CHAPTER 5 MINE DEVELOPMENT PLAN

5-1 Ore Resources Evaluation

Ore resources evaluations were manipulated using Genesis Module of MINEX software. The procedure for ore resources evaluation consists of inputting digital topographic data & area creation, inputting drill hole data, data validation, geological modeling, simple statistics & geostatistical analysis, 3D block grade modeling and resources reporting including classifications and interpolations of ore block grades. A data set of 548 drill holes totaling 52,006.1 m was used for resources evaluations.

Resources were classified according to the terms and definitions contained within the "JORC Code". During grade interpolation 'number of points (composites)' and 'distance' were adopted as parametres indicating 'confidence' level. Distances were determined by using ranges in the semi-variogams of each ore body. Top-cutting also were adopted for each ore deposit taking account of nugget effects for both copper and gold.

The following table gives the geological ore resources at a cut-off grade of 0.5%Cu

Table I-5-1 Geological ore reserve at 0.5%COG

	Tonnage (kt)	Copper grade (%Cu)	Contained Cu (t)	Gold grade (g/tAu)	Contained Au (kg)
Rakah					
Total	5,094	0.83	42,643	0.63	3,218
Stockwork	4,886	0.81	39,580	0.50	2,443
Massive	208	1.47	3,063	3.72	775
Hayl As Safil					
Total	5,958	1.13	67,290	0.42	2,473
Stockwork	5,369	1.06	56,917	0.33	1,772
Massive	589	1.76	10,373	1.19	701
Al Asghar					
Massive	932	2.72	25,364	0.99	923
Al Bishara					
Brecciated	3,069	1.09	33,459	0.89	2,731
Al Jadeed					
Brecciated	744	1.34	9,982	0.68	506
Total	15,797	1.13	178,738	0.62	9,851
Stockwork	10,255	0.94	96,497	0.41	4,215
Massive	1,729	2.24	38,800	1.39	2,399
Brecciated	3,813	1.14	43,441	0.85	3,237

5-2 Mine Planning

Prior to the pit design, pit optimisation is performed in order to estimate an economical pit shape.

Pit optimisation derives a pit shape with maximum profit from the block model with profits or losses calculated from assumptions of metal price, cut off grade, operating cost etc.

On the result of pit optimisation, Rakah and Al Ashgar body present minable reserves at lower copper price(US55 ¢ /lb). Similarly Hayl as Safil body is minable when copper price is more than US65 ¢ /lb, and Al Bishara body is minable when copper price is more than US105 ¢ /lb. However Al Jadeed body does not have any block that can be exploited economically even at US120 ¢ /lb of copper price and US$400/oz of gold price.

To secure enough reserves for mine development, detailed pits are designed based on optimal pits at US120 ¢ /lb of copper and US$400/oz of gold price, because according to the results of pit optimisation studies, minable reserves are not sufficient to develop a mine based on the recent low market prices.

There is no minable reserve in Al Jadeed body from the results of pit optimisation. Therefore the pit design in Al Jadeed body is not feasible.

The existent wadi, which overlies the ore body in Hayl as Safil, does not obstruct the pit shape because this wadi will be diverted to eastside.

Minable reserves from the pit design are shown in Table I-5-2.

Table 1-5-2 Minable Reserve

Area	Ore ('000T)	Waste ('000T)	W/O Ratio	Copper (%)	Gold (g/T)	Copper (T)	Gold (kg)
Rakah	2,701	6,080	2.25	0.99	0.95	26,754	2,558
Al Ashgar	644	7,443	11.55	2.63	0.79	16,923	512
Hayl Al Safil	4,101	13,628	3.32	1.17	0.46	47,806	1,894
Al Bishara	729	2,740	3.76	1.23	0.83	8,958	607
Total	8,175	29,891	3.66	1.23	0.68	100,441	5,571

Cut off grade = 0.5%Cu

Mining schedule is planed in regard to two cases of production rates, i.e., 3,000t/day and 2,000t/day.

In order to improve the cash flow and maximize NPV, mining is envisaged to commence from Rakah and Al Ashgar pits first, because these pits are able to be exploited even with lower metal prices. After these two pits are mined out, Hayl as Safil and Al Bishara pits are mined in order.

3,000t/day production gives a mine life of 8 years, and 2,000t/day gives 12 years.

Based on annual tonnages of ore and waste mined, productivities of loading and hauling and dumping schedule, the number of required equipments is estimated.

The waste dump area is decided circumspectly to avoid the existent wadi and diverted wadi in

Hayl as Safil area, and is close to the pit. Part of waste from Hayl as Safil and Al Bishara pits are dumped into Al Ashgar pit up to original topographic level.

It is considered from the mining plan and the site investigation that contract mining is adequate for drilling, blasting, loading, hauling (including road maintenance) and dozing at waste dump in this project. In that contract mining, the contractors provide all equipments and labors.

5-3 Metallurgical Tests

In order to assist in the judgement on possibilities of improvement for useful mineral recoveries, especially for gold, basic testing for gold recovery from pyrite concentrate was carried for ore samples obtained from each ore bodies of Hayl as Safil and Rakah areas in Yanqul region. And studies were also conducted on matters related to the design of concentrator.

5-3-1 Characteristics of tested samples

Four samples for testing were collected from the drilling during this phase, each representing a different ore type. Head assays for the major elements are summarized in the following table (Table I -5-3).

Table I -5-3 Head assays of major elements

Body name and Type of ore	Rakah Body Stockwork	Rakah Body Massive	Hayl as Safil Body Stockwork	Bishara Body Breccia
Cu, %	1.15	1.82	0.915	1.45
Au, g/t	0.45	3.78	0.16	1.06
S total, %	3.35	39.0	7.40	28.3
S sulphide, %	3.30	38.8	7.40	28.1

These samples were examined mineralogically to determine the location of gold and to provide general information regarding the mineralogy of the samples. The results are shown in Table I -5-4.

Table I -5-4 Occurrence of gold minerals

Location of Gold	Proportion of Gold, %			
	Rakah Body Stockwork	Rakah Body Massive	Hayl as Safil Stockwork	Bishara Body Breccia
Liberated native gold	15	3	19	3
Locked in sulphides	46	57	37	60
Locked in silicates	12	4	17	4
Undifferentiated -20μm	27	36	27	33

5-3-2 Batch flotation tests

The best flotation results obtained for each sample in the rougher series are shown in Table I -5-5. Although pH varied for the different samples, all tests used a collector mixture comprising SIPX and M2030.

Table I -5-5 Summary of best rougher/scavenger flotation tests

Body name and Type of ore	Rakah Body Stockwork	Rakah Body Massive	Hayl as Safil Stockwork	Bishara Body Breccia
Test No	FL06	FL14	FL13	FL15
Grind P_{80}, μm	70	70	70	70
PH	9.5	11.0	12.5	9.5
Cu Recovery, %				
Cu Ro Con 1	53.9	38.7	72.9	38.2
Cu Ro/Sc Con	95.7	88.0	94.4	80.8
Cu Grade, %				
Cu Ro Con 1	24.8	41.5	22.0	22.6
Cu Ro/Sc Con	8.6	18.1	10.7	10.3
Au Recovery, %				
Cu Ro/Sc Con	86	27.6	40.9	23.9
Py Con	--	35.6	--	28.5(1)
Au Grade, g/t				
Cu Ro/Sc Con	3.2	10.8	1.3	2.4
Py Con	--	3.5	--	1.4(1)

(1) Results for pyrite concentrate produced in test FL23

Copper recoveries from rougher/scavenger flotation varied from 94% to 96% for the stockwork samples to 80 to 90% for breccia and massive sulphide samples. Concentrate grades also varied, ranging from 42% in the rougher 1 concentrate for Rakah Massive Sulphide to 22 to 25% for the remaining samples.

With the exception of the Bishara Breccia, the Oman copper samples responded very well to rougher-scavenger flotation at a moderately fine grind P_{80} of 70 microns. Finer grinding failed to improve the metallurgical response of the Bishara sample in which the copper losses in the scavenger tailings were entirely locked. The intermediate level of rougher-scavenger recovery for the Rakah Massive Sulphide sample was also due to liberation limitations.

A significant result of the test program is that all samples responded well to the same collectors, with pH being the only main variable between the conditions suitable for the respective ore types.

5-3-3 Gold recovery by cyanide leaching

Only the Rakah Massive Sulphide and Bishara Breccia samples contained sufficient quantities of gold in the copper flotation tailings to warrant investigation of gold recovery. Furthermore, production of a pyrite concentrate from both samples resulted in significant gold in the tailings, so that extraction tests were undertake on both pyrite concentrate and tailings.

Pyrite concentrate samples were leached 'as floated', after regrinding and after roasting, while the tailings were leached 'as floated'. The results of leaching test are shown in Table I -5-6.

Table I -5-6 Cyanide leaching of pyrite concentrates

	Rakah Body: Massive ore			Bishara Body: Breccia ore		
	As Floated	Re-ground	Calcined	As Floated	Re-ground	Calcined
Grind P_{80}, μm	70	34	70	70	18	70
Head Assay, Au g/t	3.53	3.53	5.30	1.84	1.84	2.26
Calc. Head Assay, Au g/t	3.37	3.61	8.12	1.97	1.91	2.16
Residue Assay, Au g/t	2.42	1.93	1.18	1.40	1.13	0.75
Au Extraction, %						
8 hours	28	40	82	28	36	62
48 hours	28	44	85	30	42	66
NaCN Cons, kg/t	5.9	7.8	13.2	17.6	22.9	46.1

According to the table, Gold recoveries from the 'as floated' concentrate of both samples were low at approximately 30%. Re-grinding increased the extraction to 40 to 45%, while roasting resulted in the highest extractions of 85% for Rakah Massive Sulphide and 66% from Bishara Breccia.

The low extractions and the relatively minor increase in extraction after re-grinding suggests that the contained gold is extremely finely disseminated in the sulphides (pyrite and possible, arsenopyrite).

Cyanide consumptions recorded during the leaches were high, particularly after roasting. On the basis of the test results, cyanide costs would exceed the value of gold recovered from the Bishara Breccia sample and a major proportion of the gold recovered from the Rakah Massive Sulphide concentrate.

The overall gold recoveries obtained by the various stages of processing, as a percentage of total gold, are shown in the Table I-5-7. The figures in ***italics*** represent actual extractions of gold from the feed samples.

Table I -5-7 Overall gold recoveries

	Rakah Body Stockwork	Rakah Body Massive	Hayl as Safil Stockwork	Bishara Breccia
Test No	FL06	FL14	FL13	FL15,FL23
Head assay, Au g/t	0.45	3.78	0.16	1.06
Au recovery to Cu con, %	***86.1***	***27.6***	***40.9***	***23.9***
Au recovery to Py con, %		35.6		28.5
Au extraction by cyanidation of Py con (calcine), %		***31.3***		***18.8***
Au recovery to Py tail, %		36.8		43.4
Au extraction by cyanidation of Py tail, %		***12.9***		***8.2***
Total Au Recovery, %	***86.1***	***71.8***	***40.9***	***50.9***

Thus gold grades and recoveries varied considerably between the samples.

