outside transport means	467L/1000km
11. Furniture	3.0
12. Tools and equipment	4.0
13. Loading machinery and equipment	9.0

These depreciation rates are low by international standards, but the Albanian's still have in use equipment which is older than the useful lives implied by these rates. However with the lack of maintenance that machinery has been receiving recently (due to a lack of spare parts and training) useful lives may well be less than with a corresponding enterprise in another country. Accordingly these rates should be reassessed following negotiation of a restructuring program.

Inventory on Hand

The following was listed as Inventory at the different locations as of January 1, 1993:

Type of Ore	*Tonnes*	*US$/tonne*	*Total price*
Durres : Port facility			
1. Lumpy Ore 40-42%	9,533	65	619,945
2. Lumpy Ore 36-40%	12,197	60	731,820
3. Lumpy Ore 30-34%	40	27	1,080
4. Chromium concentrate	15,375	67	1,030,125
5. Fine concentrate	132	35	4,620
6. Alumo-Chrome	519	(1)	-
7. Ferrochrome(lumpy)	518	420	217,560
8. Ferrochrome(fines)	659	350	230,650
			2,835,800
North Bulqiza : Mines			
1. Lumpy Ore 40-42%	4,273	65	277,745
2. Chromium concentrate	5,374	67	360,058
			637,803
South Bulqiza : Mines			
1. Lumpy Ore 38-40%	27,181	62	1,685,222
Batra : Mine			
Kraste : Mine			
Klos : Mine			
Ternove : Mine			
Kalimash : Mine			
1. Lumpy Ore 38-40%			
• Mitoxa	5,110		
• Kecli	22,898		

• Karjera	6,310		
• Vlahna	7,395		
• Perollaj	9,508		
• Thanza	200		
Total	51,421		
2. Chromium concentrate			
• Mine	4,644	67	311,148
• Mjede	2,800	67	187,600
3. Olivinite	8,499		

Prrenjas : Mines

1. Lumpy Ore 36%	1,220	60	73,200
2. Lumpy Ore 30-34%	4,328	27	116,856
			190,056

Pojska : Mine

Bulqiza Beneficiation Plant

1. Lumpy Ore 30-34%	10,850	27	292,950
2. Chromium concentrate	7,207	67	482,869
			775,819

Elbasan Ferrochrome Plant

1. Ferrochrome	1,000	420	420,000

Burrel Ferrochrome Plant

Klos Heavy Media Separation Plant

Lac Mixing Yard

Tailings

Tailings at the mines are minimal except at the Bulqiza Beneficiation Plant and at the Burrel Ferrochrome Plant. At the Bulqiza Beneficiation Plant there are 2,500,000 tonnes of Tailings. The Chromium Ore content is approximately 13%. At the Burrel Ferrochrome Plant, there are approximately 400,000 tonnes of slag that contains 6% Chromium content. There are no other reserve of such tailings as the other mines have employees working to remove the chromium from the waste.

Imported Products

Albchrome imports several of its raw materials including coking coal, quartz, and carbon paste for the furnaces at Elbasan and at Burrel.

Revenues

1992 revenues are given below. A separate schedule showing revenue by month during 1992 is attached as appendix III.

Total revenue for 1992 was USD 15.497 Million. The sales were made to the following countries and in the following compounds:

Ferrochrome

Country	Tonnes	US Dollars (Millions)
Japan	8,232	4.279
Belgium	8,202	4.107
Italy	2,604	1.070
United states	2,200	0.907
Yugoslavia	18	0.011
Total	21,256	10.374

Concentrate

Country	Tonnes	US Dollars (Millions)
Germany	10,017	0.714
Japan	9,978	0.728
Yugoslavia	2,217	0.191
France	2,123	0.187
Korea	4,012	*
Total	28,347	1.820

* The sales to Korea were made under a barter arrangement. In exchange for the Chromium concentrate other enterprises in Albania received machinery from Korea. Based on the average selling price of concentrate for the year, sales of approximately $600,000 were foregone.

High grade ore (>40%)

Country	Tonnes	US Dollars (Millions)
United states	9,600	0.657

Medium grade (36-40%)

Country	Tonnes	US Dollars (Millions)
United states	24,772	1.339
Italy	1,275	0.038 •

• The sales to Italy were bartered for the exchange of spare parts for the Albchrome enterprise.

Low grade (30-34%)

Country	Tonnes	US Dollars (Millions)
Italy	42,057	1.006
Yugoslavia	202	0.015
Korea	8,034	*
Total	50,293	1.021

Fine concentrate

France	5,221	0.286

Albchrome are suffering from the fall in the price of Chromium on world markets. At the beginning of 1992, they were receiving approximately $520 to $530 per tonne. By the end of the year, this had fallen to $440 per tonne.

At the beginning of the year, sales were made to Yugoslavia from the Kam and Kalimash mines. This chromium is very low grade(22-28%). At present, no sales are being made due to the embargo in force. Both mines are still continuing to operate and are stockpiling the production of this low grade ore. Both mines have accumulated approximately 20,000 tonnes of Chromium ore. This has a value of _____.

The price received by Albchrome is based on the South African price of Chromium ore. There are a number of penalties to the price quoted by South Africa. They are as follows:

a) The time at which payment is required. South Africa usually offer from two to three months credit. Unlike South Africa, Albania requires immediate payment. This results in a penalty of 3 cents per pound.

b) The South African size of the ore is between 10mm and 50mm. Albania is selling the ore in sizes between 10mm and 150mm. This results in a penalty of 3 cents per pound.

c) Fines contained which are greater than 5% cause a penalty of 1 cent per pound.

d) Method of transportation effects the selling price. South Africa usually offer terms of C.I.F.. Albania can only offer Free on board terms. This reduces the price by 1 to 2 cents a pound.

At present, the only ways in which Albania can improve the selling price is to reduce the size of the ore through the use of improved screening and to reduce the percentage of fines in the ore.

Improvement of the quality at Elbasan can result in a 3 to 4 cent increase in the price of the ferrochrome.

A contract is currently in existence with an American company for the supply of 10,000 tonnes of 36-40% grade ore. Negotiations are currently underway for the sale of ore to Considar of Belgium and to Sumitomo(Japan). The amount to be sold is 35,000 tonnes. The world price at the present time is 30-32 cents a pound. Albchrome believe the cost however is 32 cents per pound.

In 1991, sales made to Considar resulted in penalties of approximately $250,000 due to the poor quality of the ore. There were however no penalties in 1992. This problem no longer exists.

Albchrome are trying to sell in future in the Asian markets. the Asian buyers prefer to buy on a barter system. This currently suits the enterprise due to its dire need for spare parts.

Barter Contract for 1993

A barter contract is currently under negotiation with the Chinese (Dalian Hydraulic Component Factory P.A. China) for the sale of Chromium concentrate in exchange for machinery and equipment and spare parts.

There are currently 15,000 tonnes of Chrome concentrate sitting in storage at the port for which Albchrome hopes to barter. This has a concentrate of 46% Cr_2O_3. In addition, Albchrome is intending to export 20,000 tonnes in each of the second, third and fourth quarters to China. The following shipments will contain 48-50% Cr_2O_3.

Taxation

Turnover Tax

Previously, this was calculated at 15% at the enterprise level. This has not been consistently applied by Albchrome across the enterprises. Some enterprises were paying it and some were not. For 1993, the rate has been increased to 20% but the law has not been finalized by the state. The tax is likely to be applied to all export sales by Albchrome.

Profit Tax

A 15% tax is imposed on profits after turnover tax.

Social Security

This tax is based on total payroll and is paid to the State in support of the payment of various State benefits. The rate was previously 21.5%, but it has now increased to 25%.

Property Rent

A rental charge is being imposed by the State on certain properties that are classified as having above average "rentability". Albchrome is budgeting 112,508,000lek for this expense in 1993.

GEOALB Allocation

GEOALB is the Albanian geological enterprise. Albchrome is required to pay 23lek per tonne ore extracted from the mines.

Redundancy

An enterprise is liable for 840 lek per month per employee for the first year following redundancy.

Recent Reported Results

Appendix IV contains translated statements from each of the enterprises for the nine months ending September 30, 1992. Points to note when reviewing these statements are:

- Some items appear inconsistent between enterprises. Albchrome's explanations are usually that there are errors in the reports and different enterprises have differing practices.

- Profits and losses for each enterprise are calculated using a manual which gives transfer prices between enterprises. Inputs from other enterprises are usually reflected as raw material costs.

- Costs shown for salaries do not include the salary expenses for administration staff or staff involved in development works. These costs are included in other line items.

- Mine preparation costs include only "prepatory" costs and not "capital" costs. Refer to the explanation below.

Appendix V contains the nine months results extrapolated out for a twelve month period. Actual results for the twelve months would be worse as production deteriorated during the year.

1993 Plan

The company's plan for 1993 is contained in appendix VI. The plan is a compilation of the individual production plans for each mining enterprise, costed out by Albchrome's cost accountant.

Planned production by grade is set out by mining enterprise. The resulting salable product is then specified after processing through beneficiation or ferrochrome facilities. Planned unit costs for extraction and processing are then specified and used to calculate a gross profit. Taxes are then deducted to obtain net profit and then certain other expenses are shown.

The "redundancies" expense is shown alongside those enterprises showing a loss before taxes. This represents the redundancy cost to Albchrome if the enterprise was shut down.

It is evident that Albchrome's planned production for 1993 assumes a significant increase over 1992. We were informed that this level of production would be possible given current resources and without foreign investment. However, having seen the facilities and the rapid decline in production recently, this plan seems completely unrealistic without significant capital injections to provide necessary repairs and maintenance. In fact production will probably fall away drastically again unless action is taken soon.

SECTION B ANALYZED INFORMATION FOR VALUATION MODEL

Because the financial results reported by the enterprises contained many errors, inconsistencies and were not complete, information for the valuation model was obtained to enable costs to be built up from base data (e.g. employee numbers and average salaries). Accordingly all the costs given below are estimates of current costs for the enterprises. However, production figures are based on 1992 actuals because of the difficulties in estimating current production levels.

Production Analysis

Two sources of data were used to obtain production figures for the valuation model. The primary source of information was actual production figures for the nine months ended September 1992. The second source was planned production for 1993.

As the 1993 plan appeared unrealistic in respect of production, it was not used to estimate production levels. Instead the nine month actual results were used and extrapolated out for twelve months. These figures would be somewhat higher than actual twelve month production given the deterioration during the year. However this was thought to be a reasonable base to compare against costs and enable future projections to be made. Subject to reserves being available and with sufficient capital injections, future production could be significantly higher than shown.

The production figures available were not usually detailed by grade at each enterprise. In these cases the planned production grades were used to calculate ratios which were applied to actual total production. This produced reasonably accurate estimates of actual production by grade at each enterprise.

Appendix VII shows planned ore production by grade at each mine and then the final salable product after any further processing, being either beneficiation or ferrochrome production (in italics). Extrapolated 1992 production is shown in normal font.

A complication is with Klos heavy media separation. The output from this process is shown as a portion of fines and a portion of lumpy ore. All lumpy ore is then processed to ferrochrome and all fines further beneficiated to concentrate. Therefore ore sent to Klos is the only ore undergoing two processes according to this simplified schedule.

During 1992 Klos was hardly operational apparently due to difficulties in getting ore meeting the size restrictions for the plant. The allocations to Klos on the schedule represent the ore that would be sent to Klos once this difficulty is overcome.

Salary Costs

The salaries in Albania come from a background of communism whereby workers were generally equally paid, regardless of position. There was a form of penalty for

intelligence however: Persons holding senior "white collar" positions were generally paid less than the blue collar workers!

All salaries were doubled in January 1992. A further 4-5% increase was given in July 1992. There have been no additional increases since then.

Salaries for Albchrome employees are currently as follows:

Above ground worker	1,800 lek/mth
Under ground worker	3,600
Director	5,500
Average salary	3,250

Because of the higher salaries paid to underground workers, average salaries for beneficiation and ferrochrome facilities will be lower than average salaries at the mines. As an estimate, average salaries at the ferrochrome plants would be 2,700 lek/mth compared with 3,400 lek/mth at the mines.

Average salaries for administration workers would not significantly differ from the overall average at present.

The number of workers at each location are shown in appendix VIII. The form contains numbers as at September 1992, and there have been some reductions since then. However, more up to date figures were not generally available.

Transport Costs

Transportation from the mines to beneficiation, the ferrochrome pants and to the port at Durres is performed by a mixture of the enterprises own trucks, the trucks of other state enterprises and the use of the state owned railroad.

As of January 1, 1993 the approximate cost of transportation per tonne per kilometer is:

Albchrome's own trucks	7 Lek
Other transport enterprises	9-10 Lek
Railroad transport	3 Lek

Distances between key locations are shown in appendix IX.

Appendix X calculates the transport costs per tonne delivered, by grade, for each mining enterprise to transport its production to the next "customer" as defined in the valuation model. That is; to transport ore either through beneficiation to the port, or to Klos heavy media separation plant or the ferrochrome plants. Transport costs are then calculated for Klos and the ferrochrome plants.

Costs are grossed up to reflect the extra weight transported prior to beneficiation.

The schedule then performs a weighted average calculation to come up with a single figure per tonne for each enterprise assuming the ratio of production by grade as stated in Albchrome's 1993 plan.

Electricity Costs

Current Charge

The current charge for electricity is 1.80 lek per kilowatt.

Rate of Usage

Mine	kw per tonne extracted	average % delivered	kw per tonne sold
Bulqiza North	38	81%	47
Bulqiza South	15	39%	38
Batra	16	34%	47
Kraste	16	35%	46
Klos	14	45%	31
Ternove	15	47%	32
Kalimash	15	23%	65
Kam	14	100%	14
Prrenjas	6.5	100%	6.5
Pojska	6.5	100%	6.5
Average	15.75		33

Ferrochrome Plant	kw per tonne input	average % recovered	kw per tonne sold
Burrel	1,692	36%	4,700
Elbasan	1,656	36%	4,600
Average	1,674		4,650

Klos HMS	kw per tonne input	average % recovered	kw per tonne sold
Klos	40.3	73%	72.5

Bulqiza North has an unusually high rate of usage. This is probably because the mine also runs a screening facility on site.

Material Costs

The material costs per tonne that follow have been compiled from calculations prepared by Albchrome's cost accountant and source data supplied by several of the enterprises. Where certain pieces of information was not available averages were assumed from other enterprises. Insufficient data was available to compute figures for Kalimash and Ternove, so again the costs shown are averages from the other mines.

The details used to calculate these figures are contained in appendix XI. This appendix should be reviewed and discussed with an industry expert to identify errors (for purposes of the model) and areas for possible efficiencies.

Mine	material cost per tonne
Bulqiza North	236
Bulqiza South	92
Batra	80
Kraste	80
Klos	94
Ternove	82
Kalimash	82
Kam	94
Prrenjas	67
Pojska	65
Average	97

Ferrochrome Plant	material cost per tonne
Burrel	11,066
Elbasan	11,348

Klos HMS	material cost per tonne
Klos	162

Bulqiza North has an unusually high rate of material usage compared to the other mines. This is due to using a lot more timber during extraction, according to the cost calculations. It is unclear whether this is actually the case or an error has been made in the schedules.

Beneficiation Costs

The following analysis of beneficiation costs for the Bulqiza plant has been prepared using the extrapolated results for the 12 months ended 12.31.92. Costs have been updated to present day unit costs by:

1. Salaries. Multiplying the number of workers by the average salary at 1.1.93.

2. Materials. Multiplying the cost of materials for the period by 1.5* to reflect an estimate of inflation since mid year to 1.1.93.

3. Electricity. Multiplying the kilowatts used during 1992 with the current cost of electricity at 1.8 lek per kilowatt.

4. *Social Security.* Multiplying salary costs by 25%, being the new rate for this tax.

5. *Other Expenses.* Multiplying other expenses for 1992 by 1.5*.

6. *Depreciation.* Applying the same depreciation charge as for 1992.

* We do not have sufficient information to make an accurate assessment of inflation. There is a large difference in the rate of price increases between products. For example wages doubled early in 1992, but since then have only increased by about 5%. Electricity prices have recently increased from 1.2 lek per kw to 1.8 lek per kw, a 50% increase. We were also told that the price of a brick is now 20 times the price of two years ago. The figure used her, 1.5, is a rough approximation for inflation against these sundry items. It results in increasing the per unit cost of production by 142 lek over historical prices

Bulqiza Beneficiation Plant

Number of employees	361
Average wage 1.1.93	2763.l
1992 production of concentrate	19,951.t
Electricity used in 1992	1,980,000.kw
Salary expense	11,969 (000)l
Social security	2,992
Electricity	3,564
Other materials	7,724
Other expenses	804
	27,053
Depreciation	5,132
Total Production Costs	32,185
Average cost of production per tonne *including* depreciation	1,613.l
Average cost of production per tonne *excluding* depreciation	1,356.l

Note that these estimates assume an average percentage chromium input of approximately 24%, being the same as for 1992. A lower percentage of average chromium input would result in higher unit costs of production.

The other beneficiation plants at Kraste and Kalimash are more difficult to assess than Bulqiza. This is because these plants are combined with mines into single enterprises. Reported information does not always separate the two distinct operations to enable easy analysis. In the case of Kalimash the reported results were clearly inaccurate as simple comparison of salary expense to number of employees revealed discrepancies.

Accordingly the Bulqiza operation will be used as a standard for allocating per unit beneficiation costs on the model. Albchrome's plan indicates that they have assessed unit production costs at Bulqiza and Kraste to be similar, and unit production costs at Kalimash to be higher. This may be due to Kalimash receiving a generally lower grade of Ore from the Kalimash mines.

Development Costs

Introduction

Development works at Albchrome are classified into two types of expenditure:

1. Capital works

This represents the initial development of main shafts and transport levels.

2. Preparatory works

This expenditure is the development of the network of minor tunnels and shafts.

Prior to 1993, capital works were reimbursed by the state and were therefore not expensed by the enterprises. All preparatory costs were paid by the enterprise and were expensed as incurred.

Since 1.1.1993, both capital and preparatory costs have been expensed in the current year. The state no longer provides funding for capital works.

Under generally accepted accounting practice costs must be expensed over the period of expected benefit. The immediate expensing of costs related to development is not in accordance with this principle. A more appropriate treatment would be to capitalize both capital and prepatory expenses, estimate the amount of reserves made assessable by the works, and amortize the related expenses in proportion to the amount of ore extracted.

As it would be a major exercise to initially calculate the amounts capitalized and the rates at which to amortize them, we have instead estimated the cost per meter for development works at each mine and multiplied that cost by the planned development meters for 1993.

