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BRILLIANT CREEK GOLDFIELD

E.L 24/82



# A N N U A L   R E P O R T

May, 1986.

BY: M.R. BENDALL

FOR: OCEANIA TASMANIA PTY.LTD.

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BRILLIANT CREEK E.L. 24/82.

OCEANIA TASMANIA PTY.LTD.

ANNUAL REPORT MAY, 1986.

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INTRODUCTION: Included in this years report is a summary of the lease details and a report prepared by consultant geogogist, Peter Goldner. The result of the cross checking of previous geological interpretation and further assaying has led to the decision to start trial sampling the lodes. This will establish the exact recoverable amount of gold per tonne to see the amount of free as opposed to sulphide and amalgamated gold. This will be done with a mobile mill, plans of which are also included in this report.
As the assays of the mullock heaps, soil samples and lodes are not yet available they will be included in the next quarterly report.

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# EXPLORATION LICENCE BRILLIANT CREEK

## 1. LEASE DATA

| | |
|---|---|
| Licence No. | E.L. 24/82 |
| Location | Upper Scamander, N.E. Tas. |
| Granted | 1983 |
| Area | 20 sq. Km. |
| Land Status | Crown Land |
| Ownership | Oceania Tasmania Pty Ltd. |
| Encumberances | Nil |
| Mineral | Gold |

### Licence Conditions:

Amount expended on Lease (2 years) $17,749

(plus geophysical prospecting and research by Geological Department of University of Tasmania)

Reduction of Area: This exploration licence must be reduced to 10 sq kms by five years from date of granting (namely May, 1988)

Period of Licence: Issued for 12 months with renewals for further 12 month periods.

Maximum tenure is 10 years (namely May, 1993).

Expenditure Requirements: (Annual) $5,000 per annum, with provision for over-expenditure to be carried forward to meet under-expenditure.

## 2. EXISTING INFRASTRUCTURE

| | |
|---|---|
| a) Access: | Public road frontages |
| b) Electrical power: | Not available (10 Km from lease) |
| c) Water: | Brilliant Creek and Scamander River |

## 3. CURRENT ACTIVITY ON ADJACENT LEASES

Nil

## 4. SUMMARY OF SALIENT GEOLOGY

The area covered is the southern extension of the Upper Devonian Mt. Pierson Pluton where it contacts the lower Devonian Mathinna beds (mainly sandstones and shales). This contact is marked by an east-west trending ridge which is in the centre of the licence area and is the major area of mineralisation which generally runs north-south in fissures up to 30 metres in width. The granite is also mineralised with extensive silification, sericitisation and fracturing.

## 5. PREVIOUS MINING AND EXPLORATION

The New Cathage, Trafalgar, Double Event, Brilliant, Queen of the Earth, and Golden Ridge are the only mines in the area. They were all abandoned about 1900 due to poor access, sulphide processing problems and lack of capital, the maximum depth reached being 60m at the Trafalgar Mine. Past mining in this area can only be considered as prospecting with no serious development having taken place and no accurate record of total production. Recorded crushings of 101 tons of ore from the mines yielded 239.8 ounces of gold being an average grade of 2.37 ounces per ton for the field.

## 6. POTENTIAL TARGET

The potential is a possible fissure 1 Km in length with variable grades some being greater than 1 ounce per tonne. These occur in lodes averaging over 1 metre in width, within a fissure up to 30 metres wide, and run through both sedimentary and igneous rocks.

## 7. WORK UNDERTAKEN BY MINSTOCK

Recent exploration points to a great potential for the area. A composite sample from the Queen of the Earth dump assayed 8 grams per tonne from reefs up to 1.6 metres wide and up to 330 metres long within a lode channel over 30 metres wide. Work done so far has defined a fissure. Relocating, opening and assaying of old workings and dumps has been undertaken. Stream sampling has also produced encouraging results and the area has been mapped.

## 8. PROPOSED FUTURE EXPLORATION AND COST

More extensive assaying of mine workings and fissure outcrops needs to be undertaken, along with electromagnetic transects to define the strike and extent of the fissure. This would lead to drilling along strike and at depth of this extensive fissure lode system, this whole programme being completed.

# AN EVALUATION OF THE BRILLIANT CREEK GOLDFIELD

BY PETER GOLDNER AND ASSOCIATES

Suite 502, 5th Floor,
Commercial Union Building,
109 Pitt Street,
SYDNEY N.S.W. 2000.

FOR OCEANIA TASMANIA PTY.LTD.

## INTRODUCTION: BRILLIANT CREEK

Exploration Licence 24/82 held in the name of Oceania Tasmania Pty.Ltd., a subsidiary of the Minstock Group, covers an area of 20 square kilometres approximately 20 kilometres northwest of Scamander.
The area can be reached by an unsealed bush road known as Hogans Track which turns off the Fingal-Mathinna road some 5 kilometres from Mathinna.

## Geology and Mineralisation

The area is underlain by a sequence of interbedded grey to yellow and brown micaceous sandstones and minor dark grey carbonaceous shales belonging to the Lower Proterozoic (probably Lower Devonian) Mathinna Beds. ?. ? Upper Palaeozoic

In the northwestern part of the area held, the sediments have been intruded by the Upper Devonian Poimena Pluton which consists of a blue-grey, biotite bearing granite/adamellite.

In the Beahrs and Ryan Creek area discontinuous roof pendants of metamorphosed sediments are frequently present and Groves (1972) suggests that the roof of the Pluton dips moderately to the south.

The eastern contact zone of the intrusive is composed of biotite granodiorite which extends as a thin band north from the Trafalgar Mine.

The Mathinna Beds have been regionally folded along north northwesterly trending axes and some modification due to subsequent folding has frequently occurred.

The mineral occurrences in the Scamander area show a marked mineralogical zonation and can be divided into a number of categories i.e. wolframite - molybdenite deposits, cassiterite deposits, chalcopyrite - arsenopyrite - pyrite deposits galena - sphalerite - arsenopyrite deposits, and gold - silver - arsenopyrite deposits. The prospects with in E.L. 24/82 belong to the latter group.

The main mine workings in the area are known as the Trafalgar, New Carthage, Double Event, Brilliant, Golden Ridge and Queen of the Earth Prospects. The Trafalgar and Double Event workings occur within the biotite granodiorite at the edge of the Piomena Pluton while the remainder all occur within Mathinna Group sediments above the south dipping roof of the intrusive.

The various deposits have been described by Twelvetrees 1900 (a) and (b) and subsequently by Henderson 1935 and 1939.

All the known deposits consist of narrow (generally less than 0.5 m) quartz veins which usually contain arsenopyrite and in some instances pyrite, chalcopyrite and galena. The gold is invariably associated with silver and appears to occur both as electrum and also in the sulphides. (Twelvetrees 1900).

## Mining and Exploration History

Accurate production details are not available however from the description of the old workings in the literature it would appear that only a minor amount of gold was extracted from these prospects.

Summary details of the available data from the various prospects are tablulated in Table 2:

of what? Ore

T A B L E 2

| Mine | Strike of Vein/veins | Dip of Vein | Width (metres) | Recorded Production | Indicated grade | Type of Workings | Comments |
|---|---|---|---|---|---|---|---|
| Trafalgar (New Carthage) | ENE | Steeply S | up to 0.3 m | 46 tonnes | 122 g/t gold 122 g/t silver (Groves 1972) | Shaft to 61m, 2 levels adits and prospecting pits. | Sample of dump material collected by Minstock contained 14.1 g/t gold. |
| Double Event | 2 parallel 057° & 067° | Steeply N | from 0.25 to 1.0 | ? | from 4.97 g/t gold to 132 g/t gold Twelvetrees (1900 a) | Shaft to 18m | |
| Brilliant | North to north north east. Sub parallel to bedding | Vertical | Very variable up to 1.52 | Possibly about 100 tonnes | 21 to 61.2 g/t gold Twelvetrees (1900 a) | Shafts to 12m and 6.1m and some prospecting pits. | Numerous other small quartz veins and old workings in the general vicinity. |
| Golden Bridge | Gold mainly on joints | | Up to 0.3 | 140 tonnes in 1932 | 1.53 to 19.9 g/t gold up to 50 g/t silver. Twelvetrees (1900 a) | Shaft to 23m at least one drive. One 165m adit and an open-cut. | Channel sampling by Henderson 1939 yielded a maximum of 3m averaging 13.1 g/t gold and 4.8 g/t silver. |
| Queen of the Earth | 035° | 45-60° to SE | 0.3 to 1.6 | 196 tonnes | 15.9 g/t gold possibly up to 34 g/t gold. Groves (1972) Twelvetrees (1900 b) | Adit and two shafts. | Composite sample of quartz vein material with arsenopyrite. Collected by Minstock contained 9.23 g/t gold and 12.9 g/t silver. |

Minstock have only undertaken limited reconnaissance exploration within the area to date. This has included panning of a number of the drainages and noting the amount of visible gold present in the pans. Some limited grab sampling of dump material has been undertaken at the Queen of the Earth and Trafalgar workings and assay results are shown in the comments column of Table 2.

A resistivity survey was also carried out over the Trafalgar Mine area with inconclusive results.