It should be remembered that cyanide leaching of the Rakah Massive Sulphide and Bishara Breccia pyrite concentrates and tailings resulted in excessive cyanide consumptions, to the point that the cyanide cost would exceed the value of gold recovered. In addition, oxidation of the pyrite concentrates was required to allow reasonable gold extractions to be achieved.

Based on the nature of the samples tested, the benefit of a specific circuit for gold recovery will depend on the quantity of ore containing significant gold grades.

Quantities of the various ore types aside, the relatively refractory nature of the gold will create difficulties in processing, so that an option to be considered might be to examine ways of maximizing gold recovery to copper flotation concentrates from all ore types.

5-3-4 Flotation tests on reground cleaner feed from Yanqul ore types

In phase II, in order to identify optimum regrinding size and improve Au recoveries to Cu concentrate, a series of flotation test was conducted changing regrinding size and dosing rate of silicate dispersant or sulphurizer on each type of ore. Test results are presented in Table I-5-8.

Table I-5-8 Test results of Reground Feed Cleaning

Ore	Test No.	Stage	Time	Con Cu%	CL Cu Rec%	CLAu Rec%
RS	FL01	1st Cleaner	8.5	21.4	76.5	64.6
RS	FL05	1st Cleaner	8.5	18.0	94.6	69.9
RS	FL09	1st Cleaner	8.5	22.8	79.4	57.2
RS	FL13	1st Cleaner	11.0	17.8	90.6	70.2
RS	FL13	3st Cleaner	6.5	22.4	84.6	60.3
HASS	FL02	1st Cleaner	5.5	19.4	90.1	38.3
HASS	FL06	1st Cleaner	5.5	20.8	90.6	42.2
HASS	FL10	1st Cleaner	5.5	21.6	72.7	27.5
HASS	FL14	1st Cleaner	11.0	18.5	87.1	40.8
HASS	FL14	3st Cleaner	6.5	24.6	68.1	23.2
BB	FL03	1st Cleaner	6.0	13.3	71.8	17.8
BB	FL07	1st Cleaner	6.0	15.1	74.6	15.9
BB	FL11	1st Cleaner	6.0	16.6	66.1	11.9
BB	FL15	1st Cleaner	11.0	16.8	71.1	14.1
BB	FL15	3st Cleaner	6.5	20.7	57.2	9.1
RMS	FL04	1st Cleaner	5.5	25.6	70.8	20.2
RMS	FL08	1st Cleaner	5.5	21.5	69.6	23.5
RMS	FL12	1st Cleaner	5.5	26.6	60.2	16.3
RMS	FL16	1st Cleaner	11.0	12.9	70.0	26.3
RMS	FL16	3st Cleaner	6.5	23.2	65.5	19.2

R-SW: Rakah Body (stockwork), HAS-SW: Hayl as Safil Body (stockwork)

B-B: Bishara Body (breccia), R-MS: Rakah Body (massive sulphide)

Tests FL01-FL04 were conducted on each ore type using the ball mill regrind with a regrind target of about P_{80} 20 μ m. Tests FL05-FL08 were conducted using the UFG mill regrind with a regrind target of about P_{80} 10-15 μ m. Test FL09-FL12 were conducted silicate dispersant on each ore type, while Test FL13-16 added NaHS as sulphurizer.

For Au, the UFG and addition of NaHS gave a small improvement in Au recovery for the BB and RMS ores. There was some very marginal improvements in UFG in the BB and HASS ores for Cu.

5-3-5 Locked cycle test

Test results of the locked cycle test with 6 stages are summarized in Table I-5-9

The effect of recycles revealed from the 4th stage, obtaining stable Cu concentrate grade and recovery. This result shows that grade of 20%Cu and recovery of 80% will be able to be obtained in actual plant operation approximately.

Table I-5-9 Locked cycle test result on composite sample

Product	Weight	Assay		Recovery %	
	%	Cu %	Au g/t	Cu %	Au %
Caluculated Head	100.00	1.12	0.76	100.0	100.0
Cu 3rd Cleaner Concentrate	4.33	20.5	5.5	79.2	32.2
Cu 1st Cleaner Tail	5.36	2.39	2.17	11.4	14.6
Cu Scavenger Tail	90.31	0.12	0.45	9.4	53.2

5-3-6 Other tests

As pretreatment for Au leaching, pressure oxidation and bacterial oxidation tests were conducted in order to promote oxidation effectively. No test data showed cost effective result.

5-4 Process Design and Metallurgy

Planned location of process plant is shown in Fig.I-5-1.

Considering the size of the deposits and the variety of the ore types, the decision was taken to select a traditional crushing and grinding circuit for this study. To minimize overall capital, a crushing and single ball mill circuit was selected.

The basic design philosophy for plants such as this is to recover the fast floating coarse liberated mineral into the cleaner stream without regrind in a high grade rougher concentrate. The slower floating composite and fine particles recovered in the scavenger concentrate are then reground to liberate and create fresh sulfide surface prior to cleaning. The first cleaner is run to maintain grade, and a cleaner-scavenger unit is used to control cleaner circuit recovery. Cleaner-scavenger concentrate is returned to regrind, while the tail joins the scavenger tail as final tailings.

The plant design is based on a flowsheet established after a review of testwork programmes conducted in this study. The design and innovative layout of the operation recognises the need to conserve capital while still providing a plant that is easy to operate and maintain. The process design recognises this and provides for some flexibility in operations to enable the redirection of key process streams within the flotation circuit. This flexibility will allow for differing flotation responses expected from the various ore types. The mill plant flowsheets are shown in Fig. I-5-2, I-5-3 and I-5-4.

The mill plant differences between the throughputs of 3,000t/d and the2,000t/d cases are as follows:

① In the mill flowsheet of crushing plant, three staged circuit is appliedfor the 3,000t/d case, while two staged circuit is designed for the 2,000t/dcase.