Our calculations are based on Albchrome's calculation schedules for development expenditure at each mine. Adjustments have been made in many instances where errors were found. For instance, 1992 prices were applied by Albchrome in several places. Labor costs and social security taxes have been removed from the calculations as they have already been included in our total labor costs for each mine. We did not have an analysis of the administrative costs for most of the mines. However one was available for Kraste. It revealed that administrative salaries are included in this category. A ratio was calculated (9%) and all mines administrative expenses reduced to remove the estimated salary content which we have already accounted for.

There are two separate enterprise that specialize in capital works. They are:

i) Bulqiza : This enterprise carries out the capital works at the Bulqiza mines (the new deep shafts) and the initial capital work at the Qafe Buall (Bull's neck) mine.

ii) Klos : This enterprise is preparing the connecting tunnel between the Klos Heavy Media Plant and the Bulqiza mines and at the Thekna mine.

The costs of these enterprises are not incorporated in the calculations as budgeted information was not available. However all of this activity represents capital investment that would either increase reserve access or improve efficiency.

Total extrapolated costs for these enterprises in 1992 was:

	(000)Lek
Bulqiza	48,668
Klos	26,922
	75,590

Based on a similar level of activity these costs based on current prices would be approximately:

	(000)Lek
Bulqiza	73,000
Klos	40,000
	113,000

Estimated development expenses for 1993 at current prices for each of the mines (excluding the above costs) are as follows:

Mine	Planned Development	Lek/Meter	Cost (000)l
Bulqiza North	2,550	8,513	21,708
Bulqiza South	4,560	5,290	24,125
Batra	3,750	5,511	20,669
Kraste	9,000	4,936	44,422
Klos	1,895	6,195	11,741
Ternove	*2,700*	*6,300*	*17,010*
Kalimash	*2,700*	*6,300*	*17,010*
Kam	2,670	6,553	17,497
Prrenjas	2,120	7,730	16,389
Pojska	1,136	5,645	6,412
Totals	33,081	62,973	196,983
Averages	3,308	6,297	19,698

No figures were available for Kalimash or Ternove mines. Estimates based on averages from the other mines have been used (except that planned development at Kraste has been excluded from the estimates. The extent of development at this mine appears to be an unusually large).

The schedules used to calculate these figures are included as appendix XII.

Overhead Costs

Albchrome classifies these costs in two main categories. The first is a lower level administration category that will pick up costs related to a particular operation or mine. The second is a higher level category that includes the costs of administration at the enterprise level. For our purposes these costs will be combined into one category.

There is a further level of costs; those at the Albchrome head office level. There was no available information summarizing these costs although we understand that there will be

a charge made to the individual enterprises to cover these costs in the future. We do know that the head office employees 22 staff which equates to approximately 858,000 lek per annum at the average salary.

The figures the client has for these overheads are large and include many items that we need to remove before using them in the cost model. These items are:

- salary costs for administrative personnel
- interest costs
- depreciation
- stock provisions

As with other cost components, complete information was not always available to enable accurate estimates to be made. Many enterprises did not supply an analysis of these costs, and several of the breakdowns that were provided did not remotely agree in total to the expense summary. In these cases ratios from those enterprises supplying complete data were used estimate the relevant overhead cost components.

Mine	(000)l Est Overheads 1993
Bulqiza North	20,800
Bulqiza South	8,800
Batra	15,700
Kraste	8,300
Klos	5,500
Ternove	3,200
Kalimash	2,500
Kam	6,700
Prrenjas	5,500
Pojska	2,300
Average	7,900

Ferrochrome Plant	Est Overheads 1993
Burrel	22,100
Elbasan	7,500
Average	14,800

Klos HMS	Est Overheads 1993
Klos	870

There is a large difference between the overheads reported at the two ferrochrome facilities. This may reflect the fact that the Burrel plant is in a worse state of repair than Elbasan.

The schedules used to analyze overhead expenses are included as appendix XIII

Appendix I - Enterprise Summary

Enterprise	*Region*	*Mines*	*Other*
1. Bulqiza Nth	Central		Screening
		Todo Manco	
		Qafe Buall	
2. Bulqiza Sth	Central		
		Bulqiza Jugore	
		Qafe Lame	
3. Batra	Central		
		Batra and Batra Jugore	
		Lugu i Gjate 10 Korriku	
		Lugu i Qershise	
4. Kraste	Central		Beneficiation
		Kraste	
		Thekna	
		Maja e Lugut	
5. Klos	Central		
		Shkalle	
		Maja e Kunores	
		Vanas	
		Manasdrenu	
		Luqeni e Dhive	
6. Ternove	Central		
		Ternove	
		Livadhi Dashit	
7. Kalimash	Northern		Beneficiation
		Kalim. Prroi Batres	
		Vlahne	
		Qafe Perrolaj	
8. Kam	Northern		
		Zogaj	
		Lajthize	
		Rragam	
		Tpla	
		Cabrat	

Enterprise	*Region*	*Mines*	*Other*
9. Prrenjas	Southern		
		Katjeli	
		Menik	
		Guri Pishkashit	
10. Pojska	Southern		
		Pojska	
11. Bulqiza			Development
12. Klos			Development
13. Durres		Beach sand	
14. Lac			Beneficiaton
15. Burrel			Ferrochrome
16. Elbasan			Ferrochrome
17. Klos			Beneficiation (He
18. Pescope			Workshop
19. Bulqiza			Transport
20. Bulqiza			Beneficiaton

Appendix II - Mine Summary

	High grade		Medium grade		Low grade		
	>42%	%	38-42%	%	18-38%	%	Total
Central region							
Bulqiza	3,357	50%	863	13%	2,431	37%	6,651
Tetori-Qafe Buall	680	45%	285	19%	539	36%	1,504
Ternove	245	49%	12	2%	243	49%	500
Pikat	57	35%	-	0%	107	65%	164
Selishte	123	46%	-	0%	146	54%	269
Lure	31	8%	-	0%	373	92%	404
Qafe Lame	-	0%	-	0%	257	100%	257
Liadhi Dashit	-	0%	-	0%	249	100%	249
Batra and Batra Jugore	187	7%	369	14%	2,098	79%	2,654
Kraste	-	0%	-	0%	2,807	100%	2,807
Maja e Lugat	-	0%	-	0%	409	100%	409
Qafe Burrelit	5	3%	7	4%	149	93%	161
Lugu i Gjate & 10 Korriku	61	15%	31	8%	307	77%	399
Maja e Konures	23	4%	-	0%	575	96%	598
Thekna	457	44%	40	4%	539	52%	1,036
Shkalle	124	44%	20	7%	136	49%	280
Cervja	-	0%	-	0%	471	100%	471
Fushe Lope	184	74%	-	0%	63	26%	247
Liqeni i Dhive	30	100%	-	0%	-	0%	30
Lugjete Kamares	-	0%	-	0%	106	100%	106
Lucane	-	0%	44	73%	16	27%	60
Kaptina	-	0%	-	0%	222	100%	222
Vanas	78	100%	-	0%	-	0%	78
Krasta ne Thellesi	88	39%	-	0%	136	61%	224
Maja e Theknes	-	0%	-	0%	44	100%	44
Northern region							
Kalimash	-	0%	-	0%	6,439	100%	6,439
Vlahne	139	5%	-	0%	2,709	95%	2,848
Surroj	-	0%	-	0%	844	100%	844
Leshnice	-	0%	-	0%	208	100%	208
Rragonni	-	0%	-	0%	215	100%	215
Kagenete	-	0%	10	1%	725	99%	735
Zogaj 1 to 8	15	2%	-	0%	939	98%	954
Kam	-	0%	3	2%	182	98%	185
Lugu i Cijinit	-	0%	-	0%	305	100%	305
Hija Bushit	17	3%	-	0%	645	97%	662
Lajthize	161	81%	6	3%	31	16%	198
Qafe perrollaj	79	15%	46	9%	398	76%	523
Lugu i Zanit	-	0%	-	0%	135	100%	135
Objekte te tropoje	86	10%	65	8%	697	82%	848
Hajdaimataj	-	0%	-	0%	21	100%	21
T'pla	90	100%	-	0%	-	0%	90

Appendix II - Mine Summary

	High grade		Medium grade		Low grade		
	>42%	%	38-42%	%	18-38%	%	Total
Shpati Yishise	-	0%	-	0%	11	100%	11
Southern region							
Katjeli	304	32%	229	24%	411	44%	944
Bushtrice Menik	6	4%	-	0%	143	96%	149
Pojska	49	16%	-	0%	251	84%	300
Cervenatea	-	0%	-	0%	37	100%	37
Memlishti	-	0%	-	0%	16	100%	16
Cecote	7	10%	-	0%	63	90%	70
Pishkasa	11	24%	-	0%	34	76%	45
Objekte te Shebenek	13	9%	9	6%	122	85%	144
Qafe Mesi	-	0%	-	0%	7	100%	7
Perrroj Lopes	-	0%	-	0%	9	100%	9
Objekte te Nemasive	-	0%	-	0%	489	100%	489
Mehalte Epeseme	-	0%	-	0%	70	100%	70
Tolkovice 1.2	3	18%	-	0%	14	82%	17
Objekte te Prrenjas	-	0%	-	0%	16	100%	16
	6,710		2,039		28,593		37,342

Appendix III - Monthly Sales

Month	*Type of Ore*	*Tonnes*	*Selling price*	*Average price*
January				
	Ferrochrome			
	Chrome concentrate	5,250	351,700	66.99
		2,196	150,000	68.31
	Ore 30-34%	205	5,500	26.83
			507,200	
February				
	Ferrochrome	703	357,000	507.82
		2,019	987,200	488.95
	Ore 30-34%	7,700	230,000	29.87
			1,574,200	
March				
	Ferrochrome	2,008	1,023,000	509.46
	Chrome concentrate	10,400	710,000	68.27
	Ore 30-34%	8,034	0	0.00
	Ore 30-34%	4,352	132,000	30.33
			1,865,000	
April				
	Ferrochrome	2,009	992,000	493.78
	Chrome concentrate	995	77,000	77.39
	Ore 42%	3,753	237,000	63.15
	Ore 36-40%	7,780	462,000	59.38
	Ore 36-38%	3,346	180,000	53.80
			1,948,000	
May				
	Ferrochrome	2,163	1,072,000	495.61
	Chrome concentrate	1,262	102,000	80.82
	Chrome concentrate	5,040	354,000	70.24
	Ore 41.6%	5,860	419,000	71.50
			1,947,000	
June				
	Ore 30-34%	10,842	270,000	24.90
	Ore 30-34%	8,000	241,000	30.13
	Fine 34-36%	2,612	109,500	41.92
			620,500	
July				
	Ferrochrome	2,201	1,160,400	527.21
August				
	Ferrochrome	2,010	924,000	459.70
	Chrome concentrate	4,032	0	0.00
	Ore 36-40%	5,612	322,500	57.47
	Ore 30-34%	4,596	124,000	26.98
			1,370,500	
October				

Appendix III - Monthly Sales

Month	*Type of Ore*	*Tonnes*	*Selling price*	*Average price*
	Ferrochrome	2,018	1,099,000	544.60
	Ore 30-34%	2,700	73,000	27.04
			1,172,000	
November				
	Ferrochrome	2,200	907,000	412.27
	Fines	2,687	136,100	50.65
	Ore 30-34%	3,600	100,700	27.97
			1,143,800	
December				
	Ferrochrome	2,005	944,100	470.87
	Ferrochrome	1,901	713,200	375.17
	Ore 36-38%	4,152	213,000	51.30
	Ore 36-38%	4,233	217,000	51.26
			2,087,300	
Total			15,395,900	

Appendix IV - Nine Months Results

	1 Bulqiza Nth Chrome Ore	Concentrate	Total	2 Bulqiza Sth Mine	3 Batra Mine	4 Kraste Mine	Beneficiation	Joint Results	5 Klos Mine	6 Ternove Mine	7 Kallmash Concentrate	28-32% Ore	30-34% Ore	Joint Results	8 Kam Mine
Units produced	48,668	7,943	56,611	18,066	28,266	25,883	7,372	33,255	8,828	5,200	4,249	875	330	5,454	13,188
Cost per unit	1,323	904	1,680	2,452	2,337	1,162	8,570	2,804	2,406	1,885	2,873	1,557	2,166	2,619	1,151
Number of employees			2,015	1,140	1,270	700	450	1,150	550	338	320	---------->	735	1,055	485
Capital expenditure 1.1.92 USD			18,472	8,826	8,305			18,472	4,200	2,421				9,804	4,973
Costs of production															
Direct costs															
Raw materials	0	0	0	0	0	0	50,284	50,284	0	0	7,623	0	0	7,623	0
Other materials	1,136	6,062	7,198	1,510	10,601	2,592	1,397	3,989	792	932	108	37	16	161	841
Fuel	3,833	52	3,885	0	0	0	0	0	5,166	0	0	0	0	0	329
Electricty	1,778	72	1,850	481	535	1,355	2,108	3,463	97	171	791	6	5	802	2,041
Salaries and wages	29,997	544	30,541	11,760	9,105	3,708	3,207	6,915	1,728	2,289	1,093	170	111	1,374	3,936
Social security	5,308	96	5,404	2,081	1,611	656	567	1,224	306	405	193	30	20	243	696
	42,052	6,826	48,878	15,832	21,852	8,311	57,563	65,875	8,089	3,797	9,808	243	152	10,203	7,843
Allocated mine costs															
Mine preparation			21,999	18,459	21,966	12,094	0	12,094	6,894	1,830	0	862	519	1,381	1,359
GEOALB tax			1,510	416	650	595	0	595	203	378	0	20	6	26	373
	0	0	23,509	18,875	22,616	12,689	0	12,689	7,097	2,208	0	882	525	1,407	1,732
Allocated administration costs															
Operational level	21,399	345	21,744	7,737	20,607	6,160	3,077	9,237	4,672	1,590	1,091	90	19	1,200	3,660
Enterprise level	942	13	955	1,845	989	2,907	2,537	5,444	1,382	2,209	1,310	147	19	1,476	1,944
	22,341	358	22,699	9,582	21,596	9,067	5,614	14,681	6,054	3,799	2,401	237	38	2,676	5,604
Total costs of production	64,393	7,184	95,086	44,289	66,064	30,067	63,177	93,245	21,240	9,804	12,209	1,362	715	14,286	15,179
Income statement															
Revenue	195,575	49,550	245,125	43,730	53,738			39,836	19,203	5,617				6,557	16,580
Cost of sales	91,562	71,220	162,782	41,527	56,736			58,874	19,416	7,909				11,094	9,951
Selling costs															
Transportation			9,767	2,664	3,438			1,750	774	298				2,564	399
Other Sales Costs			0	2,231	0			631	331					63	
	0	0	9,767	4,895	3,438	0	0	2,381	1,105	298	0	0	0	2,627	399
Turnover Tax	0	0	0	1,464	0	0	0	0	0	0				0	0
Profit	104,013	-21,670	72,576	-4,156	-6,436	0	0	-21,419	-1,318	-2,590	0	0	0	-7,164	6,230
Profit from Development etc			4,077	3,207	1,129			0	0	-2,733				0	0
Misc															
profit inc. capital wks			0	-737	0			2,959	717	0				0	0
profit from stock revaluation			-13,758	0	29,043			41,301	0	1,668				0	0
physical stock differences			0	0	0			0	0	0				0	0
natural disasters			0	0	0			0	0	0				0	0
fines & penalties (net)			0	170	0			-397	-325	0				0	0
bad debts (total)			0	0	-199			0	0	0				0	0
adjustment of errors			0	39	0			-8,032	0	0				0	0
1991 losses offset			-23,794	0	0			0	0	0				0	0
other			0	1,193	561			-8,793	-21	0				0	0
Result	104,013	-21,670	39,101	-284	24,098	0	0	5,619	-947	-3,655	0	0	0	-7,164	6,230

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	9 Prrenjas Katjel Deposit	Guri Pishkask	Menik Dep.	Total	10 Pojska Deposit A	Deposit B	Total	11 Bulqiza Prep. & Tunl	12 Klos Prep. & Tunl	13 Durres Beach Sands	Beach Sands B	Total	14 Lac Blending Yard	15 Burrel Ferrochrome	16 Elbasan Ferrochrome
Units produced	14,166	3,482	6,356	24,004	15,368	774	16,142	n/a	n/a	161	3,204	3,365	68,223	6,832	7,145
Cost per unit	982	890	991	971	667	4,082	831	n/a	n/a	1,204	882	898	276	29,882	22,836
Number of employees				504			300	525	261			94	90	949	571
Capital expenditure 1.1.92 USD				3,934			1,457	2,708	1,845			532	2,506	12,328	15,919
Costs of production															
Direct costs															
Raw materials	0	0	0	0	358	18	376	0	0	8	577	585	0	75,982	67,592
Other materials	453	24	107	584	374	7	381	8,625	2,088	0	151	151	18,846	58,969	48,270
Fuel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricty	128	64	31	223	174	28	202	0	0	11	171	182	0	27,237	29,382
Salaries and wages	1,520	494	800	2,814	2,338	352	2,690	7,520	7,275	67	498	565	0	10,584	4,412
Social security	269	87	142	498	414	62	476	1,331	1,287	12	88	100	0	1,873	781
	2,370	669	1,080	4,119	3,658	467	4,125	17,476	10,650	98	1,485	1,583	18,846	174,645	150,437
Allocated mine costs															
Mine preparation	7,945	1,016	3,670	12,631	4,441	2,317	6,758	0	0	0	0	0	0	0	0
GEOALB tax	332	82	150	564	0	0	0	0	0	0	0	0	0	0	0
	8,277	1,098	3,820	13,195	4,441	2,317	6,758	0	0	0	0	0	0	0	0
Allocated administration costs								machinery etc	machinery etc						
Operational level	3,046	1,258	1,272	5,576	1,196	229	1,425	11,430	3,838	41	951	992	0	26,537	11,355
Enterprise level	218	74	127	419	961	146	1,107	7,595	5,703	55	391	446	0	2,974	1,371
	3,264	1,332	1,399	5,995	2,157	375	2,532	19,025	9,541	96	1,342	1,438	0	29,511	12,726
Total costs of production	13,911	3,099	6,299	23,309	10,256	3,159	13,415	36,501	20,191	194	2,827	3,021	18,846	204,156	163,163
Income statement															
Revenue				64,235	31,265	1,162	32,427	40,111	22,703	183	2,169	2,352	0	149,804	213,257
Cost of sales				19,194	8,332	2,892	11,224	36,787	20,468	307	2,018	2,325	2,364	160,086	168,486
Selling costs															
Transportation				6,048	3,318	160	3,478	915	976	65	53	118	9,734	5,624	2,142
Other Sales Costs					561	30	591	0	0	2		2	0	0	0
	0	0	0	6,048	3,879	190	4,069	915	976	67	53	120	9,734	5,624	2,142
Turnover Tax				4,551	112	0	112	0	0	0	0	0	0	0	8,936
Profit	0	0	0	34,442	18,942	-1,920	17,022	2,409	1,259	-191	98	-93	-12,098	-15,906	33,693
Profit from Development etc				0			0	0	0	0	0	0	0	0	0
Misc															
profit inc. capital wks				0			0	0	0	0	0	0	34,805	0	0
profit from stock revaluation				2,575			0	0	0	0	257	257	0	2,834	0
physical stock differences				0			26	0	0	0	0	0	0	0	0
natural disasters				0			0	0	0	0	0	0	0	0	0
fines & penalties (net)				0			16	0	0	0	0	0	-174	5	0
bad debts (total)				0			0	0	0	0	0	0	0	0	0
adjustment of errors				0			4,863	0	0	0	0	0	78	-7,614	643
1991 losses offset				0			0	0	0	0	0	0	0	0	
other				-1,178			0	0	0	0	0	0	-151	440	969
Result	0	0	0	35,839	18,942	-1,920	21,927	2,409	1,259	-191	355	164	22,460	-20,241	35,305