The writer visited the New Carthage/Trafalgar (workings no longer accessible) line of lode and the Queen of the Earth Workings. The New Carthage workings are situated approximately 200 metres north northeast of the Trafalgar workings on the same line of lode and adjacent to the main access road. Numerous small shallow exploratory pits and trenches have been excavated between the two main workings. Dump material suggests the New Carthage mineralisation consists mainly of vein quartz containing variable proportions of coarse grained arsenopyrite which in places can constitute 30-40% of the rock. The host sediments have been hornfelsed and the records suggest the New Carthage adits were driven through the sediments to the granite contact. The dump material at the Trafalgar workings consist mainly of biotite granodiorite which is occasionally weakly stained by iron oxide and infrequently silicified. Only minor vein quartz was noted and this generally contained some minor arsenopyrite (generally less than 3%). The veins appear to have formed along fractures and dump material at both the New Carthage and Trafalgar workings suggest the mineralised vein was probably less than 0.5 metres wide. Assuming a strike length of 200 metres, a width of 0.5 metres and a depth extent of 100 metres (which is probably optimistic), this lode would have a potential of about 23,000 tonnes applying an S.G. of 2.3. Historical records indicate a grade of up to 122 g/t gold and Minstock sampling of Trafalgar dump material returned a grade of 14 g/t. However as the entire length of lode was not developed it is likely the high grade mineralisation occurred in restricted shoots and an average grade for the entire length of lode of 15 g/t would probably be optimistic.

The Queen of the Earth Workings lie near the bottom of a steep ridge approximately 40 minutes walk from the nearest trafficable road. The workings consist of an adit approximately 35 metres in length and an open stope to surface has been developed on a quartz vein approximately 20 metres from the adit mouth. The vein channel exposed in the workings, dips approximately 50$^{\circ}$ west and consists of massive, iron stained vein quartz containing arsenopyrite. The vein channel was stoped over a width of between 0.6 and 1 metre however the entire width does not appear to have consisted of quartz. The vein appears to have been stoped over a length of approximately 15-20 metres suggesting that the high grade mineralisation occurred as shoots within the vein. The mineralisation noted on the dump is similar to character to the New Carthage mineralisation.

T A B L E 3

| Mine | Strike of Vein/veins | Dip of Vein | Width (metres) | Recorded Production | Indicated grade | Type of Workings | Comments |
|---|---|---|---|---|---|---|---|
| Trafalgar (New Carthage) | ENE | Steeply S | up to 0.3 m | 46 tonnes | 122 g/t gold 122 g/t silver (Graves 1932) | Shaft to 61m, 2 levels adits and prospecting pits. | Sample of dump material collected by Minstock contained 14.1 g/t gold. |
| Double Event. | 2 parallel 037° & 067° | Steeply N | from 0.25 to 1.0 | ? | from 4.97 g/t gold to 132 g/t gold Twelvetrees (1900 a) | Shaft to 18m | |
| Brilliant | North to north north east. Sub parallel to bedding | Vertical | Very variable up to 1.52 | Possibly about 100 tonnes | 21 to 61.2 g/t gold Twelvetrees (1900 a) | Shafts to 12m and 6.1m and some prospecting pits. | Numerous other small quartz veins and old workings in the general vicinity. |
| Golden Ridge | Gold mainly on joints | | Up to 0.3 | 148 tonnes in 1932 | 1.53 to 19.9 g/t gold up to 50 g/t silver. Twelvetrees (1900 a) | Shaft to 23m at least one drive. One 165m adit and an open-cut. | Channel sampling by Henderson 1939 yielded a maximum of 3m averaging 13.1 g/t gold and 4.8 g/t silver. |
| Queen of the Earth | 035° | 45-60° to SE | 0.3 to 1.6 | 156 tonnes | 15.9 g/t gold possibly up to 34 g/t gold. Graves (1932) Twelvetrees (1900 b) | Adit and two shafts. | Composite sample of quartz vein material with arsenopyrite. Collected by Minstock contained 9.23 g/t gold and 12.9 g/t silver. |

On the footwall side of the lode (which cuts the bedding approximately at right angles) the adit has been continued parallel to the bedding which here consists of a well banded grey to brown quartzite bands, about 0.5 metre wide, separated by sheared carbonaceous rich horizons. This entire zone is strongly ironstained and there appears to be a fault or shear parallel to the bedding in this area. Although this area has not been stoped, it appears that it could be mineralised and requires detailed chip sampling.

## Conclusions and Recommendations

Available descriptions and the field inspection suggest the auriferous quartz veins within E.L. 24/82 are closely associated with the contact aureol of the Poimena Pluton. The veins appear to be generally thin and of limited strike length and are hosted either by the intrusive (Trafalgar and Double Event) or the adjacent sediments (Brilliant, Golden Ridge, Queen of the Earth).

Both the geological framework and the historical records suggest the area has limited potential for significant sized deposits. The main limiting features are that multiple closely spaced veins do not occur and the individual veins which are present are quite thin. The high grade zones mined in the past appear to have occurred as small shoots within the vein channels. Nevertheless historical grades were comparatively high and the area has never been seriously investigated using modern exploration techniques. It is therefore felt that further exploration in the area is required before a true assessment of the potential can be made.

The initial phase of exploration recommended is a regional stream sediment sampling programme accompanied by geological mapping and detailed sampling within the contact aureol of the intrusive. Detailed sampling of the Queen of the Earth workings is also required. This work is estimated to cost $10,000 to $15,000. Further follow-up work will depend on results of the initial programme but if warranted is likely to involve detailed grid mapping, soil sampling and possibly electrical geophysical surveys.

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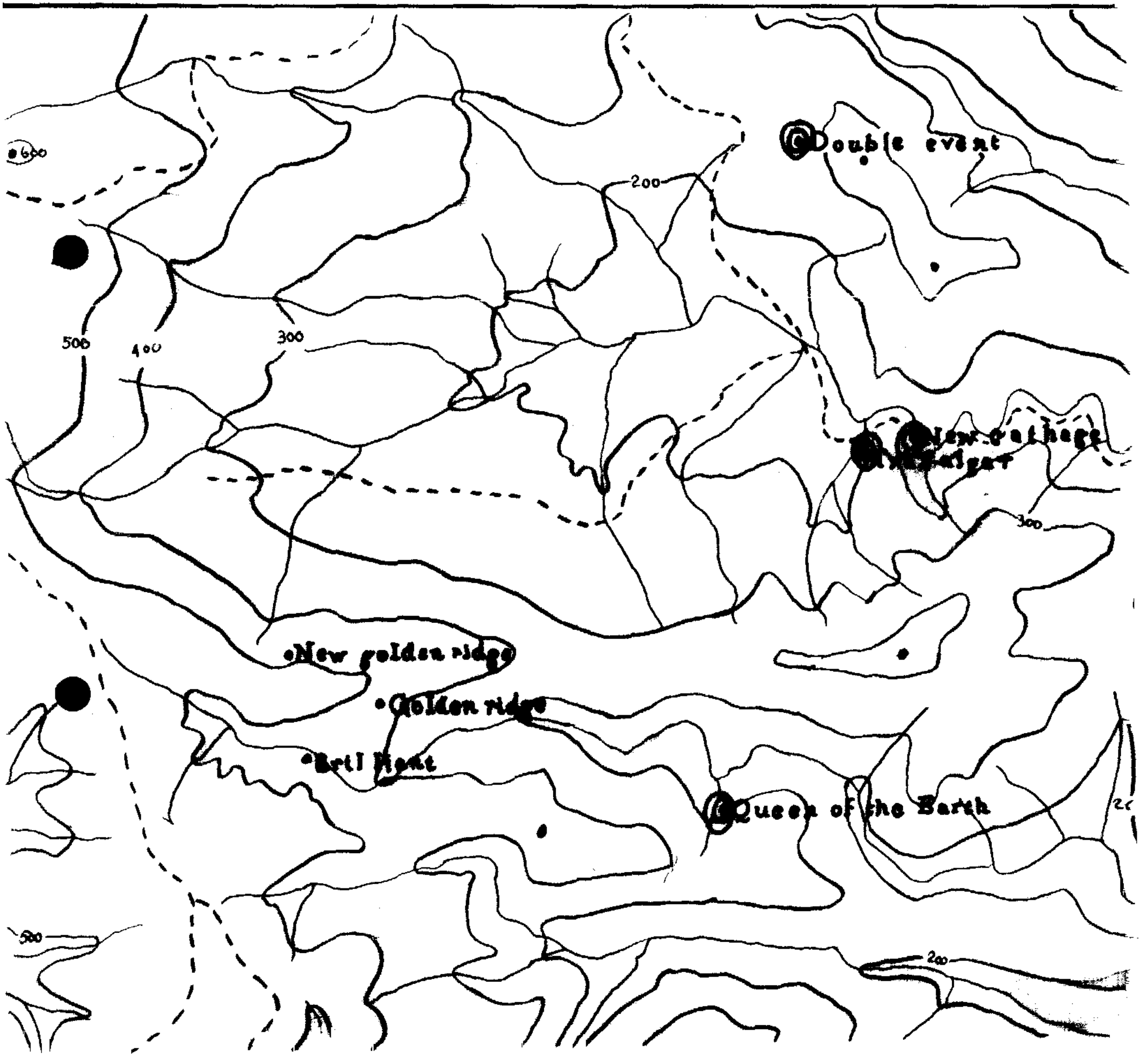
# SAMPLE MINING ◎ Brilliant Creek El

24/82



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~~NOT RELEVANT~~

# MINSTOCK SILVER/LEAD/ZINC PROJECT

## PRELIMINARY PROCESS DESIGN

prepared for

<u>LAWRENCE H. HOWROYD & ASSOCIATES</u>

JULY 1984

by

<u>LONGWORTH & McKENZIE PTY LIMITED</u>

LONGWORTH & McKENZIE PTY. LIMITED

NOTE:

MODULES 1, 2 and 3 are the components Specifically related to the gold sample plant for E L 24/82.