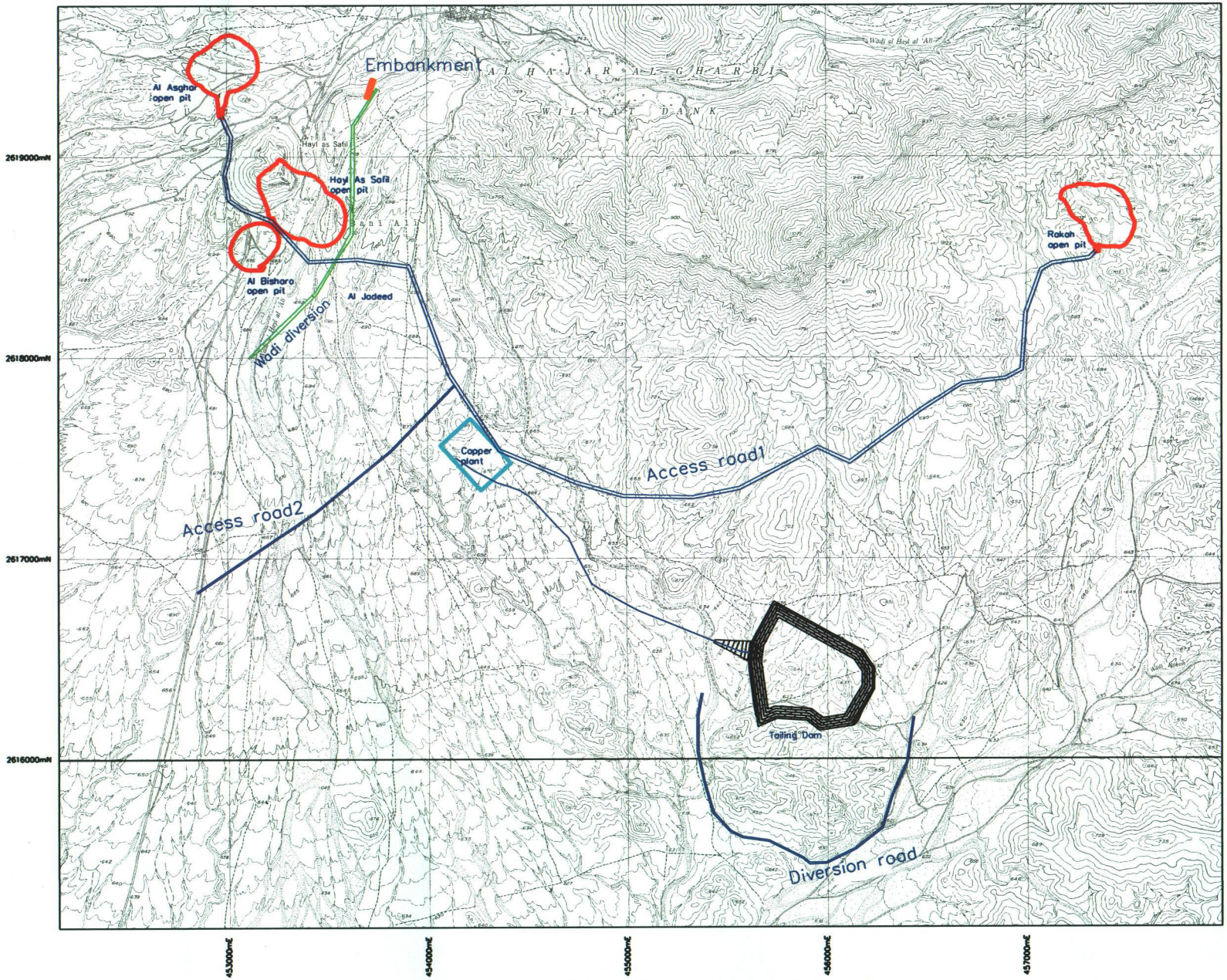
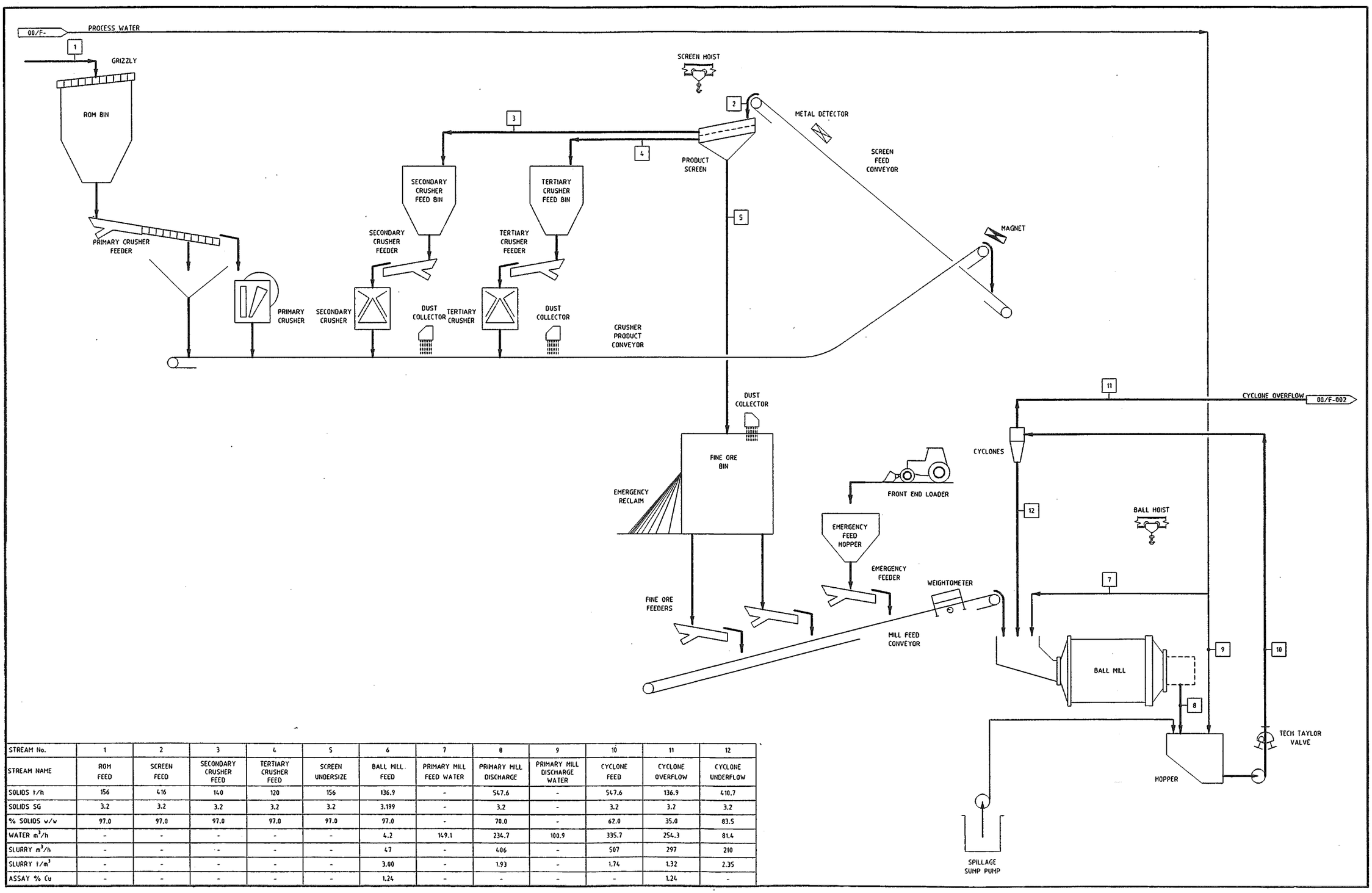
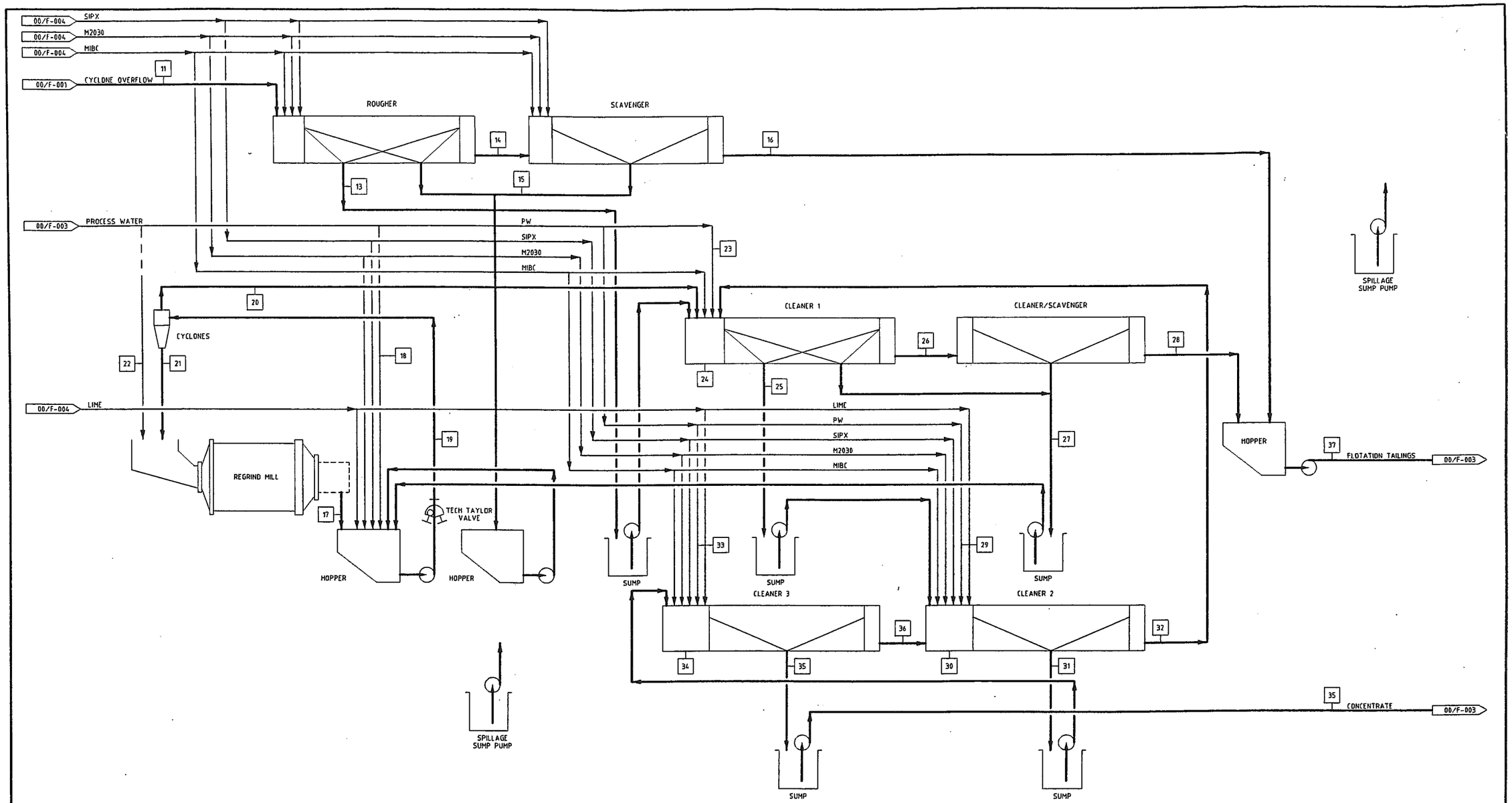


Fig. I -5-1 Location of process plant and tailing dam



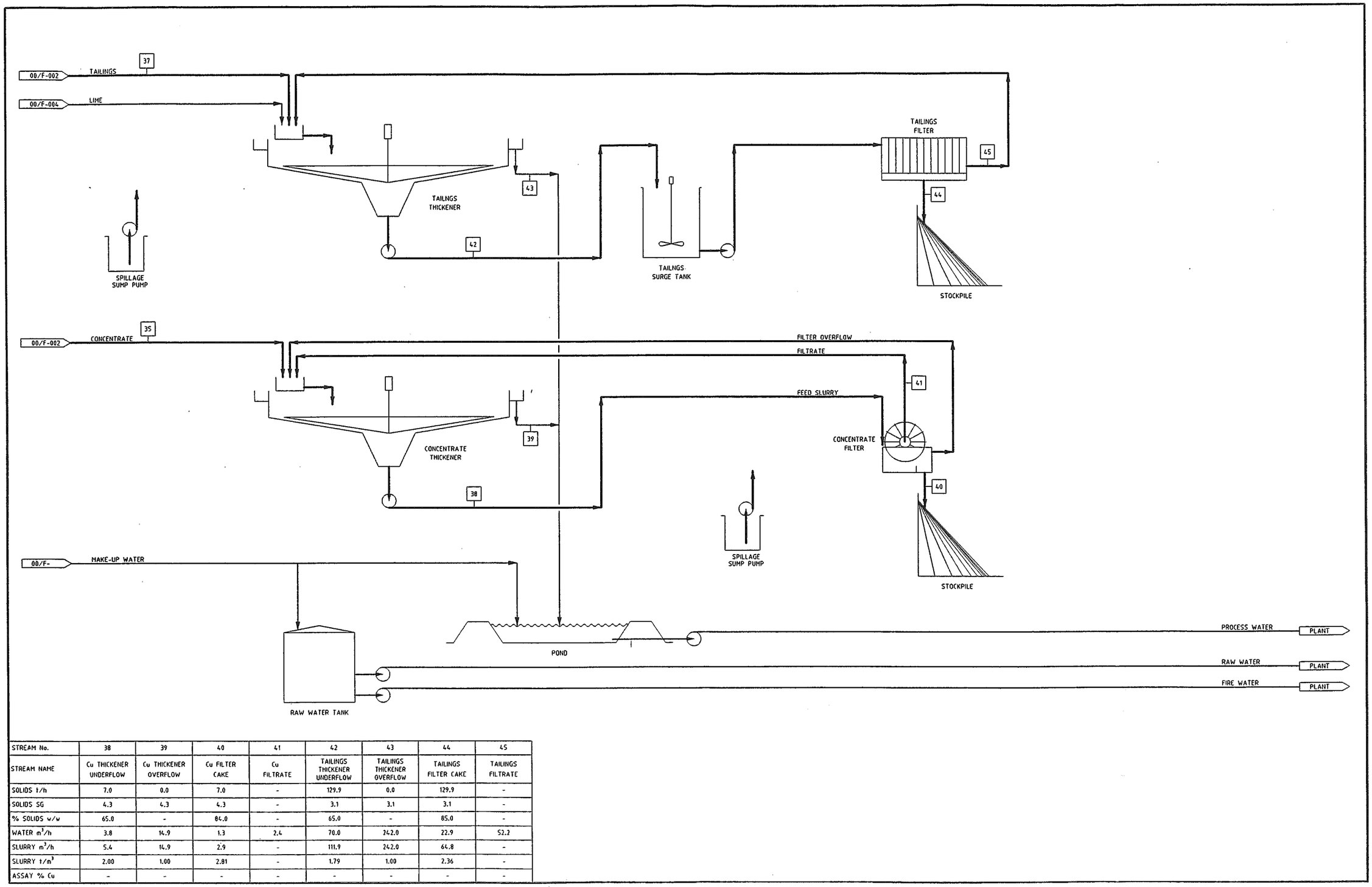
STREAM No.	1	2	3	4	5	6	7	8	9	10	11	12
STREAM NAME	ROM FEED	SCREEN FEED	SECONDARY CRUSHER FEED	TERTIARY CRUSHER FEED	SCREEN UNDERSIZE	BALL MILL FEED	PRIMARY MILL FEED WATER	PRIMARY MILL DISCHARGE	PRIMARY MILL DISCHARGE WATER	CYCLONE FEED	CYCLONE OVERFLOW	CYCLONE UNDERFLOW
SOLIDS t/h	156	416	140	120	156	136.9	-	547.6	-	547.6	136.9	410.7
SOLIDS SG	3.2	3.2	3.2	3.2	3.2	3.199	-	3.2	-	3.2	3.2	3.2
% SOLIDS w/w	97.0	97.0	97.0	97.0	97.0	97.0	-	70.0	-	62.0	35.0	83.5
WATER m^3/h	-	-	-	-	-	4.2	149.1	234.7	100.9	335.7	254.3	81.4
SLURRY m^3/h	-	-	-	-	-	47	-	406	-	507	297	210
SLURRY t/m^3	-	-	-	-	-	3.00	-	1.93	-	1.74	1.32	2.35
ASSAY % Cu	-	-	-	-	-	1.24	-	-	-	-	1.24	-