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	17 Klos Heavy Media	18 Pescope Workshop	19 Bulqiza Trucks	Buses	Total	20 Bulqiza Beneficiation
Units produced	0	n/a	n/a	n/a	n/a	14,963
Cost per unit	n/a	n/a	n/a	n/a	n/a	4,785
Number of employees	170	59			125	361
Capital expenditure 1.1.92 USD	1,996	12,191			0	6,149
Costs of production						
Direct costs						
Raw materials	0	937	0	0	0	53,839
Other materials	317	198	928	794	1,722	465
Fuel	208	89	785	758	1,543	0
Electricty	286	39	0	0	0	1,080
Salaries and wages	1,078	1,091	158	127	285	4,056
Social security	191	193	28	22	50	718
	2,080	2,547	1,899	1,701	3,600	60,158
Allocated mine costs						
Mine preparation	0	0	0	0	0	0
GEOALB tax	0	0	0	0	0	0
	0	0	0	0	0	0
Allocated administration costs						
Operational level	278	168	425	357	782	10,033
Enterprise level	817	1,254	90	76	166	1,403
	1,095	1,422	515	433	948	11,436
Total costs of production	3,175	3,969	2,414	2,134	4,548	71,594
Income statement						
Revenue	2,902	2,742	2,776	2,447	5,223	68,369
Cost of sales	4,894	2,274	2,415	2,136	4,551	59,949
Selling costs						
Transportation	102	47	0	0	0	4,229
Other Sales Costs	20	0	0	0	0	0
	122	47	0	0	0	4,229
Turnover Tax	0	0	0	0	0	7,490
Profit	-2,114	421	361	311	672	-3,299
Profit from Development etc	0	0	0	0	0	0
Misc						
profit inc. capital wks	0	0	0	0	0	0
profit from stock revaluation	0	0	0	0	0	590
physical stock differences	0	0	0	0	0	0
natural disasters	0	0	0	0	0	0
fines & penalties (net)	0	0	0	0	0	676
bad debts (total)	0	0	0	0	0	2,706
adjustment of errors	1,116	0	0	0	0	925
1991 losses offset	0	0	0	0	0	0
other	0	0	0	0	0	106
Result	-998	421	361	311	672	1,704

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Appendix V - 12 Months Results

	1 Bulqiza Nth Chrome Ore	Concentrate	Total	2 Bulqiza Sth Mine	3 Batra Mine	4 Kraste Mine	Beneficiation	Joint Results	5 Klos Mine	6 Ternove Mine	7 Kalimash Concentrate	28-32% Ore	30-34% Ore	Joint Results	8 Kam Mine
Units produced	64,891	10,591	75,481	24,088	37,688	34,511	9,829	44,340	11,771	6,933	5,665	1,167	440	7,272	17,584
Cost per unit	1,323	904	1,680	2,452	2,337	1,162	8,570	2,804	2,406	1,885	2,873	1,557	2,166	2,619	1,151
Number of employees			2,015	1,140	1,270	700	450	1,150	550	338	320	---------->	735	1,055	485
Capital expenditure 1.1.92 USD			18,472	8,826	8,305			18,472	4,200	2,421				9,804	4,973
Costs of production															
Direct costs															
Raw materials	0	0	0	0	0	0	67,045	67,045	0	0	10,164	0	0	10,164	0
Other materials	1,515	8,083	9,597	2,013	14,135	3,456	1,863	5,319	1,056	1,243	144	49	21	215	1,121
Fuel	5,111	69	5,180	0	0	0	0	0	6,888	0	0	0	0	0	439
Electricty	2,371	96	2,467	641	713	1,807	2,811	4,617	129	228	1,055	8	7	1,069	2,721
Salaries and wages	39,996	725	40,721	15,680	12,140	4,944	4,276	9,220	2,304	3,052	1,457	227	148	1,832	5,248
Social security	7,077	128	7,206	2,775	2,148	875	757	1,632	408	540	258	40	26	324	929
	56,069	9,102	65,171	21,109	29,136	11,082	76,751	87,833	10,785	5,063	13,078	324	202	13,604	10,458
Allocated mine costs															
Mine preparation	0	0	29,332	24,612	29,288	16,125	0	16,125	9,192	2,440	0	1,149	692	1,841	1,812
GEOALB tax	0	0	2,013	555	867	793	0	793	271	504	0	27	8	35	497
	0	0	31,345	25,167	30,155	16,919	0	16,919	9,463	2,944	0	1,176	700	1,876	2,309
Allocated administration costs															
Operational level	28,532	460	28,992	10,316	27,476	8,213	4,103	12,316	6,229	2,120	1,455	120	25	1,600	4,880
Enterprise level	1,256	17	1,273	2,460	1,319	3,876	3,383	7,259	1,843	2,945	1,747	196	25	1,968	2,592
	29,788	477	30,265	12,776	28,795	12,089	7,485	19,575	8,072	5,065	3,201	316	51	3,568	7,472
Total costs of production	85,857	9,579	126,782	59,052	88,086	40,090	84,237	124,326	28,320	13,072	16,279	1,816	953	19,048	20,239
Income statement															
Revenue	260,767	66,067	326,833	58,307	71,651	0	0	53,115	25,604	7,489	0	0	0	8,743	22,107
Cost of sales	122,083	94,960	217,043	55,369	75,648	0	0	78,499	25,888	10,545	0	0	0	14,792	13,268
Selling costs															
Transportation	0	0	13,023	3,552	4,584	0	0	2,333	1,032	397	0	0	0	3,419	532
Other Sales Costs	0	0	0	2,975	0	0	0	841	441	0	0	0	0	84	0
	0	0	13,023	6,527	4,584	0	0	3,175	1,473	397	0	0	0	3,503	532
Turnover Tax	0	0	0	1,952	0	0	0	0	0	0	0	0	0	0	0
Profit	138,684	-28,893	96,768	-5,541	-8,581	0	0	-28,559	-1,757	-3,453	0	0	0	-9,552	8,307
Profit from Development etc			5,436	4,276	1,505	0	0	0	0	-3,644	0	0	0	0	0
Misc															
profit inc. capital wks			0	-983	0	0	0	3,945	956	0	0	0	0	0	0
profit from stock revaluation			-18,344	0	38,724	0	0	55,068	0	2,224	0	0	0	0	0
physical stock differences			0	0	0	0	0	0	0	0	0	0	0	0	0
natural disasters			0	0	0	0	0	0	0	0	0	0	0	0	0
fines & penalties (net)			0	227	0	0	0	-529	-433	0	0	0	0	0	0
bad debts (total)			0	0	-265	0	0	0	0	0	0	0	0	0	0
adjustment of errors			0	52	0	0	0	-10,709	0	0	0	0	0	0	0
1991 losses offset			-23,794	0	0			0	0	0				0	0
other			0	1,591	748	0	0	-11,724	-28	0	0	0	0	0	0
Result			60,066	-379	32,131	0	0	7,492	-1,263	-4,873	0	0	0	-9,552	8,307

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Appendix V - [illegible]months Results

	9 Prrenjas Katjel Deposit	Guri Pishkask	Menik Dep.	Total	10 Pojska Deposit A	Deposit B	Total	11 Bulqiza Prep. & Tunl	12 Klos Prep. & Tunl	13 Durres Beach Sands	Beach Sands B	Total	14 Lac Blending Yard	15 Burrel Ferrochrome	16 Elbasan Ferrochrome	17 Klos Heavy Media
Units produced	18,888	4,643	8,475	32,005	20,491	1,032	21,523	n/a	n/a	215	4,272	4,487	90,964	9,109	9,527	0
Cost per unit	982	890	991	971	667	4,082	831	n/a	n/a	1,204	882	898	276	29,882	22,836	#DIV/0!
Number of employees				504			300	525	261			94	90	949	571	170
Capital expenditure 1.1.92 USD				3,934			1,457	2,708	1,845			532	2,506	12,328	15,919	1,996
Costs of production																
Direct costs																
Raw materials	0	0	0	0	477	24	501	0	0	11	769	780	0	101,309	90,123	0
Other materials	604	32	143	779	499	9	508	11,500	2,784	0	201	201	25,128	78,625	64,360	423
Fuel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	277
Electricty	171	85	41	297	232	37	269	0	0	15	228	243	0	36,316	39,176	381
Salaries and wages	2,027	659	1,067	3,752	3,117	469	3,587	10,027	9,700	89	664	753	0	14,112	5,883	1,437
Social security	359	117	189	664	552	83	635	1,774	1,716	16	117	133	0	2,497	1,041	254
	3,160	893	1,439	5,492	4,877	623	5,500	23,301	14,200	130	1,980	2,111	25,128	232,860	200,582	2,773
Allocated mine costs																
Mine preparation	10,593	1,355	4,893	16,841	5,921	3,089	9,011	0	0	0	0	0	0	0	0	0
GEOALB tax	443	109	200	752	0	0	0	0	0	0	0	0	0	0	0	0
	11,036	1,464	5,093	17,593	5,921	3,089	9,011	0	0	0	0	0	0	0	0	0
Allocated administration costs								machinery etc	machinery etc							
Operational level	4,061	1,677	1,696	7,435	1,595	305	1,900	15,240	5,117	55	1,268	1,323	0	35,383	15,140	371
Enterprise level	291	99	169	559	1,281	195	1,476	10,127	7,604	73	521	595	0	3,965	1,828	1,089
	4,352	1,776	1,865	7,993	2,876	500	3,376	25,367	12,721	128	1,789	1,917	0	39,348	16,968	1,460
Total costs of production	18,548	4,133	8,398	31,079	13,674	4,212	17,887	48,668	26,922	258	3,769	4,028	25,128	272,208	217,550	4,233
Income statement																
Revenue	0	0	0	85,647	41,687	1,549	43,236	53,481	30,271	244	2,892	3,136	0	199,739	284,343	3,869
Cost of sales	0	0	0	25,592	11,109	3,856	14,965	49,049	27,291	409	2,691	3,100	3,152	213,448	224,648	6,525
Selling costs																
Transportation	0	0	0	8,064	4,424	213	4,637	1,220	1,301	87	71	157	12,979	7,499	2,856	136
Other Sales Costs	0	0	0	0	748	40	788	0	0	3	0	3	0	0	0	27
	0	0	0	8,064	5,172	253	5,425	1,220	1,301	89	71	160	12,979	7,499	2,856	163
Turnover Tax	0	0	0	6,068	149	0	149	0	0	0	0	0	0	0	11,915	0
Profit	0	0	0	45,923	25,256	-2,560	22,696	3,212	1,679	-255	131	-124	-16,131	-21,208	44,924	-2,819
Profit from Development etc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc																
profit inc. capital wks	0	0	0	0	0	0	0	0	0	0	0	0	46,407	0	0	0
profit from stock revaluation	0	0	0	3,433	0	0	0	0	0	0	343	343	0	3,779	0	0
physical stock differences	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
natural disasters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
fines & penalties (net)	0	0	0	0	0	0	21	0	0	0	0	0	-232	7	0	0
bad debts (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
adjustment of errors	0	0	0	0	0	0	6,484	0	0	0	0	0	104	-10,152	857	1,488
1991 losses offset				0			0	0	0	0	0	0	0	0		0
other	0	0	0	-1,571	0	0	0	0	0	0	0	0	-201	587	1,292	0
Result	0	0	0	47,785	25,256	-2,560	29,236	3,212	1,679	-255	473	219	29,947	-26,988	47,073	-1,331

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	18 Pescope Workshop	19 Bulqiza Trucks	Buses	Total	20 Bulqiza Beneficiation
Units produced	n/a	n/a	n/a	n/a	19,951
Cost per unit	n/a	n/a	n/a	n/a	4,785
Number of employees	59			125	361
Capital expenditure 1.1.92 USD	12,191			0	6,149
Costs of production					
Direct costs					
Raw materials	1,249	0	0	0	71,785
Other materials	264	1,237	1,059	2,296	620
Fuel	119	1,047	1,011	2,057	0
Electricty	52	0	0	0	1,440
Salaries and wages	1,455	211	169	380	5,408
Social security	257	37	30	67	957
	3,396	2,532	2,269	4,801	80,210
Allocated mine costs					
Mine preparation	0	0	0	0	0
GEOALB tax	0	0	0	0	0
	0	0	0	0	0
Allocated administration costs					
Operational level	224	567	476	1,043	13,377
Enterprise level	1,672	120	101	221	1,871
	1,896	687	577	1,264	15,248
Total costs of production	5,292	3,219	2,846	6,065	95,458
Income statement					
Revenue	3,656	3,701	3,263	6,964	91,159
Cost of sales	3,032	3,220	2,848	6,068	79,932
Selling costs					
Transportation	63	0	0	0	5,639
Other Sales Costs	0	0	0	0	0
	63	0	0	0	5,639
Turnover Tax	0	0	0	0	9,987
Profit	561	481	415	896	-4,399
Profit from Development etc	0	0	0	0	0
Misc					
profit inc. capital wks	0	0	0	0	0
profit from stock revaluation	0	0	0	0	787
physical stock differences	0	0	0	0	0
natural disasters	0	0	0	0	0
fines & penalties (net)	0	0	0	0	901
bad debts (total)	0	0	0	0	3,608
adjustment of errors	0	0	0	0	1,233
1991 losses offset	0	0	0	0	0
other	0	0	0	0	141
Result	561	481	415	896	2,272

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	% Cr2O3	Ore Production	Exports: Concentrate	Exports: Ferrochrome	Exports: Lumpy	Extraction	Beneficiation	Unit Costs: Heavy Media	Unit Costs: Ferrochrome	Unit Costs: Total per Uni	Total Costs	Total Export Value	Profit	Taxes: Turnover Tax	Taxes: Rent	Taxes: Profit Tax	Total Tax	Net Profit	Geological Expense	Amortisation	Employees Involved	Redundancie Expense"	Total Other Misc. Costs
1 Bulqiza North		125,000									891.920	1.330.690	438,770	199.604	87.188	45.633	332.425	106.345	2.875	45.316	3.593	0	48.191
To Burrel	42%	20.000		7.400		2.102			8.464	10.566	211.320	333.000											
To Elbasan	42%	47.600		17.000		2.574			8.954	11.528	548.733	765.000											
Bulqiza Beneficiation	30%	23.000	7.940			1.785	689			2.474	56.893	55.580											
Bulqiza Screening	36%	27.000	18.800			1.750	337			2.087	56.349	131.600											
Export	42%	7.400			7.400	2.517				2.517	18.626	45.510											
												0											
2 Bulqiza South		50,000									173.830	138.075	-35.755	20.711	0	0	20.711	-56.466	1.099	10.271	1.225	12.650	24.020
Export	38%	5.000			5.000	2.589				2.589	12.945	25.000											
Bulqiza Beneficiation	19%	36.000	8.120			2.491	454			2.945	106.020	56.840											
Bulqiza Beneficiation fines	28%	4.000	1.288			2.491	644			3.135	12.540	9.016											
To Kloss	28%	5.000	317	1.000		2.561	127	1.037	4.740	8.465	42.325	47.219											
												0											
3 Ternove		35,000									153.281	169.309	16.028	25.396	0	0	25.396	-9.368	805	6.538	606	0	7.343
To Burrel	40%	4.500		1.600		2.136			8.464	10.600	47.700	72.000											
To Kloss	28%	6.000	380	1.200		2.030	127	1.037	4.740	7.934	47.604	56.660											
Bulqiza Beneficiation	19%	20.000	4512			1.890	454			2.344	46.880	31.584											
Bulqiza Beneficiation fines	25%	4.500	1295			1.890	576			2.466	11.097	9.065											
												0											
4 Krasta		65,000									215.170	215.796	626	32.369	0	0	32.369	-31.743	1.495	10.336	1.417	14.283	26.114
To Burrel	42%	4.500		1.600		2.395			8.464	10.859	48.866	72.000											
To Kloss	29%	6.000	380	1.200		2.255	127	1.037	4.740	8.159	48.954	56.660											
Bulqiza Beneficiation	28%	4.500	1.450			2.185	644			2.829	12.731	10.150											
Kraste Benefication	21%	30.000	6.862			1.599	513			2.112	63.360	48.034											
Kraste Benefication	19%	20.000	4.136			1.599	464			2.063	41.260	28.952											
												0											
5 Batra		110,000									283.724	265.800	-17.924	39.870	0	0	39.870	-57.794	2.530	12.818	1.685	16.984	32.332
To Export	38%	6.000			6.000	2.661				2.661	15.966	30.000											
To Kloss HMS	27%	8.000	508	1.600		1.760	127	1.037	4.740	7.664	61.312	75.556											
Bulqiza Beneficiation	21%	40.000	9.960			1.662	499			2.161	86.440	69.720											
Bulqiza Beneficiation fines	28%	6.000	1.934			1.662	644			2.306	13.836	13.538											
Kraste Benefication	21%	30.000	6.862			1.630	513			2.143	64.290	48.034											
Kraste Benefication	19%	20.000	4.136			1.630	464			2.094	41.880	28.952											
												0											
6 Kloss		37,000									187.527	207.840	20.313	31.176	0	0	31.176	-10.863	851	8.798	926	0	9.649
To Burrel	40%	10.000		3.571		2.672			8.464	11.136	111.360	160.695											
Kraste Benefication	21%	27.000	6.735			2.322	499			2.821	76.167	47.145											
												0											
7 Kam		20,000									68.800	90.800	22.000	13.620	0	2.502	16.122	5.878	460	2.648	695	0	3.108
To export	41%	4.000			4.000	3.440				3.440	13.760	24.600											
To export	38%	10.000			10.000	3.440				3.440	34.400	50.000											
To export	32%	6.000			6.000	3.440				3.440	20.640	16.200											
												0											
8 Kalimarsh		160,000									210.080	259.252	49.172	38.888	0	3.081	41.969	7.203	3.680	7.322	1.055	0	11.002
Kalimarsh Beneficiation	19%	160.000	37.036			654	659			1.313	210.080	259.252											
												0											
9 Pojska		25,000									37.175	79.000	41.825	11.850	25.320	1.396	38.566	3.259	575	1.040	300	0	1.615
To export	38%	5.000			5.000	1.487				1.487	7.435	25.000											
To export	32%	20.000			20.000	1.487				1.487	29.740	54.000											
												0											
10 Perenjas		20,000									56.360	65.500	9.140	9.825	0	0	9.825	-685	460	2.760	505	0	3.220
To export	38%	5.000			5.000	2.818				2.818	14.090	25.000											
To export	32%	15.000			15.000	2.818				2.818	42.270	40.500											
										Totals	2.277.867	2.822.062	544.195	423.309	112.508	52.612	588.429	-44.234	14.830	107.847	12.007	43.917	166.594
Total Albchrome Exports																							
Ferrochrome		36.171									1.164.998	1.627.695											
Concentrate 49%		122.651									902.997	858.557											
Chromite 42%		7.400									18.626	45.510											
Chromite 41%		4.000									13.760	24.600											
Chromite 38%		31.000									84.836	155.000											
Chromite 32.5%		41.000									92.650	110.700											
											2.277.867	2.822.062											
Prices				Production through Kloss																			
Ferrochrome		45.000		Input	25.000																		
Chromite 41.6%		6.150		Output	14.000	Lumpy																	
Chromite 38%		5.000			4.300	Fine																	
Chromite 32.5%		2.700		Waste	6.700																		
Concentrate 49%		7.000																					