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# MINSTOCK SILVER/LEAD/ZINC PROJECT

## PRELIMINARY PROCESS DESIGN

prepared for

LAWRENCE H. HOWROYD & ASSOCIATES

JULY 1984

by

LONGWORTH & McKENZIE PTY LIMITED

REF: UMT0123/RBE/dmci

L&M

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## 1.0 INTRODUCTION

Lawrence H. Howroyd & Associates engaged Longworth & McKenzie Pty Limited (LM) to prepare a preliminary process design and equipment selection for the proposed Minstock Silver/Lead/Zinc Mining Venture. Minstock Mining is considering the development of several mineral deposits near Zeehan in Western Tasmania. Operations would include mining and treatment of ore to produce a blended concentrate. This study has been limited to the process plant, and includes a conceptual design, selection of major equipment, and indicative capital and operating costs. LM has prepared this report with the assistance of Michael J. Noakes, consultant metallurgist.

LM emphasizes that the plant design is very preliminary. Very little information has been available on the ore, and the process is based on a number of important assumptions, as discussed in the report. The cost estimates indicate the order of magnitude only for capital expenditure and plant operating costs. Both design and costs are heavily influenced by the ore characteristics, particularly grindability and grain size.

## 2.0 CONCEPTUAL DESIGN

### 2.1 Design Data

The following design parameters were established by the client :

- Several ore deposits exist with potentially 70,000 - 100,000 tonnes of ore each at approximately 30% mineralisation.
- Mining may involve only one deposit or perhaps several concurrently, in a number of small open cut operations.
- The process plant is to be designed to produce 10,000 tonnes per annum of blended silver/lead/zinc concentrate at 60% mineralisation.

The information available included a geological report dated November 1983 by Summons Geoservices Pty. Ltd. and copies of several laboratory analyses on ore samples. The information pertained principally to the Comstock ore area. The Summons report estimates that "the best compromise" mineral assemblage for the Comstock area ores is 60% pyrite, 30% sphalerite and 10% galena.

## 2.2 Ore Grade and Specific Gravity

For the purposes of this study, it is assumed that the mineral assemblage above is representative of all the Minstock deposits. In a normal mining operation some non-sulphide dilution can be expected. Assuming 15% non-sulphide gangue, the typical ore feed grade to the process plant would be :

| | |
|---|---|
| Feed Grade | 7.8% Pb |
| | 16.8% Zn |
| | 600 g/t Ag |
| | 23.8% Fe |
| | 36.6% S |
| | 15% Insolubles |

The specific gravities of the minerals in the assumed feed analysis are :

| | S.g. |
|---|---|
| Pyrite | 5.0 |
| Galena | 7.5 |
| Sphalerite | 4.1 |
| Insolubles | 2.7 |

Accordingly, the specific gravity of the ore is calculated as 4.67.

**2.3 Process Selection**

Based on the above specific gravities, a gravity or heavy media process would remove only a small portion of the ore (insolubles), but would not reduce the major diluent, pyrite. Therefore it is proposed to consider a small demountable flotation plant, with associated crushing and grinding circuits.

Assuming the recoveries as listed below, the following product concentrate grade is calculated :

| | |
|---|---|
| Concentrate Grade : | 16.6% Pb |
| | 35.8% Zn |
| | 900 g/t Ag |
| | 11.9% Fe |
| | 33.7% S |
| | 2.0% Insol. |
| Assumed Recoveries : | Lead 85% |
| | Zinc 85% |
| | Silver 60% |
| | Pyrite 20% |
| | Insol. 5% |

The bulk rougher concentrate would be 40% of the feed weight (i.e. for a 100 tpd feed rate, 40 tpd of bulk concentrate would be produced).

**2.4 Proposed Design Criteria**

The following base design criteria were selected, based on the above considerations.

| | | |
|---|---|---|
| Feed grade : | 7.8% Pb | |
| | 16.8% Zn | |
| | 600 g/t Ag | |
| Ore Sg : | 4.67 | |
| Crushability : | Soft - somewhat sticky | |
| Work index (Bond) : | 10.0 kwhr/short ton | |
| ROM sizing : | 100% - 900 mm | |
| Ball mill feed size : | 80% - 12.7 mm | |
| Flotation feed size : | 80% - 75 micron (Rosebery ores - very fine grained) | |
| Reagent Addition : | $Na_2S_2O_5$ | 400 g/t |
| | $Na_2CO_3$ | 800 g/t |
| | Lime | 600 g/t |
| | Xanthate | 130 g/t |
| | NaCN | 65 g/t |
| | $CuSO_4$ | 600 g/t |
| | Frother | 60 g/t |
| Flotation pH = | 9.0 | |
| Flotation Recovery : | Lead | 85% |
| | Zinc | 85% |
| | Silver | 60% |
| | (Significant silver associated with tetrahedrite) | |
| Flotation density : | 40% solids | |
| Flotation time : | 20 minutes | |
| Settling rate : (concentrates & tailings) | 0.5 $m^2$/t/24 hrs | |
| Final settled density | 80% solids | |

It is assumed that the plant will operate 7 hours/day for 200 days per year, with an availability of 90%. Thus to produce 10,000 tpa of concentrate, the daily mill feed rate would be :

$$\frac{10{,}000 \text{ tpa product}}{\underset{\text{days}}{200} \times \underset{\text{conc. recovery}}{.4} \times \underset{\text{avail.}}{.9}} \text{ or 140 dry tonnes per day feed}$$

The conceptual process flowsheet is shown in Figure 1. The calculated mass balance and water balance are also shown, based on the assumed design criteria.

## 3.0 FUNCTIONAL DESCRIPTION

Based on the flowsheet in Figure 1, major equipment selections were made as listed in Appendix A. The following describes the plant operation.

Run-of-mine ore is reclaimed from the ROM stockpile using a 1.5 $m^3$ front end loader and fed to a hopper protected by an oversize grizzly. A 1.0 m width variable speed apron feeder withdraws the ore from the bin at the required rate and feeds it to a 300 x 900 mm single toggle jaw crusher for reduction to 85% passing 75 mm. The hopper, feeder and jaw crusher are mounted on a steel skid mounted module referred to as Module No. 1. The oversized crusher is chosen to handle the proposed topsize ROM ore of 900 mm.

Jaw crushed product is conveyed to a 1.2 x 3.6 m double-deck screen containing a 50 mm square mesh top deck protection screen and a 12.7 mm square mesh lower deck. The oversize from both decks falls into a 610 mm short head cone crusher whose product is conveyed back to the screen feed conveyor. It is estimated that 83% of the feedweight will circulate in this manner. The double-deck screen and cone crusher are steel skid mounted as Module No. 2.

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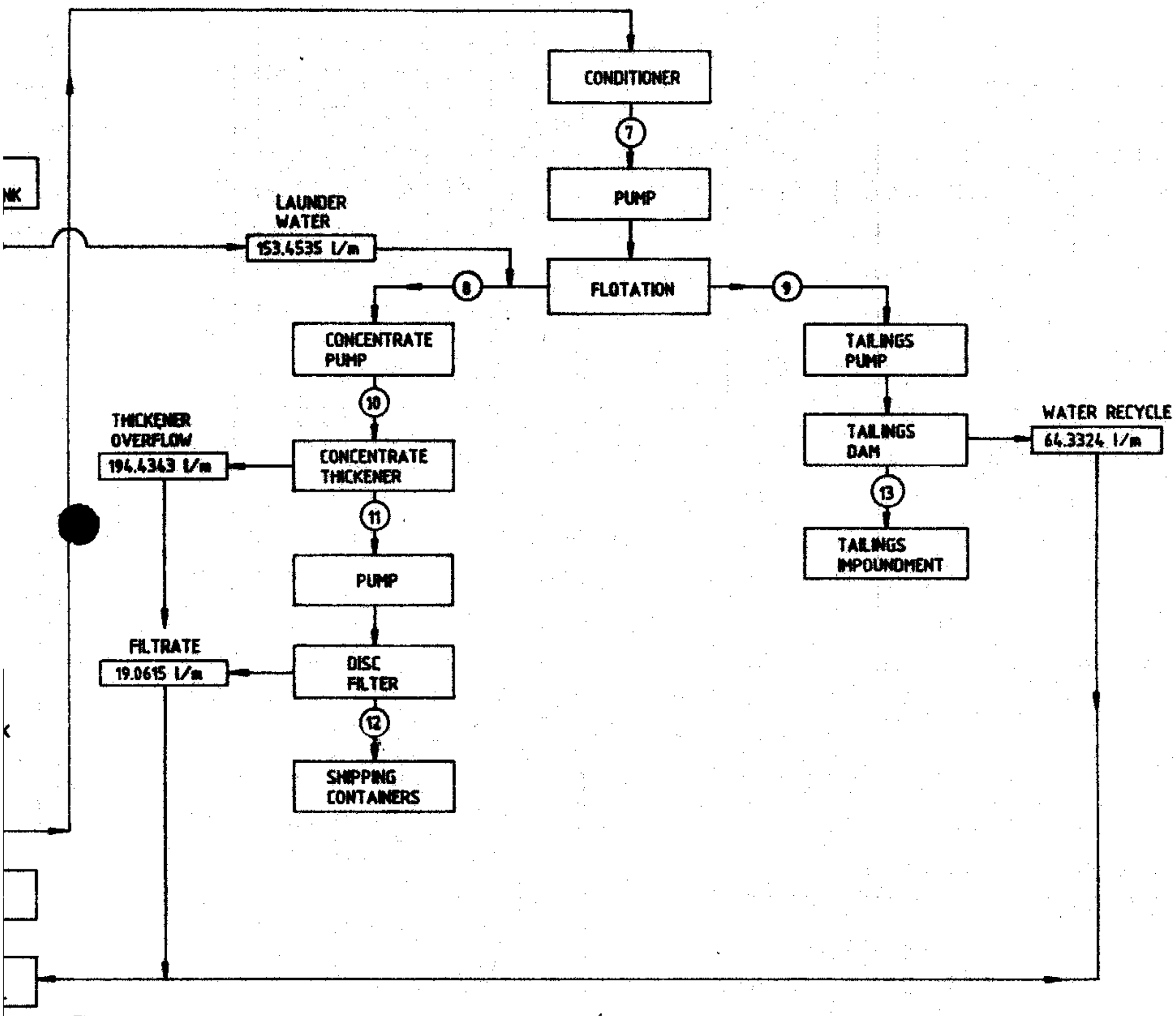
FLOTATION CIRCUIT (MODULES 4 AND 5)