Fig. I -5-2 Process flow diagram (crushing and grinding)



STREAM No.	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
STREAM NAME	CYCLONE OVERFLOW	ROUGHER CONCENTRATE	ROUGHER TAILINGS	SCAVENGER CONCENTRATE	SCAVENGER TAILINGS	REGRIND MILL DISCHARGE	REGRIND MILL DISCHARGE WATER	REGRIND CYCLONE FEED	REGRIND CYCLONE OVERFLOW	REGRIND CYCLONE UNDERFLOW	REGRIND MILL FEED WATER	CLEANER 1 DILUTION WATER	CLEANER 1 FEED	CLEANER 1 CONCENTRATE	CLEANER 1 TAILINGS	CLEANER/ SCAVENGER CONCENTRATE	CLEANER/ SCAVENGER TAILINGS	CLEANER 2 DILUTION WATER	CLEANER 2 FEED	CLEANER 2 CONCENTRATE	CLEANER 2 TAILINGS	CLEANER 3 DILUTION WATER	CLEANER 3 FEED	CLEANER 3 CONCENTRATE	CLEANER 3 TAILINGS	COMBINED TAILINGS
SOLIDS t/h	136.9	6.3	130.6	10.6	120.0	18.8	-	33.6	14.7	18.8	-	-	25.5	11.4	14.0	4.1	9.9	-	14.2	9.7	4.5	-	9.7	7.0	2.7	129.9
SOLIDS SG	3.2	4.3	3.1	3.3	3.1	4.3	-	4.3	4.3	4.3	-	-	3.7	4.1	3.4	3.7	3.2	-	4.0	4.2	3.7	-	4.2	4.3	3.9	3.1
% SOLIDS w/w	35.0	35.0	35.0	25.0	36.3	60.0	-	38.0	25.0	64.0	-	-	15.0	30.0	10.7	20.0	8.9	-	15.0	30.0	7.2	-	15.0	30.0	6.6	29.4
WATER m^3/h	254.3	11.7	242.6	31.9	210.7	12.6	30.5	54.7	44.1	10.6	1.9	16.2	144.3	26.7	117.6	16.4	101.2	14.9	80.2	22.6	57.6	32.3	54.9	16.3	38.6	312.0
SLURRY m^3/h	297	13	284	35	249	17	-	63	48	15	-	-	151.2	29.5	121.7	17.5	104.3	-	83.7	24.9	58.8	-	57.2	17.9	39.3	353.3
SLURRY t/m^3	1.32	1.37	1.31	1.21	1.33	1.85	-	1.41	1.24	1.96	-	-	1.12	1.29	1.08	1.17	1.07	-	1.13	1.30	1.06	-	1.13	1.30	1.05	1.25
ASSAY % Cu	1.24	20.00	0.34	3.20	0.08	-	-	-	5.09	-	-	-	9.59	16.0	4.35	10.0	2.03	-	15.4	18.0	9.76	-	18.0	20.0	12.86	0.23

Fig. I -5-3 Process flow diagram (flotation)



STREAM No.	38	39	40	41	42	43	44	45
STREAM NAME	Cu THICKENER UNDERFLOW	Cu THICKENER OVERFLOW	Cu FILTER CAKE	Cu FILTRATE	TAILINGS THICKENER UNDERFLOW	TAILINGS THICKENER OVERFLOW	TAILINGS FILTER CAKE	TAILINGS FILTRATE
SOLIDS t/h	7.0	0.0	7.0	-	129.9	0.0	129.9	-
SOLIDS SG	4.3	4.3	4.3	-	3.1	3.1	3.1	-
% SOLIDS w/w	65.0	-	84.0	-	65.0	-	85.0	-
WATER m^3/h	3.8	14.9	1.3	2.4	70.0	242.0	22.9	52.2
SLURRY m^3/h	5.4	14.9	2.9	-	111.9	242.0	64.8	-
SLURRY t/m^3	2.00	1.00	2.81	-	1.79	1.00	2.36	-
ASSAY % Cu	-	-	-	-	-	-	-	-

Fig. I -5-4 Process flow diagram (dewatering)

② The sizes (consequently the installed motor powers) of the major mill equipments such as of ball mills, thickeners and filters are distinct each other.

③ The flotation cell numbers are designed as one cell less in therougher-scavenger circuit and three cells less in the cleaner circuit for the 2,000t/d case , with the same flotation cell sizes.

5-5 Tailings Dam

5-5-1 Site selection

The sites were initially selected taking into account the topography of the area, environmentally sensitive areas and the position of the disposal area in relation to the process plant. The four alternative schemes identified as possible options for the a tailings management facility (TMF) are shown in Fig. I-5-1.

5-5-2 Pre-feasibility design

Two tailings deposition methods were selected for comparison in this study.

- "Wet" tailings deposition, consisting of thickened tailings, pumped as slurry at a pulp density of 45% to 55%.
- "Dry" tailings deposition, with a moisture content of approximately10% to 15%, which to be transported by truck to the depository.

The main works for this study are summarized as follows:

- preliminary design of the main cost items for both "Dry" and "Wet" TMF options
- evaluation for the two tailings disposal options with respect to the environmental impact, capital and operating costs

The combined total for the capital, operating and closure costs indicates that for low water costs, the wet tailings disposal option has the lowest lifetime cost and that for high water costs, the dry tailings disposal option has the lowest lifetime cost.

In terms of the expected accuracy of the cost estimate, the total life costs for the two disposal options are not significantly different and other factors need to be considered to take decisions as to which is the best option. One of these factors is environmental risk.

Both options have been designed to minimize the impact on the environment. Based on risk analysis and experience, the wet tailings disposal method generally has a higher potential impact than the dry tailings for the same set of circumstances.

In view of the potential impact on the environment and a risk of water cost, "Dry " tailings disposal option will be adopted for this study.

5-6 Organization and Human Resources Plan

Basic concept for the plan in this study is derived from the idea of the previous Sohar mine.

During this study, the number of people was reduced as much as possible but trying to keep a good efficiency in every section of the organization. The number of personnel working within the mine operation was set in 95, but this number is estimated to increase to promote systematically the Omanization of employees. According to this circumstance, it is expected that 65% of the total of employees will be of Omani nacionality.

5-7 Infrastructure

At present, Oman is planning to construct a new highway (near the project site) from Sohar to Yanqul. Transportation of Materials and products will use this highway.

There are two access road in the project area. Access road ① will be constructed between each pit and the process plant and 15m width for large dump truck with approximately 6,500m in length. Box culverts will be constructed at small wadi, where road is feared of erosion by the surface flows. Access road ② will be constructed between the process plant and the highway and 8m width with approximately 1,700m in length.

A part of existing public road will be closed by the tailing dam construction. Therefore the new diversion road will be constructed for public road. Diversion road is 8m width and approximately 2,300m length.

Wadi al hayl al Ali is located at Hayl As Safil and Al Bishara pits. Therefore, a wadi diversion will be planned for prevention of surface flows into the pits. Standard section of channel is designed for 50 years Rainfall Intensity.

At present, Masarrat Water Supply Project is carrying out and the pipeline is constructed between mother well at Masarrat and Yanqul. This project will be completed by March, 2002, and water tank (capacity 5,000ton) will be constructed at Yanqul city.

5-8 Environment

Groundwater investigation was conducted in order to clarify concerns on the behavior of the groundwater, permeability and water quality in and around area of Rakah and Hayl as Safil deposits.

The groundwater levels are distributed in a range from –9.09 to -19.89m. The calculation of the permeability coefficients based on pumping test at each bore hole of this area indicated values distributed in a range between 4.55E-5 and 1.66E-7cm/s and with a tendency to present

higher values in the lower downstream.

The groundwater in the study area can be classified into three groups. In the Group 1, represented by the area around Rakah Gold Mine, indicates characteristics of high contents of calcium and sulfate ions (gypsum) and sodium and chlorine ions (salt). The Group 2 which represent the two wadis of Wadi al Hayl al Ali and Wadi Rakah, show relatively higher contents of bicarbonate ion. Group 3 representing Wadi Falaj Sudayriyin and the downstream of Wadi Rakah, shows higher contents of sodium and chlorine ions.

The environmental factors mainly consist of excavation work of overburden, waste dump areas, mining work, ore dressing work, stock and transportation works of concentrate, tailing dump areas, waste water treatment, pumping and supply works of groundwater, mine office, accommodation, mine road, other associated facilities, etc.

Selected environmental items consist of 11 items, namely air quality, water quality, noise/vibration, land water, flora/fauna, landscape, wastes, cultural heritages, communities, and relocation of havitants.

The environmental monitoring plan, consisting of the air quality, water quality, soil quality, noise and vibration.

5-9 Financial and Economic Evaluation

In relation to the capital and operating costs for the project, the following terms and conditions were applied;

a) water would be collected at the processing plant, i.e. construction costs in related to water facilities to the processing plant would not be included,
b) electricity could be received at the processing plant, i.e. construction costs related to electricity facilities to the processing plant would not be included,
c) water price would be set at 1 Baiza per gallon which is the price that Rakah Gold Mine currently pays to the local people,
d) electricity price would be set at 20 Baizas per kilowatt which is the price that Rakah Gold Mine currently pays to the Ministry of Housing, Electricity and Water,
e) construction cost of an access road connecting the town of Yanqul to the mine would be excluded,
f) construction costs for communication facilities would be applied only to the facilities in the processing plant,
g) compensations cost for lands and houses for local people would be excluded,
h) education cost related to technical education to Omani workers would be excluded,
i) profits relating to extraction of Gossan, i.e. gold oxides, at the Bishara would be excluded,

and

j) capital cost would includ the mining cost for stripping overburdens and Gossans at the Bishara body.

Capital and operating costs were calculated at 3,000t/d and 2,000t/d of mining rate based on the terms and conditions above. Ore processing rate is same as the mining rate.

5-9-1 Capital cost at processing rate of 3,000t/d

The total capital cost at 3,000t/d amounted to US$29,658,500. Breakdown of the capital cost is presented in Table I-5-10. In relation to the concentrator costs, capital cost relating to a tailings dam amounted to US$4,248,400. Significant decrease in capital costs for mining is caused by adoption of contractors for drilling & blasting, mining, loading & hauling including road maintenance and dozing of waste dumps with all equipments by contractors, aiming to decrease capital costs.

Table I-5-10 Summary of capital costs

Item	Base case -3,000t/d (US$ 1,000)	Option case -2,000t/d (US$1,000)
Mining	2,276.0	2,276.0
Concentrator	18,759.0	15,379.0.0
Mine general items	609.3	609.3
Infrastructure	1,998.0	1,998.0
Environment	153.0	153.0
Owner's costs	1,344.2	1,344.3
Subtotal	25,139.5	21,759.5
Contingency	1,146.0	1,146.0
EPCM	3,373.0	3,373.0
Subtotal	4,519.0	4,519.0
Total	29,658.5	26,278.5

Table I-5-11 Summary of direct operation costs

Item	Base case -3,000t/d (US$ 1,000)	Option case -2,000t/d (US$1,000)
Mining	28,119.3	31,126.3
Concentrator	51,029.1	57,511.7
Supporting	6,004.0	8,672.5
Concentrate Transportation	4,505.7	4,504.7
Environment	207.0	253.0
Total	89,864.2	102,068.2

In relation to the total capital cost, initial investment amounted to US$27,501,000 while additional investment amounted to US$2,157,500 (Table I-5-12). Main item for additional investment is allocated according to the expansion cost of tailings dams at Year 4 after the commencement of production.