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Appendix VII - 1992 Production Esimates

	% Cr2O3	1993 Planned Ore Production	Percentage Production	Kloss 1993 est. Production	1993 Planned Exports Concentrate	Ferrochrome	Lumpy	1993 Planned Realization	1992 Extrapolated Production	After HMS	1992 Extrapolated Exports Concentrate	Ferrochrome	Lumpy
1 Bulqiza North		*125,000*							**80,101**				
To Burrel	42%	*20,000*	*16.00%*			*7,400*		*37.00%*	12,816			4,742	
To Elbasan	42%	*47,600*	*38.08%*			*17,000*		*35.71%*	30,502			10,894	
Bulqiza Beneficiation	30%	*23,000*	*18.40%*		*7,940*			*34.52%*	14,739		5,088		
Bulqiza Screening	36%	*27,000*	*21.60%*		*18,800*			*69.63%*	17,302		12,047		
Export	42%	*7,400*	*5.92%*				*7,400*	*100.00%*	4,742				4,742
2 Bulqiza South		*50,000*							**24,088**				
Export	38%	*5,000*	*10.00%*				*5,000*	*100.00%*	2,409				2,409
Bulqiza Beneficiation	19%	*36,000*	*72.00%*		*8,120*			*22.56%*	17,343		3,912		
Bulqiza Beneficiation fines	28%	*4,000*	*8.00%*		*1,288*			*32.20%*	1,927		621		
To Kloss Fines	28%	*5,000*	*10.00%*	*860*	*317*			*36.86%*	2,409	414	153		
Lumpy				*2,800*		*1,000*		*35.71%*		1,349		482	
3 Ternove		*35,000*							**6,933**				
To Burrel	40%	*4,500*	*12.86%*			*1,600*		*35.56%*	891			317	
To Kloss Fines	28%	*6,000*	*17.14%*	*1,032*	*380*			*36.82%*	1,189	204	75		
Lumpy				*3,360*		*1,200*		*35.71%*		666		238	
Bulqiza Beneficiation	19%	*20,000*	*57.14%*		*4512*			*22.56%*	3,962		894		
Bulqiza Beneficiation fines	25%	*4,500*	*12.86%*		*1295*			*28.78%*	891		257		
4 Kraste		*65,000*							**34,562**				
To Burrel	42%	*4,500*	*6.92%*			*1,600*		*35.56%*	2,393			851	
To Kloss Fines	29%	*6,000*	*9.23%*	*1,032*	*380*			*36.82%*	3,190	549	202		
Lumpy				*3,360*		*1,200*		*35.71%*		1,787		638	
Bulqiza Beneficiation	28%	*4,500*	*6.92%*		*1,450*			*32.22%*	2,393		771		
Kraste Benefication	21%	*30,000*	*46.15%*		*6,862*			*22.87%*	15,952		3,649		
Kraste Benefication	19%	*20,000*	*30.77%*		*4,136*			*20.68%*	10,634		2,199		
5 Batra		*110,000*							**37,688**				
To Export	38%	*6,000*	*5.45%*				*6,000*	*100.00%*	2,056				2,056
To Kloss Fines	27%	*8,000*	*7.27%*	*1,376*	*508*			*36.92%*	2,741	471	174		
Lumpy				*4,480*		*1,600*		*35.71%*		1,535		548	
Bulqiza Beneficiation	21%	*40,000*	*36.36%*		*9,960*			*24.90%*	13,705		3,412		
Bulqiza Beneficiation fines	28%	*6,000*	*5.45%*		*1,934*			*32.23%*	2,056		663		
Kraste Benefication	21%	*30,000*	*27.27%*		*6,862*			*22.87%*	10,279		2,351		
Kraste Benefication	19%	*20,000*	*18.18%*		*4,136*			*20.68%*	6,852		1,417		
6 Kloss		*37,000*							**11,771**				
To Burrel	40%	*10,000*	*27.03%*			*3,571*		*35.71%*	3,181			1,136	
Kraste Benefication	21%	*27,000*	*72.97%*		*6,735*			*24.94%*	8,590		2,143		
7 Kam		*20,000*							**17,584**				
To export	41%	*4,000*	*20.00%*				*4,000*	*100.00%*	3,517				3,517
To export	38%	*10,000*	*50.00%*				*10,000*	*100.00%*	8,792				8,792
To export	32%	*6,000*	*30.00%*				*6,000*	*100.00%*	5,275				5,275

Appendix VII - 1992 Production Esimates

	% Cr2O3	1993 Planned Ore Production	Percentage Production	Kloss 1993 est. Production	1993 Planned Exports Concentrate	Ferrochrome	Lumpy	1993 Planned Realization	1992 Extrapolated Production	After HMS	1992 Extrapolated Exports Concentrate	Ferrochrome	Lumpy
8 Kalimarsh		***160,000***							**80,905**				
Kalimarsh Beneficiation	19%	*160,000*	*100.00%*		*37,036*			*23.15%*	80,905		18,727		
9 Pojska		***25,000***							**21,523**				
To export	38%	*5,000*	*20.00%*				*5,000*	*100.00%*	4,305				4,305
To export	32%	*20,000*	*80.00%*				*20,000*	*100.00%*	17,218				17,218
10 Perenjas		***20,000***							**18,888**				
To export	38%	*5,000*	*25.00%*				*5,000*	*100.00%*	4,722				4,722
To export	32%	*15,000*	*75.00%*				*15,000*	*100.00%*	14,166				14,166
										6,975	58,754	19,845	67,201
Total Albchrome Exports						***Production through Kloss***							
Ferrochrome		*36,171*						*Planned*	*Planned*	Extrapolated			
Concentrate 49%		*122,651*						*Tonnes*	*Percentage*	Tonnes			
Chromite 42%		*7,400*				*Input*		*25,000*	*100.00%*	9,529			
Chromite 41%		*4,000*				*Output*	*Lumpy*	*14,000*	*56.00%*	5,336			
Chromite 38%		*31,000*					*Fines*	*4,300*	*17.20%*	1,639			
Chromite 32.5%		*41,000*				*Waste*		*6,700*	*26.80%*	2,554			

Appendix VIII - Employee Numbers

	1 Bulqiza Nth	2 Bulqiza Sth	3 Batra	4 Kastre	5 Klos	6 Ternove	7 Kalimash	8 Kam	9 Prrenjas	10 Pojska	11 Bulqiza	12 Klos
Above the ground	390	290	320	460	120	110	320	170	130	86	140	231
Underground	1490	794	937	720	400	220	675	495	335	179	345	0
Personnel	80	56	65	60	30	20	60	30	40	35	40	30
Total employees	1960	1140	1322	1240	550	350	1055	695	505	300	525	261
Indentified for layoff	230	140	55	90	20	0	0	30	0	0	30	0
	1,730	1,000	1,267	1,150	530	350	1,055	665	505	300	495	261

	13 Durres	14 Lac	15 Burrel	16 Elbasan	17 Klos	18 Pescope	19 Bulqiza Transport	20 Bulqiza Beneficiation	Total
Above the ground	68	83	820	681	39	83	148	369	5,058
Underground	0	0	0	0	0	0	0	0	6,590
Personnel	8	7	50	46	7	7	10	20	701
Total employees	76	90	870	727	46	90	158	389	12,349
Indentified for layoff	0	0	50	41	0	0	0	19	705
	76	90	820	686	46	90	158	370	11,644

Appendix IX - Transport Distances

	Center	Bulqiza Beneficiation Plant	Klos Heavy Media Plant	Kraste Beneficiation Plant	Burrel Fe Cr Plant	Lac Mixing Plant	Milet Station	Mjede	Elbasan Fe Cr Plant	Durres Port
1.	Bulqiza North Mine	5	25		44	80	70			
2.	Bulqiza South Mine	7	25		50	77				
3.	Batra mine	16	30	7	50	93				
4.	Kraste Mine	16	30	7	50	93	88			
5.	Klos mine	25			45	75				
6.	Ternove Mine	40	60		75	115				
7.	Kalimash Mine							145		
8.	Kam Mine					240				
9.	Prrenjas Mine								50	1
10.	Pojska Mine								75	120
11.	Bulqiza Beneficiation Plant					70	65			
12.	Burrel Fe Cr Plant					45				96
13.	Klos Heavy Media Plant	18			18	65				
14.	Lac Mixing Plant								95	51
15.	Milet Railway Station									56
16	Elbasan									80
17	Mjede									100

Appendix X - Transport per Tonne Costs

	Percentage of deliveries	Type of transport		Lek/t/Km	Distance (Km)	Percentage input for 1t output	Lek/Tonne	Weighted Average
1. Bulqiza North Mine								
Lumpy Ore >41%	20%							
Mine								
Burrel		Road	*B*	9	44	100%	396	79
Lumpy Ore >41%	47%							
Mine								
Elbasan		Road	*B*	9	140	100%	1260	592
Lumpy Ore 38-40%	7%							
Mine								
Lac		Road	*B*	9	70	100%	630	
Durres		Railroad		3	56	100%	168	
							798	56
Concentrate 30%>>>>>>49%	8%							
Mine								
Beneficiation		Road		7	5	286%	100	
Milet		Road	*B*	9	65	100%	585	
Durres		Railroad		3	56	100%	168	
							853	68
Concentrate 36%>>>>>49% (Screeening)	18%							
Mine								
Milet		Road	*B*	9	65	100%	585	
Durres		Railroad		3	56	100%	168	
							753	136
								931

Appendix X - Transport per Tonne Costs

	Percentage of deliveries	Type of transport		Lek/t/Km	Distance (Km)	Percentage input for It output	Lek/Tonne	Weighted Average
2. Bulqiza South Mine								
19-28% Ore to Beneficiation	*48%*							
Mine								
Beneficiation		Road	*O*	7	7	435%	213	
Milet		Road	*B*	9	65	100%	585	
Durres		Railroad		3	56	100%	168	
							966	464
Lumpy Ore 38-40%	*26%*							
Mine								
Lac		Road	*B*	9	72	100%	648	
Durres		Railroad		3	56	100%	168	
							816	212
28% Ore to Kloss	*26%*							
Mine								
Klos Heavy Media		Road	*O*	7	25	100%	175	46
								721
3. Batra mine								
38-40% Ore	*16%*							
Mine								
Lac		Road	*B*	9	93	100%	837	
Durres		Railroad		3	56	100%	168	
							1005	161
19-21% Ore to Kraste	*30%*							
Mine								
Kraste Beneficiation		Road	*O*	7	7	454%	222	
Milet		Road	*B*	9	81	100%	729	
Durres		Railroad		3	56	100%	168	
							1119	336
27% Ore to HMS	*22%*							
Mine								
Klos Heavy Media		Road	*O*	7	30	100%	210	46

Appendix X - Transport per Tonne Costs

	Percentage of deliveries	Type of transport		Lek/t/Km	Distance (Km)	Percentage input for It output	Lek/Tonne	Weighted Average
21-28% to Bulqiza	*32%*							
Mine								
Bulqiza Beneficiation		Road	*O*	7	16	387%	433	
Milet		Road	*B*	9	65	100%	585	
Durres		Railroad		3	56	100%	168	
							1186	380
								922
4. Kraste Mine								
Lumpy Ore >40%	*20%*							
Mine								
Burrel		Road	*B*	9	50	100%	450	90
19-21% Ore to Kraste	*48%*							
Mine								
Beneficiation Kraste		Road	*O*	7	7	454%	222	
Milet		Road	*B*	9	81	100%	729	
Durres		Railroad		3	56	100%	168	
							1119	537
Lumpy Ore 29%	*26%*							
Mine								
Klos Heavy Media		Road	*B*	9	30	100%	270	70
28% Ore to Bulqiza	*6%*							
Mine								
Bulqiza Beneficiation		Road	*B*	9	16	310%	446	
Lac		Road	*B*	9	65	100%	585	
Durres		Railroad		3	56	100%	168	
							1199	72
								770

Appendix X - Transport per Tonne Costs

	Percentage of deliveries	Type of transport		Lek/t/Km	Distance (Km)	Percentage input for It output	Lek/Tonne	Weighted Average
5. Klos mine								
Lumpy Ore>40%	*60%*							
Mine								
Burrel		Road	*B*	9	45	100%	405	243
21% Ore to Kraste	*40%*							
Mine								
Kraste Beneficiation		Road	*O*	7	7	400%	196	
Milet		Road	*B*	9	88	100%	792	
Durres		Railroad		3	56	100%	168	
							1156	462
								705
6. Ternove Mine								
Lumpy Ore >40%	*28%*							
Mine								
Burrel		Road	*B*	9	75	100%	675	189
28%Ore to Kloss	*37%*							
Mine								
Klos Heavy Media		Road	*O*	7	60	100%	420	155
19-25% Ore to Bulqiza	*36%*							
Mine								
Beneficiation (Bulqiza)		Road	*O*	7	40	100%	280	
Milet		Road	*B*	9	65	23%	135	
Durres		Railroad		3	56	23%	39	
							453	163
								508

Appendix X - Transport per Tonne Costs

		Percentage of deliveries	*Type of transport*		*Lek/t/Km*	*Distance (Km)*	*Percentage input for It output*	*Lek/Tonne*	*Weighted Average*
7.	**Kalimash Mine**								
	Concentrate (Beneficiation)	*100%*							
	Mine								
	Beneficiation								
	Mjede		Road	*E*	10	120	100%	1200	
	Durres		Railroad		3	110	100%	330	
								1530	**1,530**
8.	**Kam Mine**								
	Lumpy Ore 36-40%,>40%	*100%*							
	Mine								
	Lac		Road	*E*	10	180	100%	1800	
	Durres		Railroad		3	56	100%	168	
								1968	**1,968**
9.	**Prrenjas Mine**								
	Lumpy Ore 30-34%,36-40%	*100%*							
	Mine								
	Durres		Railroad		3	135	100%	405	**405**
10.	**Pojska Mine**								
	Lumpy Ore 30-34%,36-40%	*100%*							
	Mine								
	Durres		Railroad		3	157	100%	471	**471**

Appendix X - Transport per Tonne Costs

		Percentage of deliveries	Type of transport		Lek/t/Km	Distance (Km)	Percentage input for It output	Lek/Tonne	Weighted Average
11.	**Kloss HMS Plant**								
	Fines	24%							
	Klos Heavy Media								
	Beneficiation		Road	*O*	7	18	350%	441	
	Milet		Road	*B*	9	65	100%	585	
	Durres		Railroad		3	56	100%	168	
								1194	287
	Lumpy Ore	76%							
	Klos Heavy Media								
	Burrel		Road	*B*	9	25	382%	860	653
									940
13.	**Burrel Ferrochrome Plant**								
	Plant								
	Durres		Road	*B*	9	110	100%	990	**990**
14.	**Elbasan Ferrochrome Plant**								
	Plant								
	Durres		Road	*B*	9	80	100%	720	**720**

O The cost of transport includes a price based on fuel consumed, tire wear and the repairs to the trucks.

E The cost is that which other enterprises charge per kilometer per tonne.

B This represents an average of the cost of Albchrome's own vehicles and the externally contracted trucks.