ALANCE

| | | |
|---|---|---|
| ED | 5.1167 | l/m |
| LL ADDN. | 140.6995 | l/m |
| R ADDN. | 153.4535 | l/m |
| TOTAL | 299.2697 | l/m |

| | | |
|---|---|---|
| ER OVERFLOW | 194.4343 | l/m |
| E | 19.0615 | l/m |
| S RECYCLE | 64.3324 | l/m |
| S IMPOUNDMENT | 14.5020 | l/m |
| CAKE | 6.8595 | l/m |
| TOTAL | 299.2697 | l/m |

LANCED

ON (EXCLUDING EVAPOURATIVE
E) = 0.22 TONNES/TONNE ORE.

| LONGWORTH & McKENZIE PTY. LIMITED | | |
|---|---|---|
| DRAWN: | M.J.N. | MINSTOCK SILVER/LEAD/ZINC PROJECT<br>ZEEHAN<br>TASMANIA |
| REV. 1 | | |
| | | |
| | | CONCEPTUAL<br>PROCESS FLOWSHEET<br>FIGURE 1. |
| | | |
| | | |
| DATE: | 14-6-84 | |

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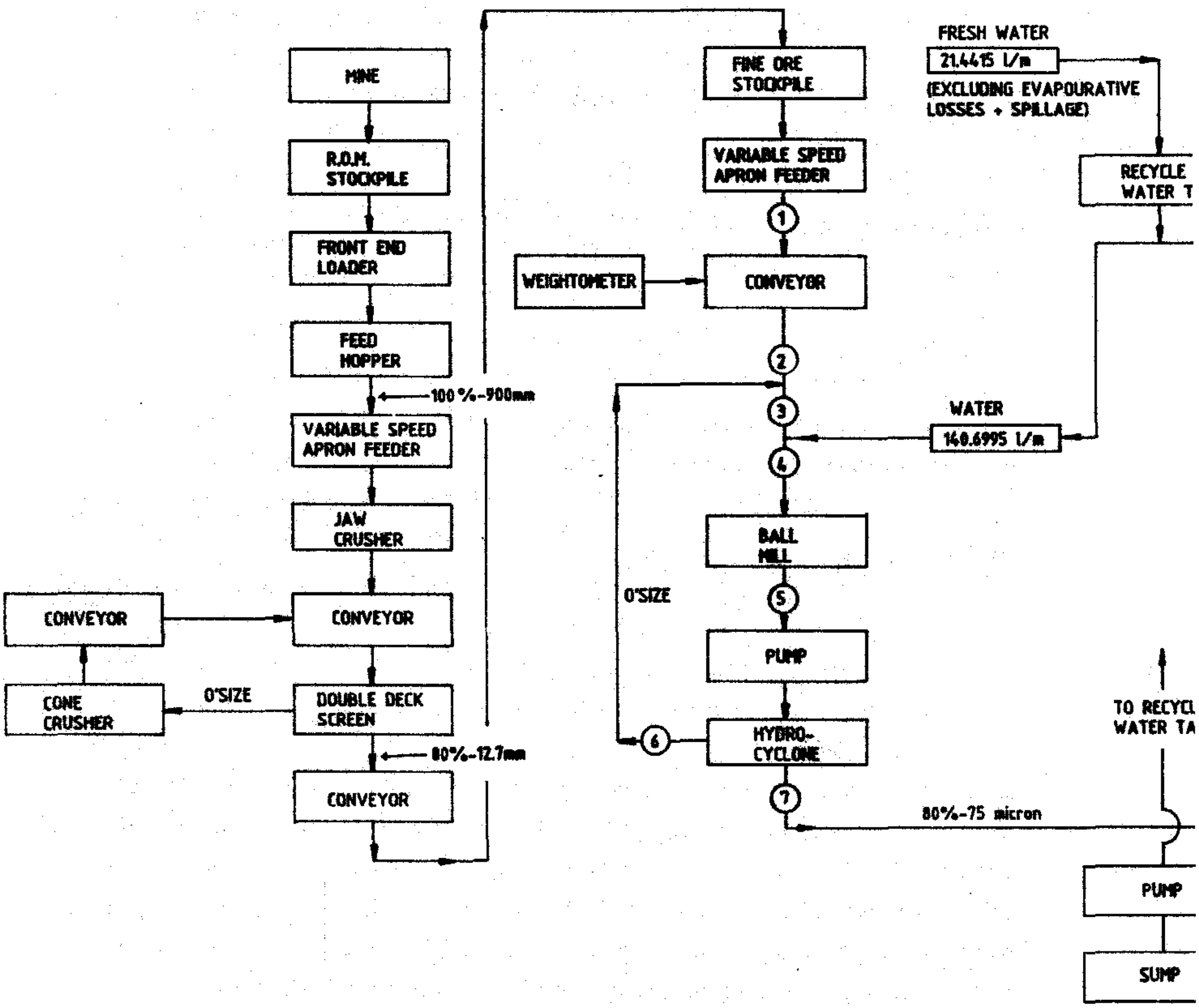
CRUSHING AND SCREENING CIRCUIT (MODULES 1 AND 2)

GRINDING CIRCUIT (MODULE 3)




| STREAM | MT/DAY ORE | | | | PULP FLOWS | | | ASSAYS | | | % DISTRIBUTION | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DRY MTPD | % SOLIDS | DENSITIES SOLIDS | DENSITIES PULP | PULP (l/m) | SOLID (l/m) | WATER (l/m) | % Pb | % Zn | g/t Ag | Pb | Zn | Ag |
| (1) | 140 | 95 | 4.67 | 3.9459 | 25.9333 | 20.8166 | 5.1167 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (2) | 140 | 95 | 4.67 | 3.9459 | 25.9333 | 20.8166 | 5.1167 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (3) | 420 | 74.9 | 4.67 | 2.4308 | 160.5598 | 62.4498 | 97.9100 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (4) | 420 | 55.0 | 4.67 | 1.7613 | 301.0593 | 62.4498 | 238.6095 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (5) | 420 | 55.0 | 4.67 | 1.7613 | 301.0593 | 62.4498 | 238.6095 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (6) | 280 | 67.7 | 4.67 | 2.1369 | 134.4265 | 41.6332 | 92.7933 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (7) | 140 | 40 | 4.67 | 1.4585 | 166.6328 | 20.8166 | 145.8162 | 7.8 | 16.8 | 600 | 100.0 | 100.0 | 100.0 |
| (8) | 56 | 36.8 | 5.46 | 1.4298 | 74.0264 | 7.1246 | 66.9018 | 16.6 | 35.0 | 900 | 85.13 | 85.24 | 60.0 |
| (9) | 84 | 42.5 | 4.26 | 1.4820 | 92.6064 | 13.6920 | 78.9144 | 1.93 | 4.13 | 400 | 14.87 | 14.76 | 40.0 |
| (10) | 56 | 15.0 | 5.46 | 1.1396 | 227.4799 | 7.1246 | 220.3553 | 16.6 | 35.0 | 900 | 85.13 | 85.24 | 60.0 |
| (11) | 56 | 60.0 | 5.46 | 1.9612 | 33.0456 | 7.1246 | 25.9210 | 16.6 | 35.0 | 900 | 85.13 | 85.24 | 60.0 |
| (12) | 56 | 85.0 | 5.46 | 3.2714 | 13.9841 | 7.1246 | 6.8595 | 16.6 | 35.0 | 900 | 85.13 | 85.24 | 60.0 |
| (13) | 84 | 80.0 | 4.26 | 2.5787 | 28.2740 | 13.6920 | 14.5820 | 1.93 | 4.13 | 400 | 14.87 | 14.76 | 40.0 |

WATER

WATER IN :

MILL
BALL
LAUNC

WATER OUT :

THICKI
FILTR
TAILIN
TAILIN
FILTEI

WATER CONSUMP
LOSSES + SPILLA

The double-deck screen undersize sizing 80% passing 12.7 mm is conveyed to an open conical fine ore stockpile supported by 15 x 15 m concrete pad. The pad is above a tunnel and the fine ore passes through an opening in the pad to a 0.45 m width variable speed apron feeder to be withdrawn at the rquired rate of about 20 tph. The feeder discharges onto the mill feed conveyor, which is equipped with a weightometer for mill feed control.

Mill feed is washed into a 3 m diameter x 3 m long overflow type ball mill. The ball mill discharge is pumped to a 150 mm hydrocyclone classifier which recirculates an estimated 200% of the mill feed. The ball mill, pump and hydrocyclone are steel skid mounted as Module No. 3. This module is the largest unit by weight in the plant and represents a major portion of the capital cost. Significant capital savings could be realized if it could be shown that a coarser grind could be used than has been assumed.

The hydrocyclone overflow, which is estimated to contain 80% passing 75 micron material, flows by gravity to a 0.9 x 1.35 m reagent conditioning tank where the required reagents are added. This tank allows the pulp to be conditioned for 5 minutes. (It is noted that some reagents may be added to the ball mill or later in the circuit). The conditioned pulp is pumped to six 566 litre flotation cells where a bulk concentrate containing an estimated 16.6% Pb, 35.8% Zn and 900 g/t Ag is produced and is pumped to the concentrate thickener discussed below. The flotation tailings are pumped to a tailings dam for impoundment. The conditioner, pumps and flotation cells are mounted on a steel skid mounted module referred to as Module No. 4.