The total operating cost amounted to US$89,864,200. Breakdown of the operating expenditures is presented in Table I-5-13. Mining operating cost amounted to US$28,119,300 which represents more than 30% of the total operating cost. This is the reason for mining development on contractor basis.

5-9-2 Capital cost at processing rate of 2,000t/d

The total capital cost at processing rate of 2,000t/d amounted to US$26,278,500. Breakdown of the capital expenditures is also presented at Table I-5-10. Comparing with 3,000t/d, the amount decreases 11%, i.e. US$3,380,000, at 2,000t/d due to decrease of concentrator cost. Mining cost remains the same because it will be on a contractor basis. Schedule for initial and additional investments are presented at Table I-5-13.

The operating cost at processing rate of 2,000t/d amounted to US$102,068,200 as presented at Table I-5-11. Comparing with the case of 3,000t/d, it will significantly increase by US$12,204,000. This is caused by the 4 year extension of mining life while operating cost for each year decreases at the case of 2,000t/d.

5-10 Overall Evaluation of Mine Development

5-10-1 Consideration under major premise

The major premise for the financial analysis and economic analysis on this project is that the project be financially independent. The actual cost and recovery of Sohar smelter were not used. Instead international standards at present were applied for objective evaluation.

Annual production schedule, estimated annual revenue, annual profits & losses and cash flows are prepared for the financial evaluation. The results shows that the internal rate of return(ROI) at 3,000t/d is 5.92% at US100 ¢ /lbCu on all loan of 6% interest rate. Table I-5-14 and Table I-5-15 show the annual profits and losses and cash flow for financial evaluation for all loan and all equity.

Annual profits and losses and cash flow for economic evaluation are presented in Table I-5-16 and 12.47% of ROI is obtained at US100 ¢ /lbCu on all loan of 6% interest rate. In this economic evaluation, royalty and income tax are exempted

Sensitivity analysis has been conducted on the financial IRR to the project. Results at 3,000t/d are presented in Fig. I-5-5. The analysis has proven that this project is most sensitive to copper price both for all equity and loans.

Table I -5-12 Initial and additional investment schedule (3,000t/d)

(Unit : US$1,000)

Items	Total	Initial Inv.	Additional Investment								
		Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
(MINING)											
Pre-Stripping	1,723.6	1,723.6									
Direct	287.2	287.2									
Contractor	1,436.4	1,436.4									
Equipment (pump, vehicle, etc.)	552.4	144.2		28.2		380.0					
Subtotal	2,828.5	1,867.8	0.0	28.2	0.0	380.0	0.0	0.0	0.0	0.0	0.0
(CONCENTRATOR)											
Crushing	2,313.0	2,313.0									
Grinding	2,624.0	2,624.0									
Flotation	1,783.0	1,783.0									
Concentrate thickening & filtration	748.0	748.0									
Tailings thickening & filtration	2,734.0	2,734.0									
Reagents	309.0	309.0									
Water and air services	439.0	439.0									
Buildings (including main office)	1,350.0	1,350.0									
Other costs	3,358.0	3,358.0									
Tailings dam construction	3,101.0	1,839.0				1,262.0					
Tailings dam closure cost	0.0	0.0									
Subtotal	18,759.0	17,497.0	0.0	0.0	0.0	1,262.0	0.0	0.0	0.0	0.0	0.0
(MINE GENERAL ITEMS)											
Communication system	100.0	100.0									
Drainage system	250.0	250.0									
Support service expense	130.9	130.9									
Accommodation	97.4	97.4									
Magazine house	31.0	31.0									
Land acquisition	--	--									
Compensation	--	--									
Subtotal	609.3	609.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(INFRASTRUCTURE)											
Road diversion	112.0	112.0									
Access road	899.0	899.0									
Wadi diversion	987.0	987.0									
Power line	--	--									
Water pipeline	--	--									
Subtotal	1,998.0	1,998.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(ENVIRONMENT)	153.0	153.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(OWNER'S COSTS)	1,344.2	1,344.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	25,139.5	23,469.3	0.0	28.2	0.0	1,642.0	0.0	0.0	0.0	0.0	0.0
Contingency	1,146.0	810.1		1.4		334.5					
Mining	113.8	93.4		1.4		19.0					
Tailing dam	775.3	459.8				315.5					
Others	256.9	256.9									
EPCM	3,373.0	3,221.6				151.4					
Concentrator	2,763.0	2,763.0									
Tailing dam	372.1	220.7				151.4					
Others	237.9	237.9									
Subtotal	4,519.0	4,031.7	0.0	1.4	0.0	485.9	0.0	0.0	0.0	0.0	0.0
Grand Tatal	29,658.5	27,501.0	0.0	29.6	0.0	2,127.9	0.0	0.0	0.0	0.0	0.0

Table I -5-13 Initial and additional investment schedule (2,000t/d)

(Unit : US$1,000)

Items	Total	Initial Inv.	Additional Investment												
		Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
(MINING)															
Pre-Stripping	1,723.6	1,723.6													
Direct	*287.2*	*287.2*													
Contractor	*1,436.4*	*1,436.4*													
Equipment (pump, vehicle, etc.)	552.4	144.2		28.2		0.0	380.0								
Subtotal	2,276.0	1,867.8	0.0	28.2	0.0	0.0	380.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(CONCENTRATOR)															
Crushing	1,709.0	1,709.0													
Grinding	2,046.0	2,046.0													
Flotation	1,247.0	1,247.0													
Concentrate thickening & filtration	584.0	584.0													
Tailings thickening & filtration	1,865.0	1,865.0													
Reagents	247.0	247.0													
Water and air services	340.0	340.0													
Buildings (including main office)	1,350.0	1,350.0													
Other costs	2,890.0	2,890.0													
Tailings dam construction	3,101.0	1,839.0						1,262.0							
Tailings dam closure cost	0.0														
Subtotal	15,379.0	14,117.0	0.0	0.0	0.0	0.0	0.0	1,262.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(MINE GENERAL ITEMS)															
Communication system	100.0	100.0													
Drainage system	250.0	250.0													
Support service expense	130.9	130.9													
Accommodation	97.4	97.4													
Magazine house	31.0	31.0													
Land acquisition	--	--													
Compensation	--	--													
Subtotal	609.3	609.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(INFRASTRUCTURE)															
Road diversion	112.0	112.0													
Access road	899.0	899.0													
Wadi diversion	987.0	987.0													
Power line	--	--													
Water pipeline	--	--													
Subtotal	1,998.0	1,998.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(ENVIRONMENT)	153.0	153.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(OWNER'S COSTS)	1,344.2	1,344.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	21,759.5	20,089.3	0.0	28.2	0.0	0.0	380.0	1,262.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Contingency	1,146.0	810.1		1.4			19.0	315.5							
Mining	*113.8*	*93.4*		*1.4*			*19.0*								
Tailing dam	*775.3*	*459.8*						*315.5*							
Others	256.9	*256.9*													
EPCM	3,373.0	3,221.6						151.4							
Concentrator	*2,763.0*	*2,763.0*													
Tailing dam	*372.1*	*220.7*						*151.4*							
Others	*237.9*	*237.9*													
Subtotal	4,519.0	4,031.7	0.0	1.4	0.0	0.0	19.0	466.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Tatal	26,278.5	24,121.0	0.0	29.6	0.0	0.0	399.0	1,728.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table I -5-14 Annual profit(loss) and cash flow (3,000t/day, Cu:100 ¢ ,financial, all loan)

Financial evaluation: all loan

Metal Price			IRR
Copper	(USc/lb)	100	5.92 % as R.O.I.
Gold	(US$/troz)	290	

T/C(US$/t) : 100
R/C(US ¢ /lb): 10

(Unit : US$1,000)

	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
(PROFIT & LOSS STATEMENT)											
1. NET REVENUE		21,254.3	16,197.0	25,021.5	21,441.7	16,338.4	15,379.5	13,657.1	5,332.2	0.0	134,621.5
2. COSTS											
Direct Operating Costs											
Mining		3,498.0	4,345.3	4,649.1	5,538.4	4,282.3	2,543.9	2,547.2	714.9	0.0	28,119.3
Concentrator		6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	3,001.0	3,000.0	51,029.1
Supporting		667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	6,004.0
Conc. Transportation		556.7	475.3	901.9	782.1	579.7	541.3	475.3	192.4	0.0	4,504.7
Environment		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	115.0	207.0
Subtotal		11,166.0	11,931.8	12,662.2	13,431.8	11,973.2	10,196.4	10,133.7	4,586.9	3,782.1	89,864.2
Royalty		1,034.9	786.1	1,206.0	1,033.0	787.9	741.9	659.1	257.0	0.0	6,505.8
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Interest 6 %		1,749.1	1,495.2	1,221.9	827.2	453.1	422.2	9.9	0.0	0.0	6,178.5
Total Costs		17,274.5	17,537.7	18,419.7	18,621.5	17,075.8	15,222.1	14,664.3	8,705.5	4,686.1	132,207.2
3. PROFIT BEFORE TAX		3,979.7	-1,340.7	6,601.8	2,820.2	-737.4	157.4	-1,007.2	-3,373.3	-4,686.1	2,414.3
4. INCOME TAX		281.6	0.0	377.7	194.6	0.0	0.0	0.0	0.0	0.0	853.9
5. NET PROFIT AFTER TAX		3,698.2	-1,340.7	6,224.1	2,625.6	-737.4	157.4	-1,007.2	-3,373.3	-4,686.1	1,560.4
(CASH FLOW STATEMENT)											
Net Profit After Tax		3,698.2	-1,340.7	6,224.1	2,625.6	-737.4	157.4	-1,007.2	-3,373.3	-4,686.1	1,560.4
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Equity	0.0										
Loan	27,501.0										
Capital Expenditure	-27,501.0										-27,501.0
Interest During Construction	1,650.1										
Additional Capital Expenditure		0.0	-29.6	0.0	-2,128.0	0.0	0.0	0.0	0.0	0.0	-2,157.7
Working Capital Increase (Decrease)		-2,791.5	2,600.0	-2,974.1	2,407.6	-2,609.4	2,851.8	-2,593.8	4,238.5	-1,447.0	-317.8
Loan Repayment		-4,231.3	-4,554.3	-6,579.5	-6,234.7	-514.7	-6,870.8	-165.7	0.0	5,229.2	-23,921.9
Net Generated Cash		0.0	0.0	0.0	0.0	0.0	0.0	94.9	4,726.8	0.0	4,821.7
PRINCIPAL	29,151.1	24,919.8	20,365.5	13,785.9	7,551.2	7,036.5	165.7	0.0	0.0	5,229.2	
(RATE OF RETURN)											
Net Generated Cash		0.0	0.0	0.0	0.0	0.0	0.0	94.9	4,726.8	0.0	4,821.7
Capital Expenditure	-29,151.1										-29,151.1
Repayment Flow Adjustment		4,231.3	4,554.3	6,579.5	6,234.7	514.7	6,870.8	165.7	0.0	-5,229.2	23,921.9
Interest Flow Adjustment		1,749.1	1,495.2	1,221.9	827.2	453.1	422.2	9.9	0.0	0.0	6,178.5
Cash Flow Out and In	-29,151.1	5,980.3	6,049.5	7,801.5	7,061.9	967.8	7,293.0	270.5	4,726.8	-5,229.2	5,771.0
Discounted Cash Flow at 5.92 %	-29,151.1	5,646.0	5,392.0	6,564.7	5,610.2	725.9	5,164.0	180.8	2,983.2	-3,115.7	0.0