Appendix XI - Material Costs

QUANTITY (tonnes)	UNITS	N BULQIZA 1993 MATERIALS	UNIT COST	COST	S BULQIZA 1993 MATERIALS	UNIT COST	COST	BATRA 1993 MATERIALS	UNIT COST	COST
1) MATERIALS										
Consumption materials										
Dynamite	kg/t	0.35	120.00	42.00	0.25	120.00	30.00	0.25	120.00	30.00
Blasting core (fuse)	m/t	1.60	15.00	24.00	1.50	15.00	22.50	0.84	15.00	12.60
Capsules	units/t	1.20	3.00	3.60	1.00	3.00	3.00	0.30	3.00	0.90
Carbide	kg/t	0.24	57.00	13.68	0.30	57.00	17.10	0.28	57.00	15.96
Wooden props	m3/t	0.04	3800.00	152.00	0.01	3800.00	19.00	0.01	3800.00	19.76
Drill bits	units/t	0.003	340.00	1.02	0.002	340.00	0.51	0.002	340.00	0.78
Total				236.30			92.11			80.00

Appendix XI - Material Costs

QUANTITY (tonnes)	UNITS	KRASTE 1993 MATERIALS	UNIT COST	COST	KLOS 1993 MATERIALS	UNIT COST	COST	KAM 1993 MATERIALS	UNIT COST	COST
1) MATERIALS										
Consumption materials										
Dynamite	kg/t	0.25	120.00	30.00	0.26	120.00	31.20	0.26	120.00	31.20
Blasting core (fuse)	m/t	0.85	15.00	12.75	0.95	15.00	14.25	0.95	15.00	14.25
Capsules	units/t	0.30	3.00	0.90	0.40	3.00	1.20	0.40	3.00	1.20
Carbide	kg/t	0.28	57.00	15.96	0.28	57.00	15.96	0.28	57.00	15.96
Wooden props	m3/t	0.01	3800.00	19.76	0.01	3800.00	30.40	0.01	3800.00	30.40
Drill bits	units/t	0.002	340.00	0.78	0.004	340.00	1.36	0.004	340.00	1.36
Total				80.15			94.37			94.37

Appendix XI - Material Costs

QUANTITY (tonnes)	UNITS	PRRENJAS 1993 MATERIALS	UNIT COST	COST	POJSKE 1993 MATERIALS	UNIT COST	COST
1) MATERIALS							
Consumption materials							
Dynamite	kg/t	0.12	120.00	14.04	0.20	120.00	24.00
Blasting core (fuse)	m/t	1.10	15.00	16.46	0.82	15.00	12.30
Capsules	units/t	0.47	3.00	1.40	0.70	3.00	2.10
Carbide	kg/t	0.14	57.00	7.81	0.25	57.00	14.25
Wooden props	m3/t	0.01	3800.00	26.60	0.003	3800.00	11.40
Drill bits	units/t	0.001	340.00	0.34	0.003	340.00	0.85
Total				66.64			64.90

Appendix XI - Materials Cost

QUANTITY	ELBASON 1993 MATERIALS	UNIT COST	COST	BURREL 1993 MATERIALS	UNIT COST	COST
1) MATERIALS						
Consumption materials						
Coke	0.600	10,500.0	6300.00	0.600	10,500.0	6300.00
Quartz	0.220	3,200.0	704.00	0.230	3,200.0	736.00
Electric paste	0.040	4,500.0	180.00	0.003	45,000.0	148.50
Furnace bricks	0.035	42,429.0	1485.02	0.035	42,429.0	1485.02
Furnace mortar	0.014	11,500.0	161.00	0.009	5,600.0	50.40
Quartz sand	0.014	1,150.0	16.10	0.014	1,150.0	16.10
Magnesium sand	0.008	15,200.0	121.60	0.008	15,200.0	121.60
Water glass	0.006	10,000.0	60.00	0.006	10,000.0	60.00
Limestone	0.006	4,600.0	27.60	0.006	4,600.0	27.60
Iron	0.010	43,000.0	430.00	0.006	43,000.0	258.00
Industrial water	135.000	13.8	1863.00	135.000	13.8	1863.00
			11348.32			11066.22

Appendix XII - Development Costs

QUANTITY (metres)	UNITS	N BULQIZA 1993 2550 MATERIALS	UNIT COST	COST	S BULQIZA 1993 4560 MATERIALS	UNIT COST	COST	BATRA 1993 3750 MATERIALS	UNIT COST	COST
1) MATERIALS										
Dynamite	kg/m	9.50	120.00	1140.00	14.90	120.00	1788.00	7.24	120.00	868.80
Blasting core (fuse)	m/m	25.00	15.00	375.00	20.00	15.00	300.00	21.00	15.00	315.00
Capsules	units/m	12.00	3.00	36.00	10.00	3.00	30.00	8.50	3.00	25.50
Carbide	kg/man day	0.30	57.00	17.10	0.30	57.00	17.10	0.28	57.00	15.96
Wooden props	m3/m	0.40	3800.00	1520.00	0.10	3800.00	380.00	0.12	3800.00	456.00
Drill bits	units/m	0.04	340.00	14.28	0.04	340.00	13.60	0.06	340.00	20.40
Rails	kg/m	12.00	18.00	216.00	5.00	18.00	90.00	5.00	18.00	90.00
Cement	tonne/m	0.40	3400.00	1360.00	0.00	3400.00	0.00	0.00	3400.00	0.00
2) Epergy and electricity	kw/m	443.00	1.80	797.40	350.00	1.80	630.00	230.00	1.80	414.00
7) Other indirect costs		3210.80	0.91	2921.828	1822.45	0.91	1658.4295	3069.30	0.91	2793.063
8) Other administration costs				115.70			383.62			513.00
Total				8513.31			5290.75			5511.72
Total development costs				21708.94			24125.82			20668.96

Appendix XII - Development Costs

QUANTITY (metres)	UNITS	KRASTE 1993 9000 MATERIALS	UNIT COST	COST	KLOS 1993 1895 MATERIALS	UNIT COST	COST	KAM 1993 2670 MATERIALS	UNIT COST	COST
1) MATERIALS										
Dynamite	kg/m	9.50	120.00	1140.00	14.90	120.00	1788.00	14.90	120.00	1788.00
Blasting core (fuse)	m/m	8.50	15.00	127.50	21.00	15.00	315.00	21.00	15.00	315.00
Capsules	units/m	5.40	3.00	16.20	9.60	3.00	28.80	9.60	3.00	28.80
Carbide	kg/man day	0.28	57.00	15.96	0.28	57.00	15.96	0.28	57.00	15.96
Wooden props	m3/m	0.06	3800.00	228.00	0.12	3800.00	456.00	0.12	3800.00	456.00
Drill bits	units/m	0.02	340.00	6.80	0.06	340.00	20.40	0.06	340.00	20.40
Rails	kg/m	12.00	18.00	216.00	5.00	18.00	90.00	5.00	18.00	90.00
Cement	tonne/m	0.57	3400.00	1938.00	0.23	3400.00	782.00	0.00	3400.00	0.00
2) Energy and electricity	kw/m	280.00	1.80	504.00	230.00	1.80	414.00	230.00	1.80	414.00
7) Other indirect costs		630.00	0.91	573.3	1708.50	0.91	1554.735	3200.00	0.91	2912
8) Other administration costs				170.00			731.00			513.00
Total				4935.76			6195.90			6553.16
Total development costs				44421.84			11741.22			17496.94

QUANTITY (metres)	UNITS	PRRENJAS 1993 2120 MATERIALS	UNIT COST	COST	POJSKE 1993 1136 MATERIALS	UNIT COST	COST
1) MATERIALS							
Dynamite	kg/m	3.24	120.00	389.04	8.00	120.00	960.00
Blasting core (fuse)	m/m	13.61	15.00	204.18	14.00	15.00	210.00
Capsules	units/m	6.94	3.00	20.82	7.00	3.00	21.00
Carbide	kg/man day	0.25	57.00	14.25	0.25	57.00	14.25
Wooden props	m3/m	0.25	3800.00	955.70	0.20	3800.00	760.00
Drill bits	units/m	0.04	340.00	12.58	0.05	340.00	17.00
Rails	kg/m	5.00	18.00	90.00	5.00	18.00	90.00
Cement	tonne/m	0.14	3400.00	476.00	0.00	3400.00	0.00
2) Energy and electricity	kw/m	230.00	1.80	414.00	120.00	1.80	216.00
7) Other indirect costs		5488.00	0.91	4994.08	1793.20	0.91	1631.812
8) Other administration costs				160.00			1725.00
Total				7730.65			5645.06
Total development costs				16388.98			6412.79

Appendix XIII - Overhead Analysis

Mines With Analysis	3		6		8		
	Batra		**Ternove**		**Kam**		
	Mine		Mine		Mine		
Allocated administration costs							
Operational level	27,476		2,120		4,880		
Enterprise level	1,319		2,945		2,592		
	28,795		**5,065**		**7,472**		
Detailed Analysis							
Admin Materials	3,029	12.60%	919	18.14%	2,179	25.27%	18.67%
Admin Materials	21	0.09%	939	18.53%	1,807	20.96%	13.19%
Admin Payroll Costs	*10,295*	*42.80%*	*920*	*18.16%*	*2,417*	*28.04%*	*29.67%*
Admin Payroll Costs	*1,100*	*4.57%*	*1,827*	*36.06%*	*637*	*7.39%*	*16.01%*
Depreciation	*0*	*0.00%*	*111*	*2.18%*	*1,080*	*12.53%*	*4.90%*
Depreciation	*333*	*1.39%*	*37*	*0.74%*	*0*	*0.00%*	*0.71%*
Travel Expenses	0	0.00%	171	3.37%	53	0.62%	1.33%
Travel Expenses	272	1.13%	95	1.87%	137	1.59%	1.53%
Bank Costs	*1,867*	*7.76%*	*0*	*0.00%*	*0*	*0.00%*	*2.59%*
Bank Costs	*0*	*0.00%*	*48*	*0.95%*	*0*	*0.00%*	*0.32%*
Others	6,577	27.35%	0	0.00%	301	3.50%	10.28%
Others	556	2.31%	0	0.00%	9	0.11%	0.81%
	24,051	**100.00%**	**5,065**	**100.00%**	**8,621**	**100.00%**	**100.00%**
Excluded Costs	13,595	57%	2,943	58%	4,135	48%	54%
Included Overheads	**10,456**	43%	**2,123**	42%	**4,487**	52%	46%
Est. current cost multiplier	1.50		1.50		1.50		
Estimated Overheads	**15,684**		**3,184**		**6,730**		

Mines Without Analysis	1	2	4	5	7	9	10
	Bulqiza Nth	**Bulqiza Sth**	**Kraste**	**Klos**	**Kalimash**	**Prrenjas**	**Pojska**
	Total	Mine	Mine	Mine	Joint Results	Total	Total
Allocated administration costs							
Operational level	28,992	10,316	8,213	6,229	1,600	7,435	1,900
Enterprise level	1,273	2,460	3,876	1,843	1,968	559	1,476
	30,265	**12,776**	**12,089**	**8,072**	**3,568**	**7,993**	**3,376**
Exclusion Ratio	54%	54%	54%	54%	54%	54%	54%
Excluded Costs	16,402	6,924	6,552	4,374	1,934	4,332	1,830
Included Costs	**13,864**	**5,852**	**5,538**	**3,698**	**1,634**	**3,662**	**1,546**
Est. current cost multiplier	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Estimated Overheads	**20,796**	**8,779**	**8,307**	**5,546**	**2,452**	**5,492**	**2,320**

Appendix XIII - Overhead Analysis

	15	16	17
	Burrel	**Elbasan**	**Klos**
	Ferrochrome	Ferrochrome	Heavy Media
Allocated administration costs			
Operational level	35,383	15,140	371
Enterprise level	3,965	1,828	1,089
	39,348	**16,968**	**1,460**
Detailed Analysis			
Admin Materials	14,199	4,167	67
Admin Materials	272	708	0
Admin Payroll Costs	*11,632*	*5,197*	*333*
Admin Payroll Costs	*2,331*	*1,013*	*29*
Depreciation	*9,467*	*5,776*	*0*
Depreciation	*293*	*0*	*516*
Travel Expenses	85	0	0
Travel Expenses	99	111	3
Bank Costs	*0*	*0*	*0*
Bank Costs	*905*	*0*	*0*
Others	0	0	480
Others	65	0	32
	39,348	**16,972**	**1,460**
Excluded Costs	24,628	11,987	879
Included Overheads	**14,720**	**4,985**	**581**
Est. current cost multiplier	1.50	1.50	1.50
Estimated Overheads	**22,080**	**7,478**	**872**

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RTZ GROUP

EBRD CONTRACT C3095 HEALTH, SAFETY AND ENVIRONMENTAL ISSUES OF ALBCHROME OPERATIONS

A PRELIMINARY ASSESSMENT

This Report is issued by, and on the authority of the Project Manager

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J M Campbell

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	ANNEX 1	

SUMMARY

RTZ Consultants (RTZC) visited five mines, two concentrator plants and one ferrochrome smelter in Albania the week commencing 1 February 1992, the main objective being to assess the scale of health, safety and environmental problems, the resources needed to markedly improve standards, and to identify where feasible any liabilities for past practices.

In all cases extremely poor working conditions were observed which raised questions of occupational health, personal hygiene and physical safety. Many hazards were observed in the mines but the apparent low frequency of accidents suggested that avoidance measures could be taken in many cases due to the very low level of productivity. Needs range from suitable clothing and personal protective gear to replacement of old mining equipment, upgrading of services, and major reviews of mining methods, the latter being driven as much by production and operational priorities as health and safety.

All surface activities visited, including sorting of ore, upgrading of mineral, and the smelting plant suffered from poor access, little machinery guarding and safety trips, and deficient electrical standards, a full safety audit being justified for each operation before any real idea of costs to correct could be established.

The chrome mining and smelting industry exhibits relatively low potential for environmental impact so problems are not so widespread here. Tailings disposal, smelter plant fume arrestment and water conservation in general require addressing.

The focus of improvement to raise standards of health and safety in mines lies in introducing proper clothing and personal protective equipment together with facilities to maintain their use. Personal hygiene needs must be met and improvements in water services, electrical supply and ventilation are also urgently required. RTZC assesses the cost of such improvements could approach $US4.4 M.

Longer term measures would involve the introduction of new mining equipment, the review of mining methods and possibly major ventilation schemes to accompany advances in output and productivity. Success can only be achieved through applying a combination of material resources, employee retraining and new management initiatives designed to promote a culture change.

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Two major projects, the stalled Bulqiza North forced air ventilation scheme to defeat the methane problem and the anticipated requirement for fume arrestment at the two ferrochrome smelters represent large expenditure and justify individual attention as regards funding. In particular the Bulqiza North Mine is vulnerable to a major explosion accident.

Issues of liability for past health, safety and environmental problems cannot be described in a quantitative manner with any accuracy. There has been no systematic monitoring of conditions, only individual studies and initiatives generally prompted by crises. Accident and safety statistics are flawed through deficiencies in reporting. Resources essential for the conduct of measurements and for communications have become scarce or non-existent even although well trained specialists to do these jobs have been and continue to be available. Suffice it to say allowance will need to be made to cover disability and occupational illness and the report identifies the main issues of the industry. There could also be considerable exposure to wider public health considerations in towns owing their existence to the industry and where the State can no longer rectify the years of neglect.

There is hope for the future in harnessing the enthusiasm and the professional skills so apparent in the industry.

1 INTRODUCTION

RTZ Consultants Limited (RTZC) has been contracted by the European Bank for Reconstruction and Development under Consultancy Contract No C3095 to conduct a preliminary briefing study of occupational health, safety and environmental conditions in the Albanian chrome mining and smelting industry prior to playing a specialist part in the forthcoming bid-evaluation exercise scheduled for February 1993. This report describes the numerous observations made during the series of visits, identifies priorities and puts forward a first estimate of likely costs involved in the short and medium term to improve working conditions and raise environmental standards.

Specifically the European Bank Terms of Reference required that for the first part of the assignment, the visit to Albania, that

- The work should build on the earlier study carried out by RTZC and reported in June 1992.
- Four mining centres be visited together with an ore dressing facility and ferrochrome smelter.
- Issues of environmental liability and health and safety liability be investigated.
- Discussions take place with specialists for regulation and control in industry and government in particular regarding provision of information.
- A report be prepared identifying issues to be considered including costs of mitigation proposals and facility to monitor such mitigation.

The RTZC study team of two comprised Dr J M Campbell, environmental specialist and Mr F M Russell, mining engineer with extensive experience of safety requirements in underground mines.

The first section of the report is a description of the observations and findings at each location visited. Section Two outlines the requirements for improvement, how these might be related to improved mining methods, operational efficiency and manpower productivity etc and at what cost.

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Section Three addresses the issue of liability for past practices as far as is known or documented, the present level of monitoring activity, and the flow of information relating to environmental conditions.

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2 PROGRAMME

The visit took place over a period of seven days from the 1-8 February 1993 and included the following activities.

February 1	Travel to Albania	
February 2	Day visit to	Southern Region Pojska Mine
February 3	Day visit to	Central I Region
		Bulqiza North Mine
		Bulqiza Concentrator
February 4	Day visit to	Burrel Ferrochrome Smelter
		Central II Region Kraste Mine
February 5-6	Two day trip to Northern Region	
		Kalimash II Mine and Concentrator
		Kalimash I Mine
February 7	FMR return to UK	
February 8	JMC Meetings in Tirana with	
		Ministry of Health (A Shehi, Q Kodra)
		Ministry of Industry and Mines
		Technical Security Department (B Hoxha)
		Albchrome (A Duma)
		Institute of Mines (F Asllani)

A total of 32 hours was spent driving to the locations outside Tirana. The weather was good and fortunately very little snow and ice were encountered making the series of visits possible within the time allowed.

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3 VISIT REPORTS AND OBSERVATIONS

3.1 Southern District - Pojska Mine

Persons met:

Liro Llakami	Chief Geologist
Ardian Lipu	Chief Mechanical Engineer
Isja Kajori	Miners Union Representative

General

This mine located on the western shore of Lake Ohrit produces about 30 000 t/y from three areas, the East section about 28 000 t/y and the West and Gjorouka sections together about 2000 t/y. A total of 300 people are employed. The ore is hand sorted in the open air into three grades and exported directly. The mine works three shifts/day and six days/week, a normal working week for Albania. The East Section was visited.

The orebody varies in thickness from 0.4 m to 10 m, strike length from 120 m in the upper levels (911 m elevation) to over 800 m in the lower levels, (710 elevation) strike direction northwest-southeast, the dip varies between 70 and 75° to the north. The orebody is open at depth and estimated reserves, based on diamond drilling are about 100 000 t. The current production is from the 800 - 835 m elevation stopes, and the lower levels down to the 710 m are being developed. The orebody is believed to extend to below the level of the lake at elevation of 700 m to at least 620 m elevation. Sub-level open stoping methods are used and mining losses are estimated at 19% and dilution about 5-6 %.

Mine Offices and Welfare Block

The office and welfare block is a four storey building with a cafeteria facility, all of which are rudimentary and unsafe. There are very few windows fitted with glass, no heating (ice forms on the floors in winter after washing down) and the electrical wiring is in a very dangerous condition.

The changehouse consists simply of a room with lockers, probably shared, for the men to change clothes. There are no showers, toilets or heating although there are indications that they were at one stage planned or even provided. Excrement littered part of the area set aside for shower or toilet cubicles.

The lamp room is basic with a charging rack for 36 lamps. About 50 to 60 cap lamp units were reported to be in operation and two were seen charging. Carbide lamps are in use underground and an electric light is used at loading points.

The mine rescue team has six (Polish) Faser W70 self-contained breathing sets available. The equipment appeared well maintained and practices were reported to be held every month with a team of four men (two less than the safe accepted minimum) although the equipment looked unused on inspection. Chemical CO_2 absorbent was noted to be past its shelf life.

There is no facility to check who is underground other than by visual means on the part of the supervisor, a dangerous practice readily and cheaply remedied.

The men arrive for the day shift by company provided transport at 0700 and it is 0830 by the time they have changed and had a meal. They depart at 1530 having changed and had lunch at the end of shift. The pace of work is not demanding and this is reflected in the very low productivity figures - about 0.3 t/manshift.

Personal Safety Equipment

Mine management issue a basic set of industrial clothing, boots and hard hat to new employees. The boots are leather but do not have steel toe caps. Battery powered cap lamps (Polish origin) are in short supply. No gloves are issued for working underground and there is no evidence of hearing conservation measures.