It is possible that, following metallurgical testwork, it may be necessary to add cleaner flotation cells to this module to produce a satisfactory concentrate grade.

Flotation tailings will be collected in a series of ponds, where the solids will be allowed to settle for impoundment, and the water will be recycled to the process plant.

In the conceptual model developed for this study the bulk concentrate is pumped to 6 m diameter x 3 m conventional thickener for dewatering up to 60% solids. Thickener overflow water is recycled by pump to the mill recycle water head tank.

The thickener underflow is pumped to an elevated steel skid mounted 4 x 1.8 m disc vacuum filter. The filter, vacuum pump, compressor, filtrate tank and pump are all mounted on this module, referred to as Module No. 5. Filter cake falls through the floor openings into a concentrate bay. Concentrate filter cake either falls directly into a container or haulage truck or is picked up by front end loader and transferred to its transportation mode.

While the plant is scheduled for 7 hours of operation/day, it is assumed that Module No. 5 will operate 24 hours/day. This is necessary for two reasons, vis :

* To cope with concentrate produced late in day shift.

* To reduce the filter size which would otherwise be quite large for a small throughput plant.

It is reasoned that the additional cost of 2-3 extra personnel more than offsets the additional capital cost required for very much larger thickening and filtration equipment.

The entire plant is powered by a 625 KVA diesel driven generator with associated switch gear and full tankage which is sized for normal operations. The major starting load requirement is for the ball mill motor (300 KW) which will have to be relay started and geared to prevent instantaneous overload. The generator and switch gear are steel skid mounted as Module No. 6.

Instrumentation is minimal with only pH control being used in the flotation section. Normal electrical interlocking and safety precautions are observed.

Sampling is by periodic hand samples collected by the laboratory technician and these samples along with mine, exploration, etc. samples are assayed by atomic absorption techniques in an onsite demountable laboratory which also houses the mill offices and toilet facilities.

There are no mill buildings budgeted but it is assumed that some rain shelter is provided over Modules 3, 4, 5 and 6.

The mill is managed by a qualified superintendent, who is assisted by a qualified chemist/foreman. A salaried secretary/clerk is employed to assist the superintendent and foreman. Hourly paid employees number eleven of whom seven are day shift only employees. The remaining four employees operate a 4 shift schedule over a 7 day week, to double as watchmen and product handling operators (the filtration and tailings disposal systems require 24 hour/day attendance).

## 4.0 CAPITAL COST ESTIMATE

The estimated capital costs are summarised in Table 1.

Capital costs are derived by sizing major units of equipment and calculating costs from in-house information or from cost information derived on other similar Australian operations. In some cases costs are adjusted for inflation to $A 1984. Certain equipment as follows are costed as used equipment and prices are taken from used equipment catelogues for good quality equipment :

| | |
|---|---|
| Used equipment : | Front end loader |
| | Jaw crusher |
| | Cone crusher |
| | Ball mill |

The remaining equipment is assumed to be new.

Installation costs such as steel fabrication, earthworks, foundation, piping, electrical, instrumentation, engineering, etc., are factored using the "Plant Component Cost Ratio Method" as proposed by Balfour and Papucciyan at the 4th Annual Meeting of Canadian Mineral Processors, January, 1972.

**TABLE 1**

**CAPITAL COST ESTIMATE SUMMARY**

| Item No. | Item | Major Equipment Included in Cost (Installed on Site) | Est. Capital Cost $A 1984 |
|---|---|---|---|
| 1 | Front End Loader | F.E.L. only | 75,000 |
| 2 | Module No.1 | Feed Hopper, Apron Feeder, Jaw Crusher, Motor, Conveyor Skid | 95,500 |
| 3 | Module No.2 | D.D. Screen, Cone Crusher, Motor, 2 Conveyors, Skid | 110,000 |
| 4 | Fine Ore Stockpile | Concrete Pad | 4,500 |
| 5 | Fine Ore Apron Feeder | Feeder, Conveyor, Weightometer | 30,350 |
| 6 | Module No.3 | Ball Mill, Motor, Discharge Pump, Hydrocyclone, Skid | 350,750 |
| 7 | Module No.4 | Conditioner, Pump, Flotation Cells, Tailings Pump, Concentrate Pump, Skid | 44,700 |
| 8 | Water Head Tank | Tank, Pump | 15,000 |
| 9 | Concentrate Thickener | Thickener, Pump | 28,000 |
| 10 | Module No.5 | Disc Filter, Vacuum Pump, Compressor, Filtrate Pump, Skid | 80,000 |
| 11 | Module No.6 | Power Pack, Tankage, Skid | 145,000 |
| 12 | Miscellaneous Items | Laboratory/Office, Tailings Dam, Utility Vehicles, Roadworks, Site Clearing | 110,000 |
| 13 | Engineering & Project Management | | 125,000 |
| | | TOTAL MILL COST | $1,213,800 |

Note: No Allowance for Contingency

## 5.0 OPERATING COST ESTIMATE

It is estimated that the mill operating cost is $24.30 tonne ore treated derived as summarized in Table 2 and detailed in Tables 3 and 4.

It is stressed that these figures are based on experience of similar Australian operations, with the Rosebery operations being used as a major influencing factor. Metallurgical testwork is required to define the true operating parameters.

TABLE 2

**Operating Cost Estimate Summary**

| Item | Cost/Annum $A 1984 | Cost/Tonne $/t |
|---|---|---|
| Manpower | 433,700 | 17.35 |
| Consumables | | |
| Power | 90,000 | 3.6 |
| Water | 1,100 | 0.04 |
| Steel | 25,750 | 1.03 |
| Reagents | 32,000 | 1.28 |
| Spares | 25,000 | 1.00 |
| TOTAL | 607,550 | 24.30 |

Note - No allowance for contingency

TABLE 3

**Estimated Manpower Cost**

| Type<br>Salaried (S)<br>Hourly (H) | Requirement<br>No of<br>Shifts | <br>No of<br>Days/week | Total<br>No of<br>Men | Annual<br>Expense<br>$A 1984 |
|---|---|---|---|---|
| Superintendent (S) | - | - | 1 | $ 47,500 |
| Foreman/chemist (S) | - | - | 1 | 40,000 |
| Secretary/Clerk (S) | - | - | 1 | 16,200 |
| Sub-Total (S) | - | - | 3 | $ 103,700 |
| F.E.L. Driver (H) | 1 | 5 | 1 | $ 25,000 |
| Crusher & Ball Mill Operator (H) | 1 | 5 | 2 | 25,000 |
| Flotation Operator | 1 | 5 | 1 | 25,000 |
| Prod. Hdlg./Watchman | 4 | 7 | 4 | 100,000 |
| Labourer (H) | 1 | 5 | 1 | 25,000 |
| Mechanic/Fitter (H) | 1 | 5 | 1 | 25,000 |
| Mechanic's Assistance (H) | 1 | 5 | 1 | 25,000 |
| Sample Bucker/Lab. Tech. (H) | 1 | 5 | 1 | 25,000 |
| Sub-Total (H) | - | - | 11 | $ 275,000 |
| 20% Absentee | - | - | - | $ 55,000 |
| TOTAL ANNUAL | - | - | 14 | $ 433,700 |

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**TABLE 4**

**Estimated Consumables Cost**

| Item | Consumption Rate | Unit Cost | Annual Cost | Sub Totals |
|---|---|---|---|---|
| Power | 30 KWhr/tonne | $0.12/KWhr | $ 90,000 | $ 90,000 |
| Water | 0.44l/t ore | $0.10/t | $ 1,100 | $ 1,100 |
| Steel | | | | |
| Crusher Liners | 0.10 kg/t | $2000/t | $ 5,000 | |
| Mill Liners | 0.10 kg/t | $2000/t | 5,000 | |
| Steel Balls | 0.70 kg/t | $900/t | 15,750 | $ 25,750 |
| Reagents | | | | |
| Sodium Bisulphite | 400 g/t | $380/t | $ 3,800 | |
| Sodium Carbonate | 800 g/t | $240/t | 4,800 | |
| Lime | 600 g/t | $150/t | 2,250 | |
| Xanthate | 130 g/t | $2100/t | 6,825 | |
| Sodium Cyanide | 65 g/t | $1450/t | 2,356 | |
| Copper Sulphate | 600 g/t | $650/t | 9,750 | |
| Frother | 60 g/t | $1500/t | 2,250 | $ 32,000 |
| Spares (2½% Inst. Cap) | - | - | $ 25,000 | $ 25,000 |
| TOTAL ANNUAL | | | | $ 173,850 |

* Current Estimated Prices Delivered Zeehan

## 6.0 DISCUSSION

The report presents a preliminary design and cost estimates for a small ore concentrator. The capital and operating costs are indicative only. The plant is designed for operation on day shift only (with the exception of the filtration section) to minimise labour costs.

Because the plant has a relatively low throughput, a modular mounting approach has been adopted for major systems and equipment. This modular approach provides flexibility in plant arrangement. The modules are demountable and the plant can be shifted to different sites if necessary, with a minimum of civil and earthworks required. Figure 2 is a photograph of a similar transportable ore concentrating plant. The proposed Minstock project requires a concentrate thickener and a tailings impoundment area, and these facilities may have to be reeconstructed for alternate sites, depending on location.