Table I -5-15 Annual profit(loss) and cash flow (3,000t/day, Cu:100 ¢ ,financial, all equity)

Financial evaluation, all equity

Metal Price			IRR
Copper	(USc/lb)	100	7.52 % as R.O.I.
Gold	(US$/troz)	290	

T/C(US$/t) : 100
R/C(US ¢ /lb): 10

(Unit : US$1,000)

	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
(PROFIT & LOSS STATEMENT)											
1. NET REVENUE		21,254.3	16,197.0	25,021.5	21,441.7	16,338.4	15,379.5	13,657.1	5,332.2	0.0	134,621.5
2. COSTS											
Direct Operating Costs											
Mining		3,498.0	4,345.3	4,649.1	5,538.4	4,282.3	2,543.9	2,547.2	714.9	0.0	28,119.3
Concentrator		6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	3,001.0	3,000.0	51,029.1
Supporting		667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	6,004.0
Conc. Transportation		556.7	475.3	901.9	782.1	579.7	541.3	475.3	192.4	0.0	4,504.7
Environment		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	115.0	207.0
Subtotal		11,166.0	11,931.8	12,662.2	13,431.8	11,973.2	10,196.4	10,133.7	4,586.9	3,782.1	89,864.2
Royalty		1,034.9	786.1	1,206.0	1,033.0	787.9	741.9	659.1	257.0	0.0	6,505.8
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Interest 6 %		-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
Total Costs		15,525.5	16,042.6	17,197.8	17,794.3	16,622.7	14,799.9	14,654.4	8,705.5	4,686.1	126,028.7
3. PROFIT BEFORE TAX		5,728.8	154.5	7,823.7	3,647.4	-284.3	579.6	-997.3	-3,373.3	-4,686.1	8,592.8
4. INCOME TAX		412.8	3.8	569.9	256.7	0.0	10.9	0.0	0.0	0.0	1,254.0
5. NET PROFIT AFTER TAX		5,316.0	150.6	7,253.8	3,390.7	-284.3	568.7	-997.3	-3,373.3	-4,686.1	7,338.8
(CASH FLOW STATEMENT)											
Net Profit After Tax		5,316.0	150.6	7,253.8	3,390.7	-284.3	568.7	-997.3	-3,373.3	-4,686.1	7,338.8
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Equity	27,501.0										
Loan	-0.0										
Capital Expenditure	-27,501.0										-27,501.0
Interest During Construction	-0.0										
Additional Capital Expenditure		0.0	-29.6	0.0	-2,128.0	0.0	0.0	0.0	0.0	0.0	-2,157.7
Working Capital Increase (Decrease)		-2,791.5	2,600.0	-2,974.1	2,407.6	-2,609.4	2,851.8	-2,593.8	4,238.5	-1,447.0	-317.8
Loan Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,229.2	5,229.2
Net Generated Cash		5,849.2	6,045.7	7,609.3	6,999.8	967.8	7,282.1	270.5	4,726.8	0.0	39,751.2
PRINCIPAL	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,229.2	
(RATE OF RETURN)											
Net Generated Cash		5,849.2	6,045.7	7,609.3	6,999.8	967.8	7,282.1	270.5	4,726.8	0.0	39,751.2
Capital Expenditure	-27,501.0										-27,501.0
Repayment Flow Adjustment		-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5,229.2	-5,229.2
Interest Flow Adjustment		-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
Cash Flow Out and In	-27,501.0	5,849.2	6,045.7	7,609.3	6,999.8	967.8	7,282.1	270.5	4,726.8	-5,229.2	7,021.0
Discounted Cash Flow at 7.52 %	-27,501.0	5,440.0	5,229.4	6,121.5	5,237.3	673.5	4,712.9	162.8	2,646.1	-2,722.6	-0.0

Table I -5-16 Annual profit(loss) and cash flow (3,000t/day, Cu:100 ¢ , economic, all loan)

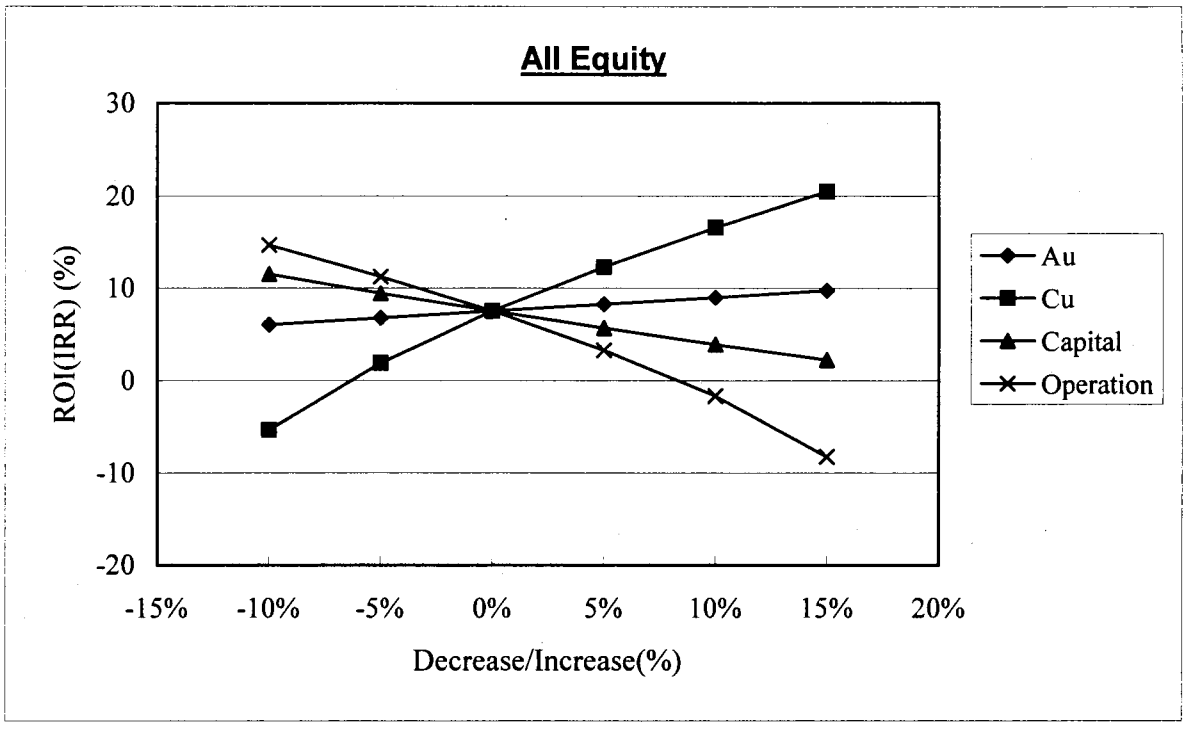
Economic evaluation: all loan

Metal Price			IRR
Copper	(USc/lb)	100	12.47 % as R.O.I.
Gold	(US$/troz)	290	

T/C(US$/t) : 100
R/C(US ¢ /lb): 10

(Unit : US$1,000)

	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
(PROFIT & LOSS STATEMENT)											
1. NET REVENUE		21,254.3	16,197.0	25,021.5	21,441.7	16,338.4	15,379.5	13,657.1	5,332.2	0.0	134,621.5
2. COSTS											
Direct Operating Costs											
Mining		3,498.0	4,345.3	4,649.1	5,538.4	4,282.3	2,543.9	2,547.2	714.9	0.0	28,119.3
Concentrator		6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	3,001.0	3,000.0	51,029.1
Supporting		667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	6,004.0
Conc. Transportation		556.7	475.3	901.9	782.1	579.7	541.3	475.3	192.4	0.0	4,504.7
Environment		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	115.0	207.0
Subtotal		11,166.0	11,931.8	12,662.2	13,431.8	11,973.2	10,196.4	10,133.7	4,586.9	3,782.1	89,864.2
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Interest 0 %		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Costs		14,490.6	15,256.5	15,991.8	16,761.3	15,834.8	14,058.0	13,995.3	8,448.5	4,686.1	119,522.9
3. PROFIT		6,763.7	940.5	9,029.7	4,680.3	503.6	1,321.5	-338.2	-3,116.3	-4,686.1	15,098.7
(CASH FLOW STATEMENT)											
Profit		6,763.7	940.5	9,029.7	4,680.3	503.6	1,321.5	-338.2	-3,116.3	-4,686.1	15,098.7
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Equity	0.0	0	0	0	0	0	0	0	0	0	0
Loan	27,501.0										
Capital Expenditure	-27,501.0	0	0	0	0	0	0	0	0	0	-27500.995
Interest During Construction	1,650.1	0	0	0	0	0	0	0	0	0	0
Additional Capital Expenditure	0	0.0	-29.6	0.0	-2,128.0	0.0	0.0	0.0	0.0	0.0	-2,157.7
Working Capital Increase (Decrease)	0.0	-2,791.5	2,600.0	-2,974.1	2,407.6	-2,609.4	2,851.8	-2,593.8	4,238.5	-1,447.0	-317.8
Loan Repayment		-7,296.8	-6,835.6	-9,385.1	-5,633.5	0.0	0.0	0.0	0.0	5,229.2	-23,921.9
Net Generated Cash		0.0	0.0	0.0	2,656.0	1,755.7	8,034.9	929.6	4,983.8	0.0	18,360.0
PRINCIPAL	29,151.1	21,854.2	15,018.7	5,633.5	0.0	0.0	0.0	0.0	0.0	5,229.2	
(RATE OF RETURN)											
Net Generated Cash		0.0	0.0	0.0	2,656.0	1,755.7	8,034.9	929.6	4,983.8	0.0	18,360.0
Capital Expenditure	-29,151.1										-29,151.1
Repayment Flow Adjustment		7,296.8	6,835.6	9,385.1	5,633.5	0.0	0.0	0.0	0.0	-5,229.2	23,921.9
Interest Flow Adjustment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow Out and In	-29,151.1	7,296.8	6,835.6	9,385.1	8,289.5	1,755.7	8,034.9	929.6	4,983.8	-5,229.2	13,130.8
Discounted Cash Flow at 12.47 %	-29,151.1	6,487.6	5,403.6	6,596.3	5,180.1	975.5	3,969.1	408.3	1,946.2	-1,815.5	0.0