Mining Operations

The mine is accessed by adits developed into the side of the hill at vertical intervals of 35 m. The adits are approximately 2.8 m high and 2.4 m wide and equipped with 600 mm gauge light rail. A two-tonne trolley line locomotive hauls 1 t capacity side tipping cars to the surface dump. Where hand sorting is carried out at the surface dump by female employees. The ore is loaded into trucks by means of a 2 m^3 capacity front-end loader (Volvo). Surface dumps are relatively small and consist of waste rock produced during initial development of the crosscut to the orebody and waste dilution in the stope.

A sub-level open stoping method is used to extract the ore. Sub-levels are 8.5 m vertical interval and the ore is drilled using light rock drills (jackhammers) fitted with pusher legs

(jacklegs). The main and sub-levels (about 3 to 4 m^2 cross-section area) are developed using conventional drilling and blasting techniques. Ore gravitates down to a cone developed every 6 m along the strike at which point it spills on to the haulage. All loading is carried out by a total of three pneumatic overthrow loaders of Chinese manufacture. Holes are charged with dynamite and detonated using safety fuse. Main blasts are conducted at the end of the shift.

Ground conditions are generally good in the main levels, timber poles are used in the mine for local support but they are largely ineffective. In the sub-levels the ground conditions are poorer with bad hanging in evidence, giving rise to the probability of accidents from falls of ground.

General conditions in the mine are below internationally recognised standards of good practice most probably due to poor supervision and motivation - for example the main access is littered with large rocks and the stope is accessed by clambering up a timbered raise rather a proper ladder way. The compressed air line is in poor condition with many leaks apparent.

Ventilation is mostly natural, fresh air entering the mine via the adits and rising through the workings. A 20 kW fan is installed on the lower level to assist ventilation flow. A ventilation survey is reported to have been carried out but this could not be verified. Drilling is carried out dry and dust is not reported to be a problem, possibly due to the natural dampness of the ore and the relatively slow pace of production. No measurements are available to support this. Ventilation conditions in development headings, where there is no through flow of air, are likely to be poor and dependent on air delivered via the pneumatic powered equipment.

Compressed air is supplied from three 20 m^3/min rated units of Chinese manufacture. Two units are running with one on standby. Spares for these units are now virtually unavailable in Albania.

Notwithstanding the exceedingly low productivity miners are paid a bonus based on development advance and tonnes mined. No details of this arrangement were made available. Transport by bus to the mine is provided by the company but meals at the cafeteria are charged. Absenteeism is stated to be about 2 to 3%, a low level by global standards.

Occupational Health Risks

Although dry drilling is used, little dust is evident as the rock surfaces are moist. The rock dust is said to contain no free silica but this will be confirmed by analysis. The host rock is dunite with visual evidence of small quantities of serpentinite. The deposit appears to be free of asbestiform minerals. It was reported that silicosis was not present in the workforce although it was also stated that medicals were not regularly carried out.

The main health and disability issues are likely to be noise induced hearing loss and tinnitus, and hand arm vibration damage, those most at risk being the drilling labour. A relatively high incidence of respiratory ailments can be expected from a combination of dust and gas exposure with smoking habits.

Environmental Impact

The Pojska operation is relatively small with a short life span. Some 400 000 tonnes have been mined to date at low levels of waste rock generation. Consequently there is not a large amount of waste rock dumped outside the mine portals.

From the point of view of groundwater ingress the mine is essentially dry at present although this may change if mining progresses to depths below the level of Lake Ohrit. There is no problem of water pollution or seepage of polluted water.

The use of electric haulage underground reduces the requirement for fuel storage on site although oil spillages are in evidence at the compressor house and tank storage is unsecured and not bunded.

Currently as there is little use of water in the changehouse and virtually no sewage, there is minimal potential for pollution of nearby Lake Ohrit.

The closure requirement will be limited to profiling of the existing waste dumps and platforms at the portals, sealing of adits and removal of surface features; buildings, compressor house, etc.

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Training

This was not investigated in any detail but appears to be centred on 15 days induction training for new employees prior to commencing underground work under the supervision of an assigned experienced employee who drive trains and use explosives are required by law to be licensed.

3.2 Central I District - Bulqiza North Mine and Concentrator

Persons met:

Geziim Dauti	Director of Mine Bulqiza
Astlan Myliku	Chief of Zone Pusit No 2
Suljman Meta	Inspector of Technical Security Bater and Bulqiza
Ferit Puca	Inspector of Technical Security Bater and Bulqiza
Vehbi Musta	Chief Mining Engineer

General

The entire operating unit now known as Bulqiza consists of Bulqiza North and South Sections together with Qafe Lame mine a few km distant, all served by one concentrator plant. The area administraton was restructured at the beginning of the year. Currently the plan is to produce 105 000 t/y of high grade chrome although following the recent strike the facilities are not up to full production. A total of 1800 people are employed at present and efforts are underway to reduce this number. Overmanning is extensive in all areas. Bulqiza North was visited

The orebody is relatively thin, ranging from 0.4 m to 10 m but average 2 m, folded and faulted, shaped like a S in plan, dipping at about 80°. Reserves are extensive - known to exist down to 27 level with estimated 300 000 t at each level. The standard form of sub-level open stoping is developed at Bulqiza North and is used throughout the section.

Mining Operations

Access to the mine is via a shaft system. There are three shafts on surface at approximately 800 m elevation which serve down to 5 level (470 m elevation). The circular 4 m shafts are equipped with timber guides. Safety dogs are used and the signal system is

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adequate. However there is no overrun or sump at the base of the shaft. As overrun is a protection feature of all safe hoisting arrangements its absence presents a safety hazard. The signal system is basic but adequate. From 5 level another sub-vertical shaft system serves down to level 14. There are also inclined haulage ways in the mine allowing mine cars to be transferred from one level to another. The mine is worked out down to 7 level and production is taking place between 8 and 11 levels with 12 to 14 in preparation. All waste and ore is handled in 1.6 t capacity rail cars which are transported through all the shaft systems to a surface tippler. Many derailed cars litter the haulage ways which are generally untidy with many obstacles. The overhead electric trolley line (380 V DC) is low at about 1.8 m introducing a considerable safety risk.

The compressor house is located on the surface with eight 40 m^3/min compressor units, up to 7 being run for 4 hours/shift. There are many leaks in the supply system. An "Alimak" jacking system for constructing raises has been used but units certain of the system components are no longer available. The lack of a suitable system for mining large diameter raises may result in the use of less safe methods.

The hoists have been standardised on a Polish design utilising a single base plate on which is mounted a 125 kW AC motor driving a 2 m diameter double drum via a reduction gearbox. Fail-safe brakes act on the drum with a service brake on the motor shaft. The hoist and rope were in good condition and although they would not pass latest standards, are adequate for the purpose. Regular checks are made and recorded. The standard of the electrical installation is poor and the motor speed control system is only just holding together. Hoist safety control systems (overwind, overspeed) are adequate but should be replaced in the medium term together with the motor speed control unit. The overrun issue should be addressed with more urgency.

Sub-level open stoping is used with manual loading of ore into rail cars in place of the more usual pneumatic loader. A microscoop is in use but only replaces what a loader could do - probably cheaper and more effectively. Development is rather small - about 2 m^2 section and travelling through it involves a lot of stooping. As the development follows the ore it is also rather tortuous. Cars are hand trammed to where the inclined haulage is located or where there are trolley line locomotives.

Ground conditions are affected by the blocky nature of the ground as a result of the folding and faulting in the orebody. There are thin seams of serpentinite present which also add to support problems and promote migration pathways for water. This type of ground should

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ideally supported by rockbolts, and cement grouted reinforcing bar would be suitable. Both cement and reinforcing bar should be readily available in the future.

Ventilation is natural although a 355 kW centrifugal fan is being installed on 5 Level as noted later in this report. Ventilation conditions in a development end visited were very poor - blasting fumes were evident, particularly ammonia, and no mechanical ventilation was installed, only compressed air to serve the equipment.

The mine is relatively wet and pumps are installed at 5 and 9 levels to raise a total of 50 to 100 l/s to the surface.

The main problems quoted by staff were ventilation as the mine gets deeper and hotter, support problems also exacerbated by increasing depth and the logistics of hauling ore to surface through so many shaft systems. The mine management are tackling these problems by installing a main fan and connecting level 5 via a 7 km long adit to the surface which is currently under development. A 16 m^2 section ramp is also being developed down to level 5 for equipment access and ventilation. Current plans call for production to double from 1995 onwards but no significant investment has been made in the past two years. Production increase is forecast to come from mechanisation of the present methods using LHDs (Load - haul - dump vehicles). Existing shafts will need to be extended below 14 level. Ventilation plans to meet the needs of new projects and increased production increase have not been finalised.

Methane has been detected in the lower levels 9 to 12. The cause is not fully understood but is not unique as a similar occurrence is reported at the Mutorashanga Chrome Mine of Union Carbide in Zimbabwe. Production has been suspended in these areas until cap lamps are made available rather than carbide lamps.

There are 1200 new lamps but no charging facilities - this is to be rectified later this month. Miners reportedly take their lamps home to recharge.

Mine Offices and Welfare Block

Changehouse facilities were found to be similar to Pojksa. Mine Offices and Welfare Block at Bulqiza North are atrocious! The building is said to be heated by a coal fired boiler plant but apparently this had not functioned for some time. There are no separate facilities for female employees, their only option being to return home in working clothes.

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Personal Safety Equipment

Hard hats are not used by all miners. Boots are also worn, generally waterproof gumboots without steel toe caps. No protective gloves are worn and are probably not available.

Accidents frequently occur during the large number of handling operations involving rail cars when transferring between shaft systems. A fatality occurred last year due to a fall of ground.

Explosives are stored in the open in an enclosed compound and are vulnerable to the weather, particularly extremes of temperature, rendering them potentially unstable.

A doctor and three nurses who staff a clinic, were not on site at the time of the visit.

Safety Practices

Facilities are generally primitive, the access ladders most awkward and unsafe. There is a lack of handrails, poor footing etc. The underground winding room is illuminated by just one incandescent light bulb. A formal safety audit would reveal a multitude of problem areas.

Workplace Environment

A previous visit by RTZC in June 1992 revealed two main concerns, the presence of asbestos mineral and the unexplained discovery of methane gas in the mine atmosphere. To these must be added a third problem, the accumulation of toxic gases.

The extent of the occurrence of asbestos mineral was much more closely explored in this visit. It had been noted that the asbestos was present along with the mineral serpentinite as thin seams occupying joints in the dunite host rock in the vicinity of the chromite ore vein. Although many samples of the serpentinite mineral were examined on this occasion no repeat occurrence of distinctly fibrous material was noted. Samples were taken for further evaluation. The likelihood is that the risk of asbestos exposure during the driving of headings is lower than originally anticipated but this remains to be confirmed.

Now that both chemical indicator tubes and direct reading measurement equipment are available for monitoring methane more is known about its occurrence in the mine

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atmosphere. It is probable that the gas had been present for some time prior to its discovery through ignition from a carbide open flame lamp.

Currently measurements of methane generally fall between 0.5 and 2% but concentrations have exceeded the lower explosive limit of 5% representing a very prominent risk. In general levels are reported to be reducing although it is not known whether this is due to increased ventilation (dilution) or a reduction in rate of diffusion into the mine atmosphere. The source of the gas remains unknown.

Measures are being taken throughout the mine to replace carbide lamps by rechargeable battery operated cap lamps. Action has already been taken at the critical levels 9 to 12 in the mining operation.

The problem of accumulation of carbon monoxide and nitrogenous gases from blasting was apparent again on this visit, heavy concentrations of ammonia being detected in one heading. A later meeting at the Ministry of Health emphasised the serious nature of this problem across the Albanian mining industry. In 1986 at Bulqiza there were 22 separate cases where miners collapsed from acute toxicity due to a combination of carbon monoxide and nitrogen oxides exposure. Many were hospitalised and there were also fatalities. This prompted a major study and report which has in turn lead to the efforts to improve ventilation. These measures still have to be instituted but have been given added urgency by the discovery of methane.

Ventilation

Following on from the 1986 study on ventilation improvements at Bulqiza North a major forced air ventilation scheme has been proposed by the Institute of Mining in Tirana. The discovery of methane adds urgency to the requirement and some progress has been made in so far as the RTZC team were shown the underground construction works for a large primary centrifugal fan installation mentioned earlier.

A visit to the Institute of Mines in Tirana revealed a wealth of study activity with two formal reports produced:

- A review of ventilation requirements with specific reference to methane;
- The design requirements for improved ventilation.

Unfortunately at this time there are simply no financial resources to complete the ventilation scheme.

The Institute staff also drew attention to the very difficult conditions reported at level 14 and the need for roof support below level 10. At the present low pace of production the problems are apparently not critical but high pressures in the surrounding rock are leading to water problems and roof instability.

The RTZC team did not have the opportunity to visit the development area below level 10 and therefore are in no position to confirm this statement.

The Institute clearly makes a vital contribution to the technical and development engineering resources available to the chrome mining industry but the relationships and reporting lines are confusing. Their input has several economic implications, illustrated by the comment that installation of the full forced air ventilation system at Bulqiza North to defeat the methane problem is going to require at least a one month shutdown of the mine.

The risk of a major explosion underground at this most important and vital centre of Albania's chrome mining industry should not be underestimated. The problem can be overcome technically but the resources are not available. A financial assistance programme separate from the ongoing review of joint venture possibilities could well be justified.

Environmental Impact

Mining at Bulqiza commenced in 1948 and since then considerable quantities of waste rock have been deposited on hillside dumps and on conical tips on flatter ground at the edge of the valley. Although visually unattractive the material is essentially inert.

Inert relatively coarse tailings from the concentrator are sent to the tailings impoundment below the plant at the head of the valley. This deposit as inspected shows no signs of weathering or eroding and is considered as posing no risk of collapse at its present height. However measures will be required to improve separation of residual suspended solids in water discharging from the tailings impoundment to avoid contamination of local streams.

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Closure Requirements

These are likely to extend as far as requiring plant and equipment to be removed, structures demolished, shafts capped, and waste rock dumps contoured. Socio-economic stress associated with the withdrawal of employment from such an isolated mining community could be considerable.

Bulqiza Concentrator

A short time was spent visiting this plant which was in operation. Much of it has been abandoned as being outdated technology, production being restricted to the relatively new spiral separators. Deficiencies in electrical wiring, access, and unguarded machinery were in evidence, a multitude of features that would instantly fail a safety inspection.

Apart from the water associated with tailings large volumes of water were being discharged from other sections of the plant, apparently overflow streams, and representing a wastage of water that could not be tolerated during the dry summer season. The sources were not traced but certainly one stream was heavily contaminated with brown solids which appeared to be soil erosion.

Security at the plant was non-existent with young people from the nearby community visiting their employee friends, a further safety risk.

3.3 Central II District - Kraste

Persons Met:

Sadik Cani	Director of Kraste Mine
Nezir Rizvani	Director of Bater Mine
Haki Disha	Chief of Kraste Mine
Agron Bala	Mining Engineer Kraste Mine
Gafur Plluci	Chief Geologist Kraste Mine

General

The town of Kraste, an isolated community at relatively high altitude serves as the administration centre for the Bater operations as well as Kraste Mine. The town appeared

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devoid of any recreation facilities, outdoors or indoors with many of the residential dwellings in an exceedingly poor state of repair.

The original intention was to visit the larger scale Bater operation but time did not allow. Discussion at the central administrative office covered both the Bater and Kraste operations with the visit concentrating on the nearby Krastę mine.

Presently about 72 000 t/y from three areas in Kraste Mine at average 35% (25-43%).

Mining Operations

Access to the mine is by adit, the condition of the access being untidy and difficult to traverse. The afternoon shift crew is employed solely in transporting of ore, a practice similar to other small operations in Albania at least during the winter months. There is an electric trolley line and the mine depends on natural ventilation. Only one overthrow loader out of 14 was working. All illumination is provided by carbide lamps.

The standard form of open stoping is modified to take account of the shallower dip of the orebody, about 50°. The orebody is severely faulted and varies between 0.5 and 10 m thick, the stope visited was about 3 m thick and contained 25% Cr_2O_3. Cones are developed in the footwall to direct the ore into a pass raised from the lower level. The presence of cones makes the operation hazardous as walking along the drilling drive involves circumnavigation of the cone with the possibility of falling down the raise. Drilling is carried out with handheld rockdrills. About seven stopes are in production.

Access to the stope visited was by a lattice work of round poles, resembling a cats cradle rather than the ladderway intended. This is a particularly dangerous function carried out daily by the miners often carrying material at the same time.

An incline haulage serves the lower level, with no stepway provided, just a mud slope for access by foot.

Ore is tipped into a bin at the surface and on to a belt for hand sorting. The separated ore is then trucked to Bulqiza for crushing and upgrading.

3.4 Northern District - Kalimash I and II

Persons met:

Ramadan Disha	Chief Engineer - Kalimash Division
Xhelal Cenka	Chief Geologist - Kalimash Divison
Lumir Hozha	Mining Engineer/Surveyor - Kalimash I
Perparim Hozha	Mining Engineer Kalimash I

There are four underground mines and two open pits or faces in the Kalimash area. Production is 20 000 t/y from open pit and 55 000 t/y from underground. The potential of the area is affected by the presence of olivine in the chrome ore - some 60% of reserves are said to contain olivine. Efforts are underway to determine means of separating the olivine from the chrome ore in the processing plant. The orebodies generally consist of low grade banded ore.

Open pit operations, more like hillside quarries, utilise conventional drill and blast techniques, with the ore being hauled to a central ore pass which connects with an underground haulage system. From a brief view of the plans stripping ratios appear high and are increasing (the orebody is 5 to 6 m thick and dipping at about 15° into the side of the mountain). Pit slope angles are also increasing. There is a potential danger in that unstable high slope angles may be attempted in order to reduce the ratio.

At Kalimash II mine the shallow dipping orebody, some 2 -10 m thick, is mined by either a form of open stoping or room and pillar. Access to the mine is by adits with an internal shaft used to connect levels. Natural ventilation is employed with a small 13 kW fan used in development headings. Electrical detonators (Albanian) are used in long hole blasting. Dynamite is used in all operations.

Exploration is carried out from underground using an electric rotary drill capable of drilling a 75 mm diameter hole with tungsten carbide inserts. Holes up to 100 m length are drilled.

Long hole drilling for the blasting employs Chinese made drifter type rockdrills, holes 8 to 10 m are drilled 36-42 mm diameter. Blasted ore falls into cones then to a lower level where a 70 kW double drum scraper pulls the ore to a pass. Ore is loaded from chutes into mine cars for haulage to the shaft.