A disk type vacuum filter has been included in the preliminary design. The principal reason for the filter is to reduce the concentrate moisture to a level suitable for bulk solids handling (about 15% moisture). This assumes that the product will be transported to Burnie for ocean shipment to a smelter. Altervatively, it may be possible to negotiate with Electrolytic Zinc Company for handling and shipping the concentrate by rail from their Rosebery concentrator.

The moisture content of the product concentrate can also influence the reactivity of the material. Under certain conditions sulphide concentrates are susceptible to sportaneous combustion during storage and handling. This is most likely to occur if the material is allowed to dry to below 10%. This factor should be considered in the design of storage and handling facilities.

If the results of this current study together with other previous work indicate that the project is viable, the following investigative work is recommended :

(1) Further exploration work is needed to prove sufficient ore reserves of suitable quality.

(2) A preliminary mine plan, including cost estimates, should be prepared.

(3) The market for the concentrate should be investigated (tonnage, sales prices, and location).

(4) Concentrate storage and transport options should be considered to establish the most appropriate and lowest cost methods.

(5) Metallurgical testwork should be performed to allow more definitive process design to proceed. This could have significant effect on both capital and operating costs.

(6) Following the above items, an engineering feasibility study should be carried out to confirm project viability.

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FIGURE 2

TYPICAL TRANSPORTABLE CONCENTRATING PLANT

# APPENDIX A

# LIST OF MAJOR EQUIPMENT

APPENDIX A

MINSTOCK - MAJOR EQUIPMENT LIST

| Module No. | Major Equipment Description | Size or Model No. | No. of Units | Motor KW/Unit | Total Connected KW |
|---|---|---|---|---|---|
| | Front End Loader | $1.5m^3$ Bucket | 1 | - | - |
| | Feed Hopper | 2m x2m x 1m | 1 | - | - |
| 1 | Variable Speed Apron Feeder | 3m x 1m | 1 | 4 | 4 |
| (Primary Crushing | Jaw Crusher | 300 x 900mm | 1 | 55 | 55 |
| Module) | Jaw Product Discharge Conveyor | 0.45 x 15m | 1 | 5.5 | 5.5 |
| 2 | Double Deck Screen-50mm/12.7m | 1.2mm x 3.6mm | 1 | 15 | 15 |
| (Sec. Crusher | Cone Crusher-Short Head+Fine Bowl | 610mm | 1 | 22 | 22 |
| & Screen | Cone Crusher Discharge Conveyor | 0.45 x 15m | 1 | 5.5 | 5.5 |
| Module) | Screen Undersize Product Conveyor | 0.45 x 15m | 1 | 5.5 | 5.5 |
| | Fine Ore Stockpile Pad | 15m x 15m | 1 | - | - |
| | Variable Speed Apron Feeder | 0.45 x 1.8m | 1 | 4 | 4 |
| | Mill Reed Conveyor | 0.45 x 15m | 1 | 5.5 | 5.5 |
| | Weightometer | Ramsey 10-20A | 1 | - | - |
| 3 | Ball Mill - Overflow Type | 3m x 3m | 1 | - | - |
| (Grinding | Ball Mill Motor | - | 1 | 300 | 300 |
| Module) | Ball Mill Discharge Pump - Horizontal Centrifugal | 62.5mm SRL | 1 | 4 | 4 |
| | Hydrocyclone | 150mm | 1 | - | - |
| 4 | Conditioner | 900 x 1350mm | 1 | 1.5 | 1.5 |
| (Flotation | Flotation Feed Pump - Vertical Sandle Centrifugal | 50mm | 1 | 2.2 | 2.2 |
| Module) | Flotation Cells | 566 litre | 3x2 | 4/pair | 12 |
| | Tailings Pump - Horizontal Centrifugal | 62.5mm SRL | 1 | 4 | 4 |
| | Concentrate Pump - Vertical Spindle Pump | 50mm | 1 | 2.2 | 2.2 |
| | Water Head Tank + Recycle Water Pump | 6m x Ø x 3m | 1 | 1.5 | 1.5 |
| | Concentrate Thickener | 6m x Ø x 3m | 1 | .75 | .75 |
| | Thickener Underflow Pump - Vertical Spindle | 50mm | 1 | 2.2 | 2.2 |
| 5 | 4 Disc Filter + Vacuum Pump | | 1 | 15 | 15 |
| (Filtration | + Compressor + Filtrate Pump | 4 x 1.8m Ø | 1 | 37 | 37 |
| Module) | | | 1 | 4 | 4 |
| | | | 1 | 7.5 | 7.5 |
| 6 | Power Pack - Generator Set | 625 KVA | 1 | - | - |

# APPENDIX B

# CAPTIAL COST BREAKDOWN

# APPENDIX B

## CAPITAL COST ESTIMATE

### ITEM 1

| Front End Loader | | | $A 1984 |
|---|---|---|---|
| Second hand price from Thompson Plant P/L (good condition) | | $ | 75,000 |

### ITEM 2

Module No.1

| | | | |
|---|---|---|---|
| Feed Hopper | new allow | $ | 5,000 |
| Apron Feeder | new price allow | $ | 15,000 |
| Jaw Crusher (new price $56,700) | used allow | $ | 30,000 |
| 75 H.P. Motor | new price | $ | 7,500 |
| Discharge Conveyor | new allow | $ | 5,000 |
| | Subtotal | $ | 62,500 |

Module Construction

| | | | |
|---|---|---|---|
| Steel Fabrication + Construction (material & labour) | | $ | 15,000 |
| Electrical (material & labour) | | $ | 10,000 |
| Instrumentation (material & labour) | | $ | 1,500 |
| Engineering | | $ | 6,500 |
| | **No.1 Module cost** | **$** | **95,500** |

### ITEM 3

Module 2

| | | | |
|---|---|---|---|
| Double Deck Screen | new price allow | $ | 28,500 |
| Cone Crusher (new price $57,860) | used allow | $ | 30,000 |
| 30 HP Motor | new allow | $ | 3,000 |
| Cone Discharge Conveyor | new allow | $ | 5,000 |
| Screen Undersize Conveyor | new allow | $ | 5,000 |
| | Subtotal | $ | 71,500 |

Module Construction

| | | | |
|---|---|---|---|
| Steel Fabrication & constr. (material & labour) | | $ | 18,000 |
| Electrical (material & labour) | | $ | 11,000 |
| Instrumentation (material & labour) | | $ | 2,000 |
| Engineering | | $ | 7,500 |
| | **No.2 Module Cost** | **$** | **110,000** |

# CAPITAL COST ESTIMATE

**ITEM 4** — $A 1984

Fine Ore Stockpile

| | | | |
|---|---|---|---|
| Concrete 225 $m^2$ at $20/$m^2$ | **allow** | **$** | **4,500** |

**ITEM 5**

Fine Ore Apron Feeder

| | | | |
|---|---|---|---|
| Apron Feeder | new allow | $ | 12,250 |
| Installation | | $ | 1,800 |
| Earthworks | | $ | 1,000 |
| Electrical | | $ | 1,800 |
| | Total Feeder | $ | 16,850 |
| Mill Feed Conveyor | new allow | $ | 5,000 |
| Weightometer | new allow | $ | 8,500 |
| | **Fine Ore Apron Feeder Cost** | **$** | **30,350** |

**ITEM 6**

Module No. 3

| | | | |
|---|---|---|---|
| Ball Mill (new price $347,000) | used allow | $ | 175,000 |
| 400 HP Motor | new | $ | 40,000 |
| Ball Mill Discharge Pump | new | $ | 2,000 |
| Hydrocyclone | new | $ | 2,750 |
| | Subtotal | $ | 219,750 |

Module Construction

| | | | |
|---|---|---|---|
| Steel fabrication & Constr. (material & labour) | | $ | 55,000 |
| Piping (material & labour) | | $ | 15,000 |
| Electrical | | $ | 30,000 |
| Instrumentation | | $ | 6,000 |
| Engineering | | $ | 25,000 |
| | **No.3 Module cost** | **$** | **350,750** |

# CAPITAL COST ESTIMATE

## ITEM 7

| | | $A 1984 |
|---|---|---|
| **Module No.4** | | |
| Conditioner | new allow | $ 3,200 |
| Flotation Feed Pump | new | $ 2,000 |
| Flotation Cells (6x20ft$^3$) $2,600/cell | new | $ 15,600 |
| Tailings Pump | new | $ 2,000 |
| Concentrate Pump | new | $ 1,500 |
| | | $ 24,300 |
| **Module Construction** | | |
| Steel Fabrication & Const (material & labour) | | $ 6,000 |
| Piping (material & labour) | | $ 3,000 |
| Electrical | | $ 4,000 |
| Instrumentation | | $ 700 |
| Low Pressure Blower & Plant Services | | $ 4,000 |
| Engineering | | $ 2,700 |
| | **No.4 Module cost** | **$ 44,700** |

## ITEM 8

| | | |
|---|---|---|
| Water Head Tank (Installed) | **new allow** | **$ 15,000** |

## ITEM 9

| | | |
|---|---|---|
| **Concentrate Thickener** | | |
| Price | new allow | $ 18,500 |
| Installation | | $ 2,700 |
| Earthworks | | $ 1,300 |
| Electrical | | $ 2,000 |
| | Subtotal | $ 24,500 |
| **Conc. Thickener U/F Pump** | | |
| | new | $ 1,500 |
| Installation | | $ 1,000 |
| Piping | | $ 1,000 |
| | **Subtotal** | **$ 3,500** |
| | **Concentrate Thickener Total** | **$ 28,000** |