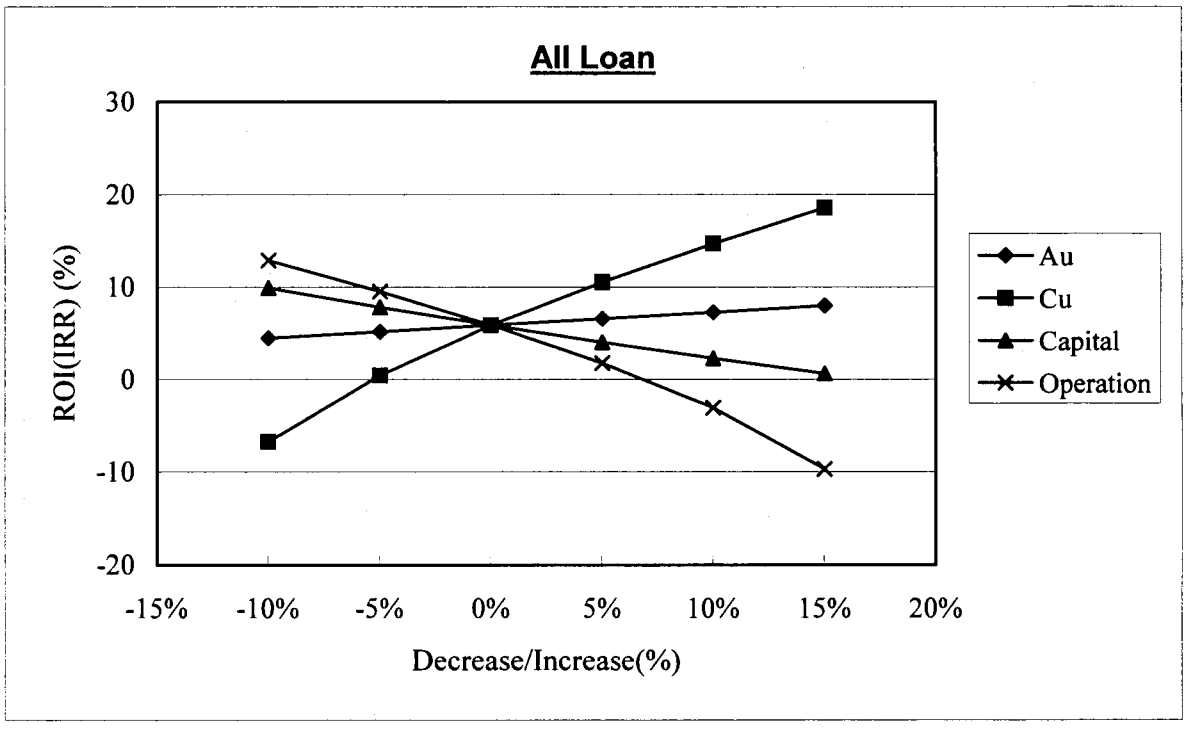


Fig. I -5-5 Sensitivity analysis on the FIRR (project) (3,000t/d)

As the result of above evaluation, the development project for copper sulfide at Yanqul will become economically viable on US100 ¢ /lbCu while it is not at the current level of US70 ¢ /lbCu by the end of February, 2002.

5-10-2 Consideration of joint developments with Bishara Gold Mining

At the beginning of Year 2002, mining out of Gossan, i.e. oxides gold, at Rakah will be followed by development of Gossan at Bishara. Based on the development plan of Gossan at Bishara submitted by OMCO to the Directrate General of Minerals, Ministry of Commerce & Industry, financial and economical analysis has been conducted including development of Gossan at Bishara.

RO1,873,102 of profits is expected from the development of Gossan at 6.35g/t of average gold grade limiting compensation to agricultural land and the road connecting the main street to the village of Sayya be remaining upaved. For this calculation, general and administration costs were not included. The development of Gossan at Bishara body will reduce stripping costs of overburden for this sulphide project which amount to US$1,525,232. The results of annual profits/losses and cash flow analysis including these factors are presented in Table I-5-17 and I-5-18.

Comparison basic condition, i.e. the case of excluding Bishara Gold Operation, and the case including Bishara Gold Operation, the latter will improve approximately 1% of IRR with 19.22% at US100 ¢ /lbCu and 8.83% at US90 ¢ /lbCu.

Furthermore, depending on better T/C & R/C, it becomes unveiled that IRR will improve into the level of over than 10% at even US90 ¢ /lbCu.

Table I -5-17 Annual profit(loss) and cash flow including Bishara gold mining (3,000t/day, Cu:90 ¢ , economic, all loan)

Economic evaluation: all loan
Average Au grade of Bishara gossan: 6.35g/t

Metal Price		IRR
Copper (USc/lb)	90	8.83 % as R.O.I.
Gold (US$/tro:	290	

T/C(US$/t) : 90
R/C(US ¢ /lb): 9

(Unit : US$1,000)

	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
(PROFIT & LOSS STATEMENT)											
1. NET REVENUE		24,645.2	14,939.0	22,634.4	19,371.5	14,804.0	13,946.8	12,399.1	4,822.9	0.0	127,563.0
2. COSTS											
Direct Operating Costs											
Mining		3,498.0	4,345.3	4,649.1	5,538.4	4,282.3	1,718.7	1,847.2	714.9	0.0	26,594.1
Concentrator		6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	3,001.0	3,000.0	51,029.1
Supporting		667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	6,004.0
Conc. Transportation		556.7	475.3	901.9	782.1	579.7	541.3	475.3	192.4	0.0	4,504.7
Environment		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	115.0	207.0
Subtotal		11,166.0	11,931.8	12,662.2	13,431.8	11,973.2	9,371.2	9,433.7	4,586.9	3,782.1	88,339.0
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Interest 0 %		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Costs		14,490.6	15,256.5	15,991.8	16,761.3	15,834.8	13,232.8	13,295.3	8,448.5	4,686.1	117,997.6
3. PROFIT		10,154.6	-317.5	6,642.6	2,610.1	-1,030.7	714.1	-896.1	-3,625.5	-4,686.1	9,565.4
(CASH FLOW STATEMENT)											
Profit		10,154.6	-317.5	6,642.6	2,610.1	-1,030.7	714.1	-896.1	-3,625.5	-4,686.1	9,565.4
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Equity	0.0	0	0	0	0	0	0	0	0	0	0
Loan	27,501.0										
Capital Expenditure	-27,501.0	0	0	0	0	0	0	0	0	0	-27,501.0
Interest During Construction	1,650.1	0	0	0	0	0	0	0	0	0	0
Additional Capital Expenditure	0	0.0	-29.6	0.0	-2,128.0	0.0	0.0	0.0	0.0	0.0	-2,157.7
Working Capital Increase (Decrease)	0.0	-2,791.5	2,600.0	-2,974.1	2,407.6	-2,609.4	3,058.1	-2,625.1	4,269.8	-1,478.4	-142.8
Loan Repayment		-10,687.8	-5,577.5	-6,998.1	-5,887.7	0.0	0.0	0.0	0.0	5,260.5	-23,890.6
Net Generated Cash		0.0	0.0	0.0	331.6	221.4	7,633.8	340.4	4,505.9	0.0	13,033.0
PRINCIPAL	29,151.1	18,463.3	12,885.8	5,887.7	0.0	0.0	0.0	0.0	0.0	5,260.5	
(RATE OF RETURN)											
Net Generated Cash		0.0	0.0	0.0	331.6	221.4	7,633.8	340.4	4,505.9	0.0	13,033.0
Capital Expenditure	-29,151.1										-29,151.1
Repayment Flow Adjustment		10,687.8	5,577.5	6,998.1	5,887.7	0.0	0.0	0.0	0.0	-5,260.5	23,890.6
Interest Flow Adjustment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow Out and In	-29,151.1	10,687.8	5,577.5	6,998.1	6,219.3	221.4	7,633.8	340.4	4,505.9	-5,260.5	7,772.5
Discounted Cash Flow at 8.83 %	-29,151.1	9,820.3	4,708.9	5,428.6	4,432.9	145.0	4,593.7	188.2	2,289.1	-2,455.6	0.0

Table I -5-18 Annual profit(loss) and cash flow including Bishara gold mining (3,000t/day, Cu:100 ¢ , economic, all loan)

Economic evaluation: all loan
Average Au grade of Bishara gossan: 6.35g/t

Metal Price			IRR
Copper	(USc/lb)	100	19.22 % as R.O.I.
Gold	(US$/tro:	290	

T/C(US$/t) : 100
R/C(US ¢ /lb): 10

(Unit : US$1,000)

	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
(PROFIT & LOSS STATEMENT)											
1. NET REVENUE		26,118.7	16,197.0	25,021.5	21,441.7	16,338.4	15,379.5	13,657.1	5,332.2	0.0	139,486.0
2. COSTS											
Direct Operating Costs											
Mining		3,498.0	4,345.3	4,649.1	5,538.4	4,282.3	1,718.7	1,847.2	714.9	0.0	26,594.1
Concentrator		6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	6,432.6	3,001.0	3,000.0	51,029.1
Supporting		667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	667.1	6,004.0
Conc. Transportation		556.7	475.3	901.9	782.1	579.7	541.3	475.3	192.4	0.0	4,504.7
Environment		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	115.0	207.0
Subtotal		11,166.0	11,931.8	12,662.2	13,431.8	11,973.2	9,371.2	9,433.7	4,586.9	3,782.1	88,339.0
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Interest 0 %		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Costs		14,490.6	15,256.5	15,991.8	16,761.3	15,834.8	13,232.8	13,295.3	8,448.5	4,686.1	117,997.6
3. PROFIT		11,628.1	940.5	9,029.7	4,680.3	503.6	2,146.7	361.8	-3,116.3	-4,686.1	21,488.4
(CASH FLOW STATEMENT)											
Profit		11,628.1	940.5	9,029.7	4,680.3	503.6	2,146.7	361.8	-3,116.3	-4,686.1	21,488.4
Depreciation		3,324.6	3,324.6	3,329.6	3,329.6	3,861.6	3,861.6	3,861.6	3,861.6	904.0	29,658.6
Equity	0	0	0	0	0	0	0	0	0	0	0
Loan	27,501.0										
Capital Expenditure	-27,501.0	0	0	0	0	0	0	0	0	0	-27,501.0
Interest During Construction	1,650.1	0	0	0	0	0	0	0	0	0	0
Additional Capital Expenditure	0	0.0	-29.6	0.0	-2,128.0	0.0	0.0	0.0	0.0	0.0	-2,157.7
Working Capital Increase (Decrease)	0.0	-2,791.5	2,600.0	-2,974.1	2,407.6	-2,609.4	3,058.1	-2,625.1	4,269.8	-1,478.4	-142.8
Loan Repayment		-12,161.3	-6,835.6	-9,385.1	-769.1	0.0	0.0	0.0	0.0	5,260.5	-23,890.6
Net Generated Cash		0.0	0.0	0.0	7,520.4	1,755.7	9,066.4	1,598.3	5,015.1	0.0	24,956.0
PRINCIPAL	29,151.1	16,989.8	10,154.2	769.1	0.0	0.0	0.0	0.0	0.0	5,260.5	
(RATE OF RETURN)											
Net Generated Cash		0.0	0.0	0.0	7,520.4	1,755.7	9,066.4	1,598.3	5,015.1	0.0	24,956.0
Capital Expenditure	-29,151.1										-29151.055
Repayment Flow Adjustment		12,161.3	6,835.6	9,385.1	769.1	0.0	0.0	0.0	0.0	-5,260.5	23,890.6
Interest Flow Adjustment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow Out and In	-29,151.1	12,161.3	6,835.6	9,385.1	8,289.5	1,755.7	9,066.4	1,598.3	5,015.1	-5,260.5	19,695.5
Discounted Cash Flow at 19.22 %	-29,151.1	10,200.5	4,809.0	5,538.2	4,102.9	728.9	3,157.1	466.8	1,228.6	-1,080.9	0.0

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6-1 Conclusions

This study represents a preliminary F/S on mineral exploration and development in Yanqul Area in order to lead the project into mining development. Accordingly, the main objectives of the study are:

1) To increase gold recovery and grade of copper concentrate,
2) To increase minable ore reserves through exploration activities, and
3) To estimate minimum investment costs and operation costs.