The method is inherently safe in that miners are not exposed to the open stope or open cones, drilling and blasting taking place in the drilling drive.

The internal shaft system consists of a cage compartment and counterweight compartment. Air and pump lines are installed in the shaft. The shaft is only concrete lined in the vicinity of the station, the remainder of the shaft is unlined. A hinged section at the station is used to connect the cage to the level, this is possibly a reflection of the inability of the hoist to accurately control the position of the cage. This is in turn related to the poor quality motor control system observed at this mine and applying to other hoist installations seen in Albania.

Shaft signalling systems are basic (some change has been made in the last eighteen months) and there is a need for interlocking devices (preventing the cage from moving while men are working in the cage). The shaft station is only illuminated when the cage tender or banksman brings an electric light bulb to the station and screws it in. The area around the shaft station is dangerous in that there are openings through which a person could fall. The hoist is similar to that installed at other operations. The mechanical side is adequate but the electric system requires upgrading to ensure safe and efficient operations.

The underground compressor room was visited. Many of the eight units installed were not running because of lack of spares. The area was noisy and littered with old parts and discarded oil. One of the newer Polish compressor units was emitting a particularly disturbing low frequency sound liable to promote physiological problems other than hearing loss.

Kalimash I presented a considerable challenge to visit. Access involved a 23 km drive followed by a 4 km walk due to narrow road covered in ice. Miners travel this unlit route every day in slippery conditions frequently in the dark. Horses are used to haul supplies in winter, access to the mine by vehicle is possible for only 9 months of the year. RTZC were said to be first foreign team there since the Russians in 1965! The operations were started in 1939 by the Italians. Currently Kalimash is mining 30 000 t/y of ore grading about 30% with a complement of 165 miners.

It was at this mine that RTZC were informed of a common working practice of 28 days continuous shift work followed by a break of 4-5 days as an alternative to a six day

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working week. Such a working schedule is punishing in the extreme and could not be sustained at the higher levels of productivity that must be envisaged in future. It may also lead to safety problems through psychological if not physical fatigue.

Present operations are in the No 10 orebody accessed by an adit on the 1166 m elevation. The orebody is narrow, and in the area visited 0.5 m in width dipping about 35°. Mining is fairly crude being carried out by a longwall technique between levels, about 30 m along dip. The ore is drilled with rockdrills and blasted with dynamite. Pillars are left, if possible where the ore is low grade or faulted, to support the hangingwall. Because of the low angle the ore is shovelled down to the lower level where it is manhandled again into mine cars. The ore is trammed to a tippler serving an aerial ropeway. From the end of the ropeway the ore is dumped into an ore pass which connects to the main haulage level and on to the processing plant at Kalimash II.

The mining method used is not safe as the men are exposed to a number of hazards, sloping working floor, narrow seam where the only working position is lying prone, and poor ground conditions in the stope. The fact that accidents were stated to be few is a reflection of the skill of the miners and the relatively slow pace of production rather than the safety of the method practised.

As in most operations the walking access routes into the mine are poor in that they are littered with debris. Again the fact that more accidents have not happened is due to the slow pace of walking which is in turn governed by the undirected illumination available from carbide lamps.

Ground conditions are affected by faulting and round pole timber support is used in those areas which cut through the faults. The standard of this support is adequate in the main adit but deteriorates in the more remote sections of the mine.

All adits and stopes are subject to natural ventilation.

Explosives are stored underground. Generally magazine conditions are not ideal but adequate for the purpose.

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3.5 Burrel Ferrochrome Smelter

Persons met Hysni Kaca, Metallurgical Engineer

The Burrel smelter was built in 1979 to a Chinese design and with Chinese technical assistance. The plant comprises three electric furnaces, one being out of production for repair and maintenance at any one time. Two furnaces were in operation on the day of the visit. The visit comprised a walk-through of the smelter plant, inspection of surrounding land within the smelter boundary and discussion with Mr Kaca. The plant layout is expansive with service buildings in reasonable condition and planted open spaces providing considerable potential for a pleasant working environment.

Atmospheric Emissions and Air Pollution Control

Two of the three furnaces are equipped with an unconventional process gas cleaning and handling system specifically designed to extract heat energy from the subsequent combustion of cleaned carbon monoxide gas. The furnaces were originally designed to be totally enclosed excluding air leakage into the waste gas system. The third furnace is not served by any gas cleaning or collection system.

The basic design involved two stage venturi scrubbing of furnace gas and transfer to a compressor house which served two functions of promoting gas flow through the cleaning unit and pressurising the gas for storage in a water filled gas holder. The system is reported to have operated successfully for a number of years but was only used during the winter months. Reduction of fume emissions to atmosphere was not therefore the primary function. The gas was used in two boiler plants, one to serve the ferrochrome plant the other to supply steam to a large glasshouse complex 1 km away, the main crop being tomatoes.

This entire system of gas cleaning, storage and heat distribution has been abandoned. The main reason is that the gas holder has been partially dismantled for major repair and never reconstructed. Other components have been removed for maintenance but not reassembled due to lack of spares or simply cannibalised.

The scrubber water circuit complete with clarifiers and rotary vacuum filtration, once probably an efficient plant in operation, is in a very poor but not irretrievable condition.

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The present mode of operation is to discharge the furnace gases directly to atmosphere. There is no igniter system at the point of discharge, partial self ignition probably occurring through in-leakage of air at furnace level. The consequence is a large flare coupled with a pronounced white plume of fine particulate matter emanating from the plant. The impact of this emission in visual terms is very extensive. The smelter is located in a wide valley bounded by high mountain ranges. The fume accumulates overnight in both summer and winter months under a stable atmospheric regime forming layers within the complex inversion structures and fumigating to ground level as the morning progresses and solar input promotes mixing. The end result is to promote reduced visibility throughout the valley.

The health risk associated with the emission is likely to be low as the carbon monoxide emitted from the process is burnt at the stack and there is no indication of any hexavalent chromium content in the fume. Trapping of emissions could occur very locally under certain atmospheric conditions leading to severe air quality deterioration in nearby villages.

Reinstatement of the existing gas cleaning system is a possibility, its operational capability having been proven. As a general principle the recovery of combustible gas from smelter plant employing reduction or carbon removal processes is now commonplace with many examples found in the steel industry. The risk of explosion is always present, particularly in a batch process but the Burrel gas handling plant has apparently been very successfully operated over long periods. Although replacement parts may need to be obtained from China, pipework, and the rebuilding of the gas holder, could be sourced in Albania. Reinstatement would offer the dual advantage of eliminating air pollution and recovering energy.

A more conventional approach would be to replace the existing system by new wet scrubbing equipment possibly utilising the existing water recirculation system and clarification plant and simply burning the cleaned gases at a flare stack. Certainly some action to reduce fume emission is needed.

Water Pollution

Investigation elsewhere has shown that hexavalent chromium, the most toxic form of the element can be formed in minor amounts as a consequence of the reaction between chromite ore and alkali salts, in a ferrochrome furnace. There is no indication of the part played by

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the design of the furnace or nature of charged materials in influencing the formation of chromium 6 (hexavalent chromium).

The abandoned clarifier served to provide a practical test of the presence of chromium 6 having been abandoned whilst still full of scrubber solids. There was no indication of the characteristic yellow colouration in the accumulated rainwater as might be expected from even small quantities of chromium 6 being present. Similarly, close inspection of a nearby stream and standing water in contact with deposited slag showed no discolouration from seepage.

Currently water use is restricted to non-contact furnace cooling and thus no polluted water is discharged from the operation.

Slag Disposal

Slag granulation facilities are available on site but it was not clear whether the plant was operable. All slag make is currently cast and air cooled to form lump material which is dumped within the plant boundary. Poor practice in the past leading to random tipping over a large area contrasts with the more formalised and contained slag dumps also on site. Some of this slag has found users and certainly it was evident from travelling extensively during this study period that granulated slag from both ferrochrome and copper smelting gains widespread use for road gritting in winter.

Investigations into further utilisation are reported to be underway with commercial interest shown from Italy.

Occupational Environment

By comparison with many other industrial operations in Albania the Burrel smelter plant is relatively well ordered and functional. No obvious workplace environmental issues of dust or noise were observed although no tapping or charging operations were observed in the limited time available.

A carbon monoxide exposure hazard must be present above the furnace floor at higher levels of the plant but there is no indication this has led to accidents. Reinstatement of the gas handling system would increase the hazard demanding strict attention to gas safety and requiring resources that are not available at present to management to minimise the risk.

Safety

A safety audit would reveal a multitude of inadequacies and dangerous conditions. In the short walkthrough the RTZC team observed totally unacceptable electrical connections, temporary wiring and a low standard in overhead crane ropes and pulley blocks.

Personal protective clothing and equipment for smelter workers is not currently available. It is doubtful whether there are any formalised procedures for safety. The technical safety manager, understood to be the wife of the Director, was not available for discussion at the time of the visit.

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4 REQUIREMENTS FOR IMPROVEMENT

The key area of improvement is undoubtedly personal safety of miners and safety and integrity of the mining operations. There are occupational health issues that need to be addressed largely a combination of protecting miners whilst striving to improve the environment in which they work. This means improvements in ventilation. Fortunately the environmental impact of the industry outside the boundary of its operations is not serious and only the smelters need to be considered as requiring attention in this respect.

This chapter makes a first attempt to quantify requirements and their associated costs mainly concentrating on short term demands to raise the standards of the industry to levels of practice acceptable by Western European standards but still some distance from full compliance. It is considered unrealistic to expect Albanian industry to be transformed overnight as so much will depend on development of management skills and training, not just availability of material resources. Indeed any improvement programme is bound to fail if this dual requirement is not recognised from the outset.

In the absence of such an initiative it is salutary to consider that any attempt to increase production without improving the health and safety situation will almost certainly lead to an appalling level of accidents.

This section reviews separate considerations for the mines, concentrator plant and smelters, providing a summary of the costs considered in tabular form.

4.1 The Mines

RTZC has taken the approach of building on previous reports, providing further detail as well as considering both short and medium term needs.

Those items that are amenable to costing either because they are related to numbers employed or to numbers of operations are described below together with a justification and a cost basis.

Cap Lamps

The number of cap lamps in use in the operations is limited and indeed many operations do not have any at all. Miners are dependent on the use of unsatisfactory

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carbide lamps and RTZC consider it important that all miners are issued with cap lamps to improve safety by:

- Enabling both hands to be free, for example when climbing ladderways.

- Providing better general visibility, for example, when checking the back or roof of the working place for loose rock that could fall down and cause injury. Carbide lamps only provide limited illumination and sometimes go out.

- Providing better close visibility, for example when coupling mine cars. This operation involves placing hands between mine cars to insert couplings, at present the men work in the shadow of the carbide lamp suspended somewhere in the vicinity, as a result the risk of accidents is high.

By controlling the issue of cap lamps it is possible to determine who is underground at any time, an important benefit in the case of accidents when the location of men must be promptly ascertained. The miner would exchange a token or disk bearing his name or mine number to obtain a lamp, reversing the procedure at the end of shift. A check at the end of shift would indicate who is still underground, possibly missing. The fact that a specific lamp is issued to a miner also serves as a check on possible abuse of the lamp. The introduction of cap lamps will be a failure if not accompanied by the system to support the initiative as is evidenced new at Bulqiza and Pojska.

The provision of cap lamps and charging facilities is estimated to cost approximately $150 for every miner. Cap lamps at $120 each will need to be replaced every three years.

Personal Protection Equipment

The amount and type of personal protection equipment presently issued to the miner is minimal and the following is recommended as standard issue to all miners.

- Safety boots with steel toe caps. Boots with metatarsal protection should be available for those whose work require them, for example miners engaged in development work and stoping operations.

- Safety gloves appropriate to the type of work undertaken.

- Hearing protectors are required by those working in noisy areas, for example, drilling.

- Safety lanyard, usually a feature of the belt that is used to carry the battery for the cap lamp. The lanyard is important for working in any area where there is a danger of falling.

- Safety glasses are specifically required in many areas of work, for example drilling.

The provision of the above is estimated to cost approximately $120 for every miner employed. The annual replacement cost will be the same.

Changehouse facilities

Suitable facilities for changing, showers and toilets are almost non-existent at all operations. Because of the state of the buildings in which they are housed it is proposed that the installation of these facilities takes place in two stages.

In the short term the existing buildings should be equipped with heating, showers and toilets. A heating system will of course need to be installed and this also entails fitting windows etc. A heating system could also serve the offices which at present are not habitable in winter. Estimates stated here are order of magnitude numbers and relate to the size of the mine.

Large operation:	$100 000
Medium	$70 000
Small	$40 000

In the medium term new buildings may be required, the actual timing and cost depending upon the potential life of the mine its size and relative importance.

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Mine Rescue Equipment

In the short term basic supplies, for example CO_2 absorbent will be needed. It is estimated that material to the value of about $5000 will be required by each mine.

This estimate excludes the cost of replacement or refurbishment of buildings used as a base for mine rescue equipment maintenance, servicing and training.

Underground Facilities

All of the mines have sub-standard mining facilities and require improvements in safety standards.

- None of the ladderways seen can be regarded as safe. It will be essential to make provision for the installation of suitable ladderways in all operations.

- There are many areas of the mining operations where simple timber support is installed and is ineffective, there are also parts of the mine where there is no support. An allowance should be made for an initial one-off cost for rectifying this situation. Cement grouted reinforcing bar is recommended as the cement and bar should be obtainable locally.

- All operations require facilities underground for first aid. In most cases this will be a simple first aid box stocked with suitable first aid material together with a simple stretcher designed for protection of injured personnel being carried underground.

- There are many instances of where openings (orepasses, tips, shaft stations) are uncovered and unprotected rendering them dangerous. Corrective action will be required in the short term.

- None of the mines have any form of safety or warning signs. Of specific mention is the need to indicate the second means of egress. Although not specifically checked it is likely all mines do have an alternative means of egress should for any reason (rockfall, fire or accident), the primary access be blocked. It is essential that this second means of egress is adequately signposted so that miners can leave the mine quickly and safely.

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Estimates stated here are order of magnitude numbers and relate to the size of the mine.

Large operation:	$40 000
Medium	$35 000
Small	$20 000

Ventilation

Most mines make use of natural ventilation and this is likely to suffice in the short term. However auxiliary fans (15 to 40 kW size) and ducting are needed in the short term to ventilate development headings. Currently only a very few headings are ventilated mechanically, those that are not ventilated will have unsatisfactory levels of blasting fumes.

Estimates stated here are order of magnitude numbers and relate to the size of the mine.

Large operation:	$20 000
Medium	$15 000
Small	$10 000

In the medium term a detailed ventilation study will be required in addition to the work planned for Bulqiza North to determine the primary ventilation requirements.

Service Water

There is no service water reticulation system installed in any operation. This will be necessary to supply drills with water to suppress dust. Wetting of the muckpile during loading will also reduce dust problems.

Ideally this should be a short term objective but realistically can be set as a short to medium term objective as dust generation will increase as production rates rise. Estimates stated here are order of magnitude numbers and relate to the size of the mine.

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The mechanical features of the hoists appear to be adequate, although some parts do not comply with current international standards. The electrical features however do need improving. Ideally this would entail the replacement of the motor control system, overspeed and overwind devices and interlocks but realistically only the specific safety devices can be expected to be replaced in the short term. Each hoisting system upgrade is estimated to cost $10 000 in the short term and a provision should be made for $50 000 per hoist system in the medium term.

Electrical Distribution

The standard of electrical installations is very poor, many instances were seen of crude connections with bare wires and absence of cable racks. No circuit or earthing protection units were evident. It would be necessary to carry out a once-off upgrade of existing installations in order to render them safe. It is fortunate in some respects that the electrical distribution systems are neither extensive nor carrying a heavy load. Estimates stated here are order of magnitude numbers and relate to the size of the mine.

Large operation	$30 000
Medium	$20 000
Small	$10 000

Observations during the visits prompted recognition of further areas of improvement that will require attention and will have a major bearing on improvements in health and safety. No estimate of cost is given as it is assumed the considerations have already been covered by previous estimates of capital requirements and revised operating cost predictions designed to achieve full economic potential.

The first set of improvements relate to the locomotives employed and to mine planning and mining methods.

Locomotives

The existing trolley line locomotives are in a very poor state of repair, connect to a 380 V DC overhead line which is precariously suspended close to where miners walk. These locomotives should be replaced by battery powered units. In the short term this recommendation should be applied to new areas with the aim being to replace all trolley locomotives in the medium term.

The battery powered locomotive will be able to be used in those areas where, because of the small size of development, only hand tramming is carried out at present. In addition back problems in miners could be reduced.

In addition, it is suspected that many of the injuries that occur during coupling of mine cars are a result of the limited inching capability of the existing trolley locomotives. The introduction of new battery locomotives should eliminate this problem.

Battery operated locomotives will certainly be required in areas at Bulqiza North subject to the methane hazard.

Mine Plans and Mining Methods

All of the mine plans seen were of poor standard. An initial effort will therefore be needed to bring the plans up to a suitable standard. Good plans will be required not only for production planning but also for safety related matters such as ventilation provision and emergency egress.

There are many instances where a change in the mining method will lead to improvements in safety and health. That changes have not been made is believed to be a reflection of the lack of investment capital. Improvements in mining methods will lead to productivity gains and cost reduction, in addition to health and safety gains. These will be self-financing and therefore the cost is not included here.

As an example the use of long hole drilling machines instead of hand held rock drills would mean that the number of sub-levels could be reduced allowing a greater concentration of safety effort.

The long hole drilling units proposed are relatively simple units. Although in Western operations these units are now electric-hydraulic types, the older pneumatic type would be better suited to operations in Albania.

The selection of more productive and safer mining methods should be the subject of a separate exercise.

Finally three staff and employee considerations are included here to emphasis that without the drive to introduce different concepts of managers perception of responsibility, consultation, work schedules and procedures, health and safety and environmental standards will remain at unacceptably low levels.

Management and Supervision

The general impression gained during the visits was that there is insufficient management control. The result of this is that the miners appear to do what they want and therefore no effort goes into maintaining a safe and hazard free working area. This is particularly noticeable in the main accesses in the mine where rocks, rubbish, mud and other debris have been allowed to accumulate. The fact that it appears that there are not many accidents is more a reflection of the pace of work than the magnitude of the problem. The cost of clearing the rubbish and debris is assumed to be part of the normal mining operations and is recommended to be part of the short term priorities.

The issue of discipline and effective management will need to be carefully addressed as the demand for increased productivity is made (see section on Loss Control).

Loss Control System

Although the working places are checked by "technical inspectors" for compliance against regulations there is no systematic management approach for health and safety. The method adopted in many Western operations is that of Loss Control. The procedures inherent in Loss Control provide a framework for the management of health and safety issues and are particularly relevant for situations where no formal health and safety management system exists.