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# CAPITAL COST ESTIMATE

## ITEM 10

| | | $A 1984 |
|---|---|---|
| **Module No.5** | | |
| 4 Disc Filter | new allow | $ 50,000 |
| **Module Construction** | | |
| Steel Fab & Const. | | $ 12,500 |
| Piping | | $ 3,500 |
| Electrical | | $ 7,000 |
| Instrumentation | | $ 1,500 |
| Engineering | | $ 5,500 |
| | **No.5 Module cost** | **$ 80,000** |

## ITEM 11

| | | |
|---|---|---|
| **Module No.6** | | |
| Power Pack - | allow $200/KVA | $ 125,000 |
| Miscellaneous | tankage<br>control panel<br>housing<br>skid mounting | $ 20,000 |
| | **No.6 Module Cost** | **$ 145,000** |

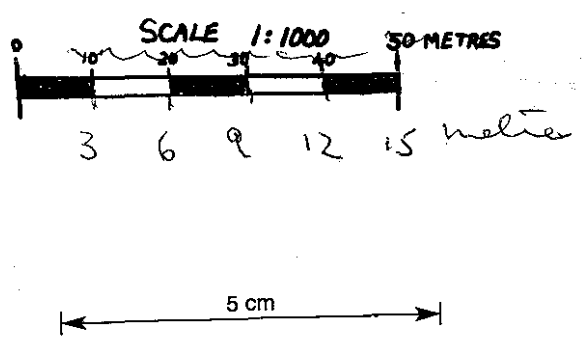
## ITEM 12

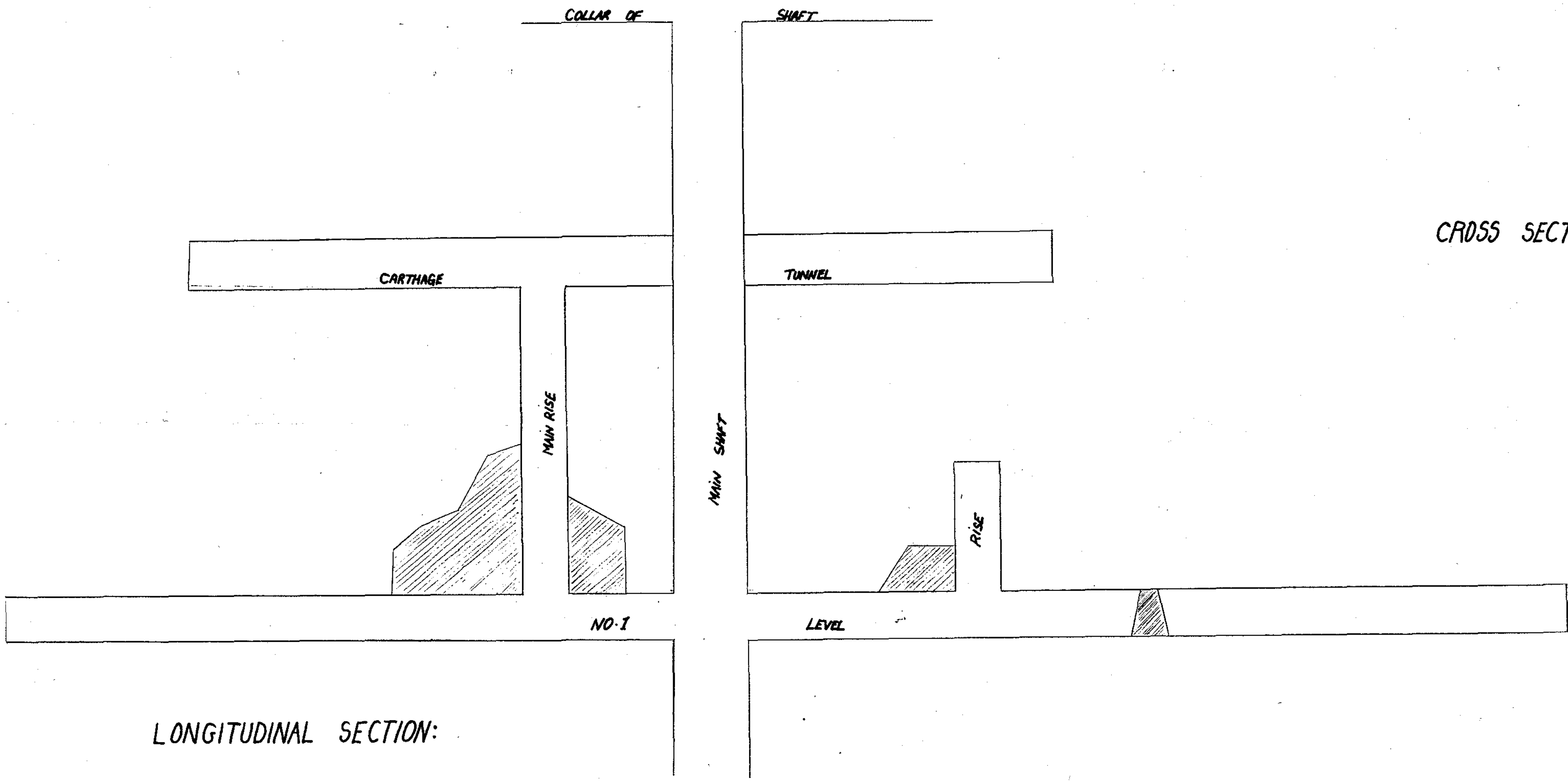
| | | |
|---|---|---|
| **Miscellaneous Items** | | |
| Laboratory/Office | allow | $ 25,000 |
| Tailings Dam | allow | $ 50,000 |
| Utility Vehicles | allow | $ 10,000 |
| Roadworks & Site clearing | allow | $ 25,000 |
| | **Miscellaneous Items** | **$ 110,000** |

## ITEM 13

| | | |
|---|---|---|
| Engineering & Project Management | **allow** | **$ 125,000** |
| **TOTAL MILL COST** | | **$ 1,213,800** |

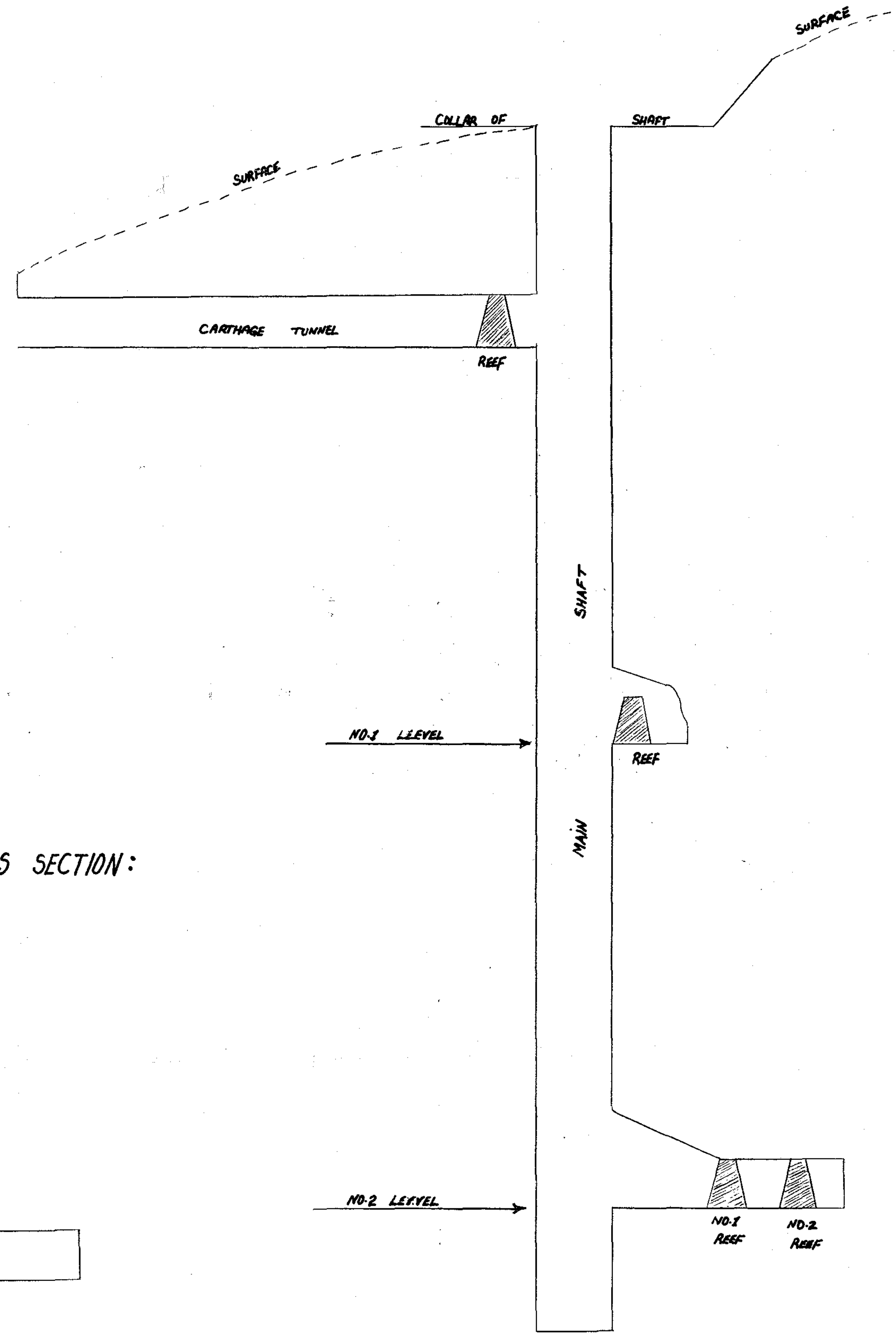
# PLAN AND SECTION OF TRAFALGAR GOLD MINE:



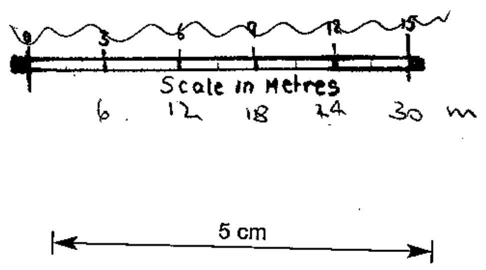



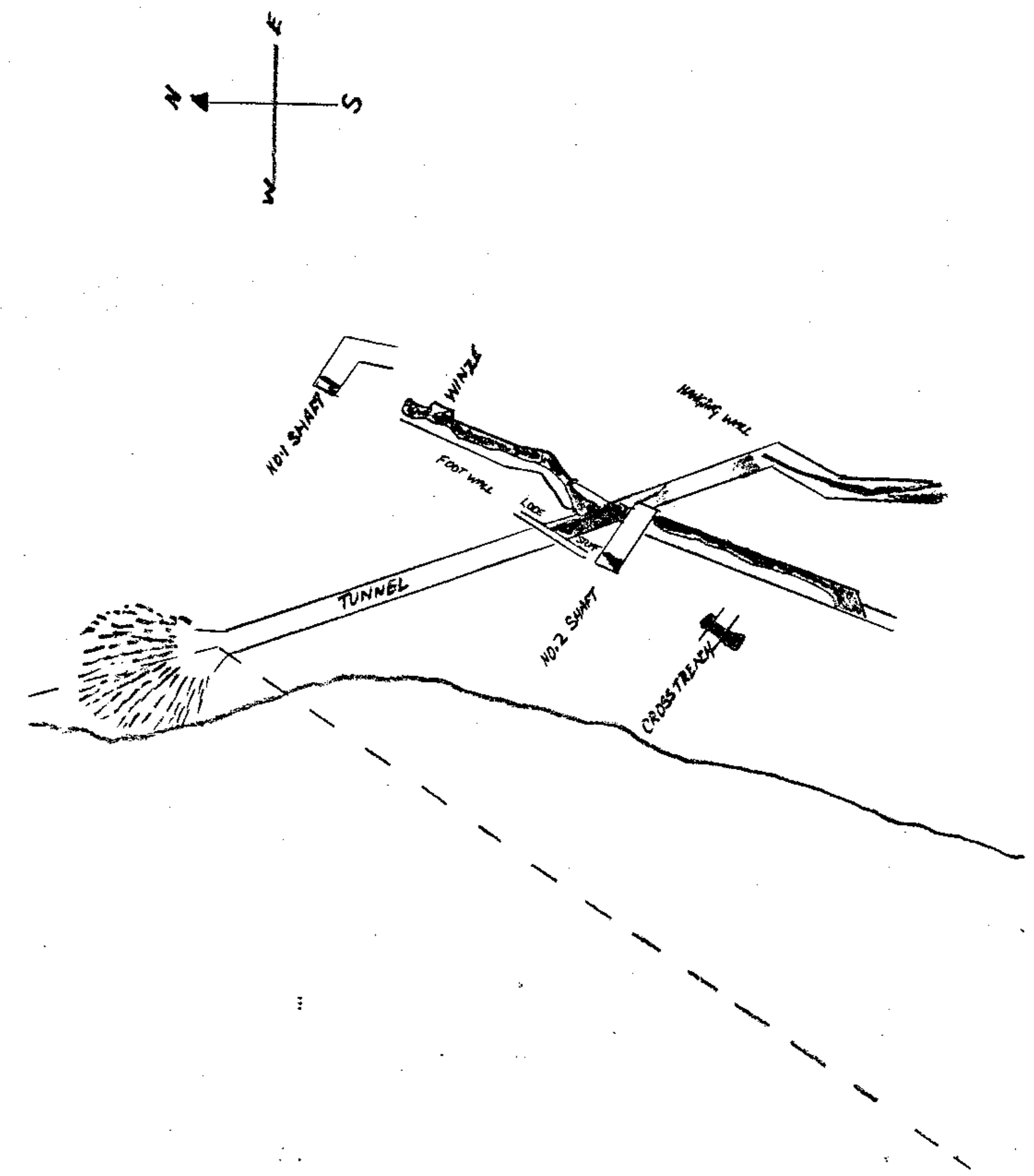

LONGITUDINAL SECTION:

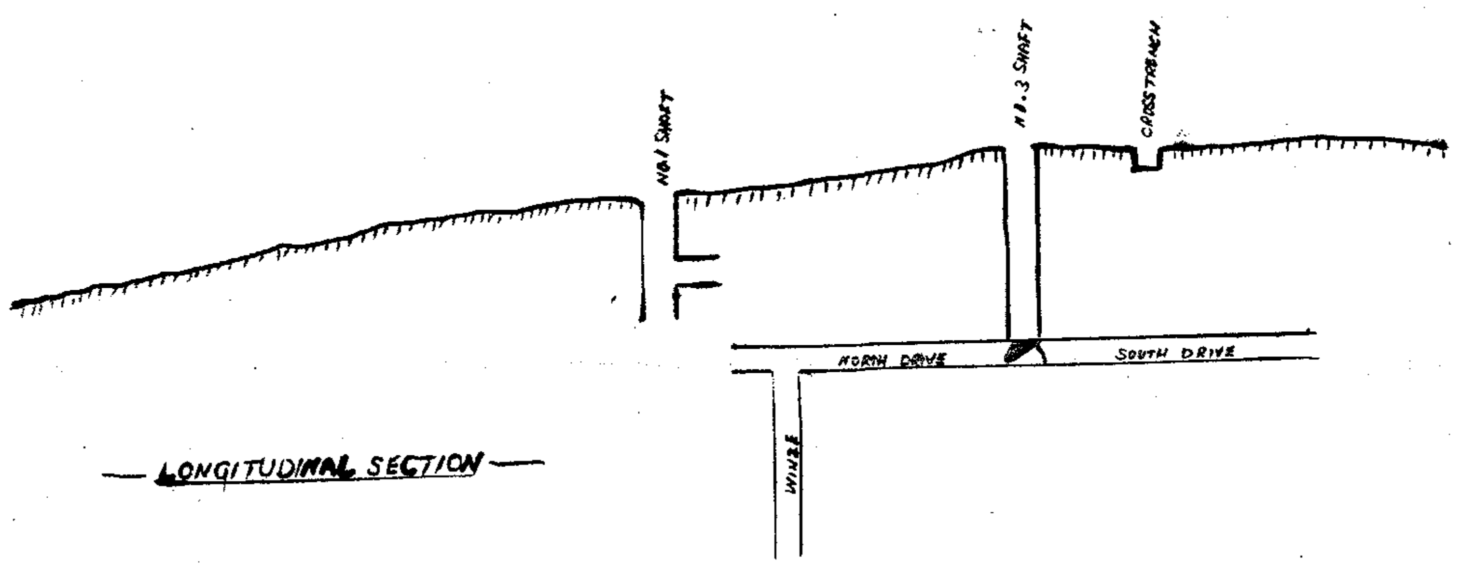
CROSS SECTION:



# PLAN AND SECTION OF QUEEN OF THE EARTH GOLD MINE

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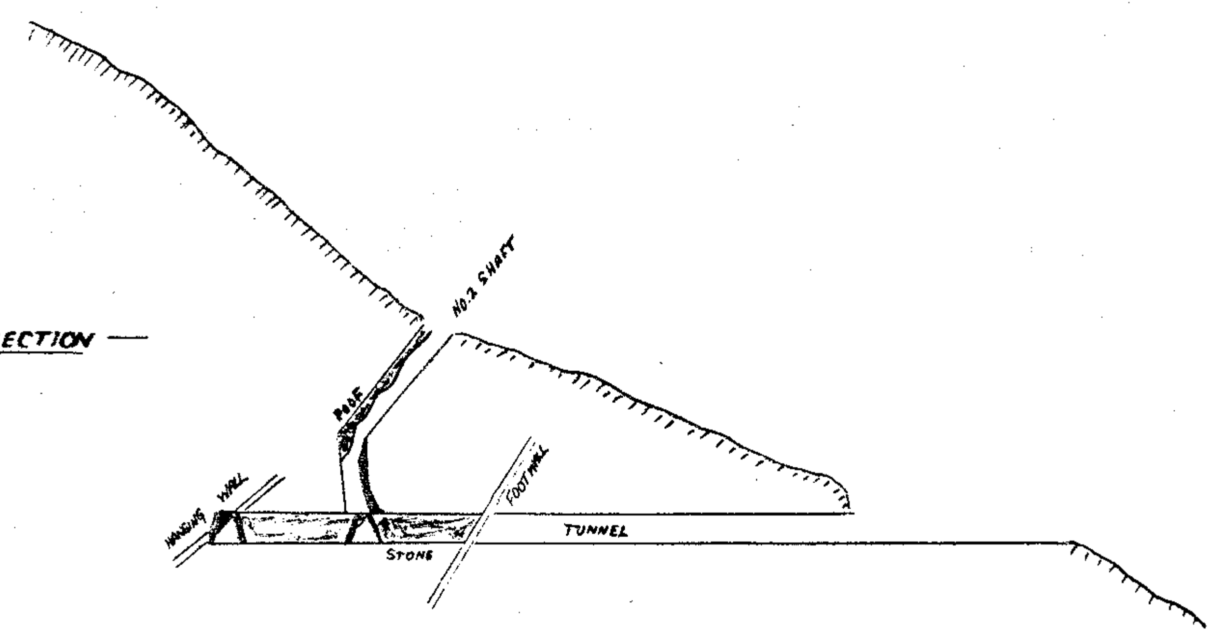


CROSS SECTION