Exploration and development plan of the mine can be summarized as follows:

6-1-1 Exploration results

The application of an exploration methodology that was established in Batinah Coast area during the geological, geophysical and drilling explorations was also applied in and around the known mineralized zone in Yanqul area.

(1) Geophysical survey to find new ore bodies within Geotimes and Lasail units in Samail Volcanic Rocks yielded very promising IP anomalies in Quron Al-Akhbab area. Drilling results within these anomalies revealed that dominant mineralization zone extends about 300m in East-West and about 150m in North-South direction. However, the total copper grade is generally low, and gold mineralization is found quite local. Ore reserve was roughly determined in 2 million tons with an average grade of 0.71% of Cu and less than 0.1g/t of Au.

(2) Based on this survey, it is concluded that the potentiality of discovering a new ore body of economical size is very low. On the other hand, in the southwestern part of the open pit in Rakah and in the north of the gossan in Hail As Safil area, conspicuous IP anomalies at small scale were detected in places where the drilling exploration confirmed stockwork mineralization. A slight increase of ore reserves can be expected here.

(3) The IP Geophysical method in this survey area detected several new mineralized zones including the known ore deposits. The application of the TEM method indicated the shape of the massive sulfide ore body. However, the massive sulphide in this area represents only a small-scale mineralization, and most deposits in this area exist in the form of stockwork types, which are also found a good target by IP method.

6-1-2 Mining Plan

(1) By conducting ore reserve calculations and taking into consideration the nugget effect, a top cutting method for each deposit were adopted both for copper and gold.

Geological ore reserves at a 0.5%Cu cut-off grade resulted as follows:

Reserves (t)	Cu (%)	Au (g/t)	Contained Cu (t)	Contained Au (t)
15,767,000	1.13	0.62	178,738	9,851

(2) In designing the pit and prior to the detailed designing, pit optimization was made by using the geological model used for ore reserve calculations. For this case and to maintain realistic mine operations, copper price at US ¢ 120/lb and gold price at US$ 400/oz were assumed.

(3) Minable ore reserve from the designed pit with a 0.5%Cu cut-off grade resulted as follows:

Reserves (t)	Cu (%)	Au (g/t)	Contained Cu (t)	Contained Au (t)
8,175,000	1.23	0.68	100,441	5,571

(4) As a result of metallurgical tests, conventional methods are to be applied for crushing and grinding process, and a crusher with a primary ball mill is adopted in order to minimize total construction costs. Estimated metallurgical test results based mainly on a locked cycle test are Cu: 20.0%, Au: 5.13 g/t, and recovery rate resulted in Cu: 85.7% and Au: 39.6%.

(5) Owing to poor precipitations, water resource in this area is very precious so that contamination of ground water should strictly be avoided. Therefore, a filter-press type is to be installed to the concentrator, and dry-type trailing dam is designed in order to be able to process from 10 to 20% of the dehydrated drainage.

(6) Investment costs with a crude ore production rate of 3,000 t/day totaled US$29,658,500, in which US$2,157,500 is an additional investment after start of operation. This amount is mainly for expansion civil work on the trailing dam to be made after four years of operation. The total operation cost resulted in US$89,864,200 but 30% of this costs goes to mining operation costs because the operation is to be done by subcontracts.

(7) Investment costs with a crude ore production rate of 2,000 t/d totaled US$26,278,500, which is little less than for the case of a 3,000 t/d production rate, but operation costs of US$102,068,200 exceeds much from the reduced investment. This result makes more economical the case for 3,000 t/d.

(8) As a result of financial evaluation, for the case that all required capital is covered by loan and with a copper price of US100 ¢ /lb, the IRR to the plan of the project results in 5.92%. Economical evaluation on this results in IRR of 12.47% in case that all required capital is covered by loan and copper price of US100 ¢ /lb.

(9) It is concluded that under present copper price level (US70 ¢ /lb as of February 2002), mining development of sulfide ore in Yanqul district is negative, but the possibility of development still remains if copper price increases over 100 ¢ /lb.

(10) If gold production is added at Bishara, IRR for economic evaluation could be increased about 1%, and in case of copper price of 100 ¢ /lb, IRR would be 19.22%, and even in case of copper price of 90 ¢ /lb, it would be 8.83%. Furthermore, it is estimated that IRR could be raised up to 10% depending on smelting charge, even under a copper price of 90 ¢ /lb.

6-2 Recommendations

Cyprus type massive sulfide exploration scheme that was established in Batinah Coast can also be successfully adapted to exploration in Yanqul area. This exploration methodology can be adapted to same type of mineralization in Oman for a more efficient exploration.

Under this economical situation, it would be difficult for a private company to enter into sulphide ore development in Yanqul, but it depends if the copper price is increased up to US 100 ¢ /lb.

If the area is developed by a governmental firm, even US 90 ¢ /lb would be feasible. Figures I-6-1 and I-6-2 indicate copper and gold price changes in the past 17 years which suggest that above-mentioned price is yet realistic.

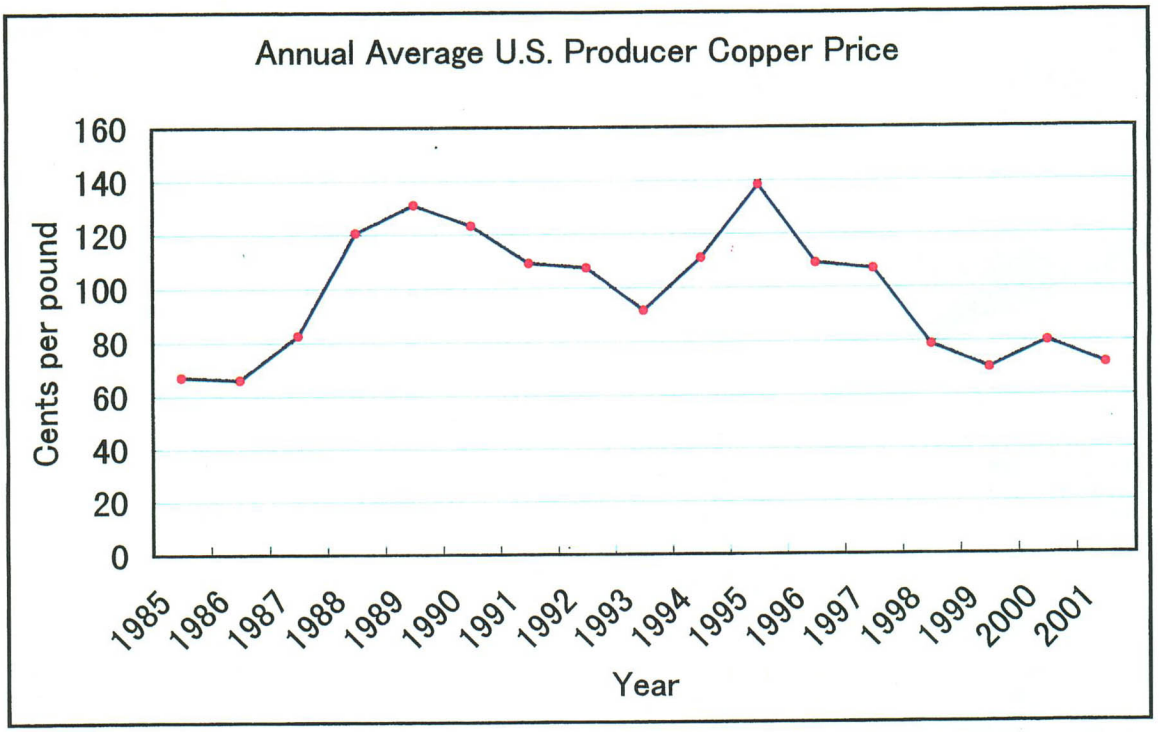


Fig. I -6-1 Historical copper price chart

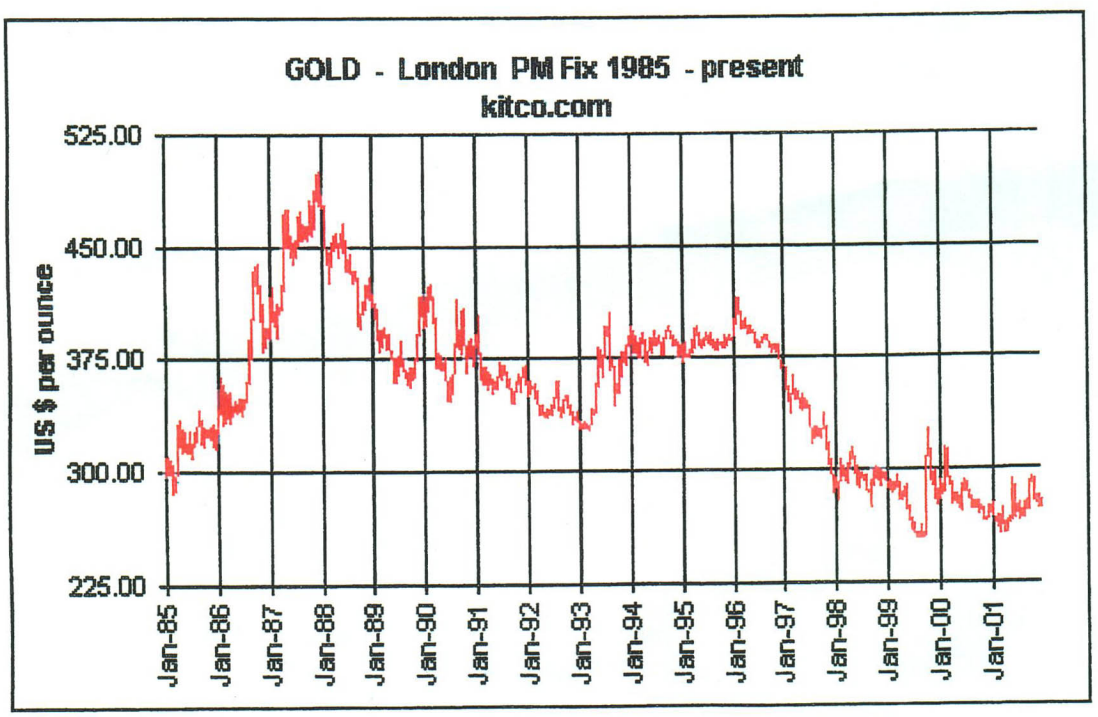


Fig. I -6-2 Historical gold price chart

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