Such a system available as a standardised package of procedures, should be introduced to the operations as soon as is practical. The cost of implementation will be incorporated in the overall management costs of the operation.

Working Arrangements

The 28 day working rota without a break is unsatisfactory. It creates fatigue on the part of the miner which in turn, can only lead to accidents. As a first step where this is currently practised the working schedule should revert to a 6 day working arrangement with possible reduction being subject to future negotiations.

The small mines may prove unattractive to potential investors or the recommendations made here to improve health and safety issues may prove onerous for small operations. In such circumstances the European Bank should consider providing loans to enable the mine to establish a privately owned co-operative. The loan should take into account both safety requirements and the need to provide equipment as well as the provision of consultants to advise on improvements that are required in mining and management.

Funds could be made conditional on the supply of ore to the smelters or for export. It is possible that such loans, if generated by the European Bank, could be provided by the smelters or other purchasers of the ore.

4.2 Concentrator Plant

Attention has been drawn to the purely physical method of separation adopted at all concentrator plant within Albchrome. This could change in future with the possibility of surface active chemicals being employed to permit treatment of the alivine rich chrome ore characteristic of the Kalimash mining area.

For the present however crucial improvements are required in terms of availability of personal protective equipment and in plant safety generally.

It can be assumed that the manning recorded for each operational region in the tables contained in Section 4.4 include those employed in the three main concentrator plants and that due allowance has been made for the short term improvements required.

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A full safety audit would be necessary to identify plant and equipment replacement where unsafe conditions exist.

4.3 Smelter Plant

Fume arrestment is a significant environmental issue. Currently furnace fume and gases are emitted directly to atmosphere through natural draught vents, by-passing existing gas cleaning and gas recovery equipment.

In the case of Burrel the gas recovery equipment has been abandoned for some considerable time having failed in service. The entire system is in a poor state of repair and the gasholder partially dismantled. At the newer ferrochrome smelter located at Elbasan, equipment of the same design and function is installed, the construction of the gasholder remains to be completed and the system commissioned.

The principle of recovering energy through conserving waste gases of high calorific value for heated power generation is attractive. In the case of Burrel the heat so produced was used to dry raw materials and for glasshouse heating off the site. Only two out of three furnaces were equipped for gas recovery and it is suspected a similar limitation applies to Elbasan.

This gas handling equipment is proven in use and its reinstatement at Burrel and completion and commissioning at Elbasan would seem to be a realistic option. This is particularly so as any replacement equipment to control air pollution is likely to retain similar features of gas scrubbing and furnace pressure control. Either way the present water recirculation and solids separation plant serving the existing scrubbers could be utilised bearing in mind the possible need for treatment of blowdown to remove hexavalent chromium.

In the absence of a critical process engineering evaluation at either smelter RTZC is restricted to providing broad cost estimates for reinstatement and replacement.

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Short Term

Burrell - Reinstatement of existing gas cleaning	$1.5 M
Elbasan - Completion of existing installation	$0.5 M

Longer Term

Both smelters - Replacement by new waste gas scrubber system	$8.0 M

Apart from the clean-up of land degraded by random tipping of air-cooled slag at Burrel all other improvement requirements in environment, health and safety relate to plant procedures. There is a vital need to improve housekeeping and to introduce new safety procedures designed to defeat the very poor work practices. The most basic of personal protective equipment such as hard hats, gloves, hot metal splash clothing is also required.

4.4 Summary of Costs

The initial estimates of cost for both the short term and medium term requirements for the mines are set out in Tables 1 and 2.

Short term requirements are considered under the following headings;

- Cap Lamps.
- Personal Protective Equipment.
- Changehouse Facilities.
- Mine Rescue.
- Mine Facilities.
- Secondary Ventilation.
- Water Services.
- Safety Helmets.
- Electrical Reticulation.

In almost all the cases cost estimates are based on production and manpower figures provided in the report prepared by Grundstofftechnik for the European Bank. Manning figures for example relate to the 1990 situation, the last year of regular output. As numbers employed are reducing and no doubt will continue to do so, the out-turn cost could be lower than the figure quoted.

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The outstanding cost for completing the full forced air ventilation scheme at Bulqiza No 1 is considered a major development project and is not included in Table 4.1.

Many of the medium term requirements discussed in Section 4.1 and 4.2 have not been costed. A number of these measures are likely to be included under categories related to operations and production improvements yielding additional benefits from a health and safety point of view.

Fume arrestment at the two smelters should also be viewed as a discreet development project requiring an initial assessment of alternatives before embarking on the appropriate course of action for each plant. Consequently the notional estimates referred to in Section 4.2 have not been included in Table 4.2.

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Environmental and Health and Safety Issues of Albchrome Operations

Table 4.1

Short Term Requirements ($ US)

Zone	Enterprise	Mine	1990 Annual Production* (x 1000 t)	Men*	Cost	Cap Lamps $180	PPE $120	Change-House	Mine Rescue	Mine Facilities	Ventilation	Water Services	Helmets	Electrical Reticulation	Total
North	Kam	Zogaj	32	650		97600	78000	40000	5000	20000	10000	5000		10000	265600
		Lajthize	9												
		Riragam	6												
		Tpla	12					20000	5000						
		Cabrat	2												
	Kalimash	Kalim. Pirol Batres	167	900		135000	108000	100000	5000	40000	20000	15000	10000	30000	463000
		Vlahne	7												
		Qafe Perroliaj	2												
Total North			237	1550		232600	186000	140000	10000	60000	30000	20000	10000	40000	728500
Central	Bulqiza	Bulqiza North	176	4050		607600	486000	100000	5000	40000	20000	15000	60000	30000	1363600
		Bulqiza South	81					70000	5000	30000	15000	10000		20000	150000
		Qafe Lame	25					40000	5000	20000	10000	5000		10000	90000
		Temove	41					40000	5000	20000	10000	5000		10000	90000
		Qafe Buall	-												
		Livadhi Dashit	-												
	Bater	Bater + Bater South	194	3647		532050	425640	100000	5000	40000	20000	15000		30000	1167690
		Lugi I Gjate & 10 Korriku	9												
		Lugi I Qershise	4												
	Kraste	Kraste	26					40000	5000	20000	10000	5000		10000	90000
		Thekna	31					40000	5000	20000	10000	5000		10000	90000
		Maja e Lugut	32					40000	5000	20000	10000	5000		10000	90000
	Klos	Shkalle	29					40000	5000	20000	10000	5000		10000	90000
		Maja e Kunores	6												
		Vonas	1,6												
		Manastreni	7												
		Liqeni I Dive	0,6												
Total Central			661	7697		1139550	911640	510000	45000	230000	115000	70000	60000	140000	3221190
South	Pirenjas	Katjeli	18												
		Menik	14												
		Guri Pishkashit	4												
	Pogradeç	Pojska	68					70000	5000	20000	15000	10000		20000	140000
Total South			94	970		145600	116400	70000	5000	20000	15000				371900
Total Mines & Concentrators			992	10117		1517550	1214040	720000	60000	310000	160000	90000	70000	180000	4321590
Smelters		Burrel, Elbasan		1600			50000	10000					10000		
Total Company						1517550	1264040	730000	60000	310000	160000	90000	80000	180000	4391590

* Figures from Grundstofftechnik Report

Environmental and Health and Safety Issues of Albchrome Operations

Table 4.2

Medium Term Requirements ($ US)

Zone	Enterprise	Mine	1990 Annual Production* (x 1000 t)	Men*	Hoisting systems	Ventilation**
North	Kam	Zogaj	32	650		
		Lajthize	9			
		Rragam	6			
		Tpia	12			
		Cabrat	2			
	Kalimash	Kalim. Prol Batres	167	900	50000	
		Vlahne	7			
		Qafe Perrollaj	2			
Total North			237	1550	50000	
Central	Bulqiza	Bulqiza North	175	4050	150000	
		Bulqiza South	81			
		Qafe Larne	25			
		Ternove	41			
		Qafe Buall	-			
		Livadhi Dashit	-			
	Bater	Bater & Bater South	194	3547		
		Lugi i Gjate & 10 Korriku	9			
		Lugi i Gershise	4			
	Krasta	Krasta	26			
		Thekna	31			
		Maja e Lugut	32			
	Klos	Shkalle	29			
		Maja e Kunores	6			
		Vanas	1,6			
		Manastreni	7			
		Liqeni i Dive	0,6			
Total Central			661	7597	160000	
South	Prrenjas	Katjeli	18			
		Menik	14			
		Guri Pishkashit	4			
	Pogradec	Polska	58			
Total South			94	970		
Total Mines			992	10117	200000	

* Figures from Grundstofftechnik Report

** Medium term ventilation costs subject to further study

R.T.Z. Consultants

5 ENVIRONMENTAL, HEALTH AND SAFETY LIABILITY

5.1 General Statement of Risk

Not surprisingly there is no statistical means of determining occupational risk in the Albanian mining industry. In the past the Government has seen no need to collect such data on a routine basis and it is arguable whether any reporting system could have functioned effectively. Apart from a period early on in the industrialisation of the country by the Chinese in the late 1960's the specialist resources available have not matched the need. Problems have largely been addressed on a reactive basis directing studies to particular problems or crises. An example of this is the investigational focus on ventilation at Bulqiza in 1986 following 22 separate gassing cases that led to fatalities requirement and the fatalities. Another is the issue of exposure to lead at the Berat Battery plant reported by RTZC last year.

Local medical practices have tended to treat workers and repatriate them without reporting to any central planning agency, a lost time injury or fatality being seen as an inadequacy to be covered up rather than reported and acted upon.

The reliance on centralised measurement and assessment capabilities and services such as investigation of workplace environmental conditions was appropriate as long as transport, equipment and support services were available. The publication of a major study on environmental conditions at places of work in Albanian mines by the Institute of Hygiene and Epidemiology is testament to the genuine professional concern for workers health in some quarters. The conclusions drawn then in the 1970's would probably be no different today other than reflect a markedly higher level of activity.

The RTZC team uncovered a litany of unsafe conditions on every visit, conditions that in many cases would be considered life threatening. It is frequently the case however that workers who live with constant reminders of the danger surrounding them, take added precautions as a consequence. A further factor is the current state of the chrome industry in low gear coupled with an abysmal level of manpower productivity. Workers have the time to think and to anticipate, to take avoidance measures. This as much as any consideration appears to be why the frequency of reported accidents is relatively low when it is patently obvious that unsafe conditions abound. This being so it is a clear warning that any attempt to raise productivity without addressing safety awareness, safety training, new working methods, equipment maintenance and housekeeping is likely to result in dire consequences with soaring accident frequency.

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The development of a new working culture and the resources to support it must be a first priority.

5.2 Environmental Impact

As a general observation underground mining of chromite ore does not present a major threat to the environment. Both the economic minerals present and the host rock are inert in terms of weathering and release no toxic pollutants into the environment.

Upgrading of mineral by density separation is a physical process resulting in the discharge of finely ground solids or tailings. In two out of three concentrator plants visited the underflow from the clarifiers containing thickened tailings is discharged directly to the environment in mountainous terrain. Retention behind conventional tailings dams would be a difficult and even dangerous practice. The inert solids accumulate on flatter ground or in impounded waters. At Kalimash the solids accumulate in the lake supplying the Drin River hydroelectric scheme. The high rate of natural erosion in the surrounding hills probably contributes a far greater burden of suspended solids. In contrast the tailings are impounded at Bulqiza, the impoundment occupying the head of a relatively dry valley and not obstructing natural drainage. The low dam wall is stable and free of erosion.

The quantities of waste rock generated are largely restricted to material produced during the driving of access adits, shafts and headings. Present mining practices involve minimal dilution of ore by waste rock.

Post-closure remediation at the mines will need to focus on rendering the sites safe for access, removing existing buildings and blocking shafts and adits. Some recontouring of deposited waste rock will be necessary together with a revegetation scheme all of which could be accomplished within one year of any closure taking place.

At the smelter sites the only additional dimension could be the occurrence of chromium 6, known to be present at low concentration in emissions and water discharges from certain ferrochrome smelter processes. The emissions although uncontrolled at present are unlikely to have led to any significant level of environmental degradation. The risk of soil or groundwater having been contaminated is considered minimal, the only significant legacy being the indiscriminate dumping of slag.

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5.3 Occupational and Public Health

Public health liability of any significance originating from mining and smelting of chromite can probably be discounted. Certainly there is considerable evidence of the contribution of Albanian industry to public health issues of air quality in urban areas of Albania. These industries include copper smelting, oil refining and chemicals production. The population of Elbasan is reported to exhibit a history of respiratory complaints related to poor air quality arising from domestic fuel burning and from the heavy pollution inventories of the cement and metallurgical plants. The smelter emissions, admittedly uncontrolled from the new ferrochrome plant could not have markedly influenced what was reported as a very serious situation some years ago.

As regards occupational health, Albanian specialists point to poor mine ventilation and consequent accumulation of toxic gases from blasting as being the most critical factor in underground working. They report a large number of cases of gassing fatalities and permanent respiratory disability arising from exposure to a mixture of carbon monoxide and nitrogenous gases such as nitrogen oxides and ammonia. The published accident statistics bear this out and reflect directly on the inability to introduce sufficient ventilation through mine planning, monitoring and deployment of equipment. There is no excuse for such accidents as protective measures are clearly understood in mining circles. Indications are that in a typical year until recently up to 5 miners in the chromite mines would be fatally gassed each year with perhaps a further 30 experiencing severe toxic effects and collapse. The long term chronic effects are impossible to gauge but extensive incidence of respiratory ailments can be expected. Clearly this problem is not confined to the chromite mines.

Exposure to dust is a further issue. Dry drilling is practised and dust is not dispersed due to lack of adequate ventilation in some mine areas. Major mitigating features are the reported absence of crystalline silica, a universal observation throughout chromite mining in Albania the level of moisture encountered, and the low production rates.

Having initially expressed concern at the presence of chrysotile asbestos in joints of the dunite rock surrounding the ore mineral deposits at Bulqiza the RTZC team failed on this occasion to identify any asbestiform mineral in any other mine location or indeed at Bulqiza itself. The original sighting now appears to be an isolated case, a view supported by Albanian specialists in occupational health.

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Silicosis and mixed dust pneumoconiosis the main occupational diseases of miners in Albania are recognised as being associated with coal and copper mining and also silica crushing and milling. In the last few years many cases have been treated at the hospital for occupational diseases in Tirana. No cases have been reported from the chromite mines even although no personal respiratory protection is available. Unfortunately there are no medical records available to confirm this anecdotal evidence.

Smoking is commonplace amongst the male population in Albania and is likely to be a dominant cause of respiratory illness.

Exposure to both noise and hand/arm vibration can be expected to have taken their toll on hearing loss, tinnitus and vibration white finger. No ameliorative measures are taken to combat noise and vibration and there are no personal protection programmes in place.

5.4 Accident Possibilities and Safety Risk

Whilst all mining operations in Albania visited by RTZC fall short of international standards of safety, there continues to be a commitment to reasonable safety practices with the basic mining law and regulations extending to individual operations. Albanian mining law is in the process of being redrafted to be responsive to the new situation.

Some 100 Albchrome employees out of 10 000 are known to hold full-time jobs in "technical safety". So abrogation of responsibility by the Company is not at issue. Poor safety performance has been as much a reflection of lack of material resources as of poor practices.

The fatal accident and disability injury frequency rates experienced are unacceptable but it is inappropriate to describe this as a result of wilful disregard of workers welfare and safety.

A number of claims from accident victims for subsistence and family maintenance, as yet unmeasured, can be anticipated as financial support from the state diminishes.

Albchrome management and other government officials readily acknowledge that both "prisoners of conscience" and common criminals were employed as forced labour at certain chrome and copper mines in Albania whilst serving their sentence. The chrome mines concerned were:

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Bulqiza North
Bater
Ternova

Hundreds of prisoners were involved over many years. Although there are suggestions in reports held by Amnesty International, for example of poor safety practices at one of the copper mines there is no indication that conditions experienced by prisoners were any different from those experienced by the mining population as a whole.

It is understood that the Albanian government has recently passed a law designed to compensate people who were involved against their wishes in such labour programmes. No details are known to RTZC. It is unlikely that any foreign company would be expected to accept any liability for the particular conditions that may have prevailed at these sites.

5.5 General Living Conditions of Employees

Certain towns, notably Bulqiza and Kraste can be considered as dormitories for the chrome mines with no other employment activity. These towns are also isolated with difficult road access. In other areas of the World the mining company would be expected to contribute to some extent to the social well-being of the community from which it draws its employees. Certainly in the case of Kraste the poor condition of housing and public buildings was very apparent. Intervention will be required to find solutions to certain basic needs of these communities in terms of:

- Public health and sanitation.
- The implications of any reductions in the workforce.
- Motivation, health and well-being of those retained in the industry.

RTZC made no reference in Albania to this indirect or secondary liability. However it was recognised even in the short time spent at these locations that investment in the community is likely to constitute a very significant part of the business once the State withdraws from providing any financial support for such communities, a situation that may already apply.

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ANNEX 1

List of Contacts

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Ministry of Health

Agim Sheki	Head of Occupational Health
Queramedin Kodra	Hygiene Institute

Ministry of Industry and Mines - Safety Centre

Bardyl Shushku	Chief Inspector
Bacchi Hoxha	Inspector in Mines and Mineral Processing

Albchrome

Ardit Duma	Foreign Co-operation
Agim Cevani	Safety

Institute of Mines

Fehmi Asllani	Director
Petrag Krastafilasn	
Cretain Magniu	
Vasil Guola	

Albchrome - Tirana

Agim Cevani	Mining Engineer/Safety
Ardit Duma	Foreign Cooperation

Bulqiza Mine

Asllau Mysliku	
Grezim Daute	Mine Director
Sulejman Meta	Technical Safety
Ferit Puca	Technical Safety
Vehbe Musta	Chief Engineer

Pojska Mine

Piro Llakmani	Chief Geologist
Ardian Lipo	Chief Engineer

Burrel Ferrochrome Smelter

Hysni Kaca	Metallurgical Engineer

Kraste Mine

Sadik Cani	Mine Director, Kraste
Nezi Rezvani	Mine Director, Bater
Hake Disha	Mine Captain, Bater
Shaban Zhaboli	Mine Captain, Kraste
Argrom Bala	Mine Engineer, Kraste
Grafar Plloci	Chief Geologist, Kraste

Kalimash

Ramadan Disha	Chief Engineer
Xhelal Cenka	Engineering Geologist (ex director)
Lumir Hozha	Surveyor Kalimash 1
Perparim Hozha	Mining Engineer Kalimash 1

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