CHAPTER 2 MINE PLANNING

2-1 Pit Design

2-1-1 Pit Optimisation

The MINEX software is used not only for pit optimization, but also for pit design and geological modeling.

Pit optimizations derive 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.

Each block is classified into "Measured", "Indicated" or "Inferred" depending on its accuracy. In this study, the pit optimization itself is accomplished based only on "Measured" and "Indicated" blocks, i.e. "Inferred" blocks are treated as waste. Once the optimal pit shape has been established, "Inferred" blocks in this pit shape are treated as ore.

The pit shape of the existent Rakah gold mine in 2000 and the original topographic data are used for modeling the topography.

Although there is a future plan to develop gold mine targeting oxide ores near the surface at Bishara area, this oxide ore is treated as waste at this stage.

Since the size of the pits varies according to the metal prices, a series of copper and gold price are adopted through the optimisation process.

The parameters used for pit optimization are based on the following conditions and shown in Table Ⅲ-2-1.

- In consideration of the credit of gold, the marginal cut off grade in US100 ¢ /lb of copper price is approximately 0.5%Cu, therefore this grade is adopted as cut off grade in this work.
- Mining operating cost is estimated from the contract unit price in the operating local limestone quarry.
- Operating costs of milling, engineering and administration are estimated from the site investigation.
- Copper grade and moisture content of concentrate are estimated as 20% and 15%, respectively from the laboratory test.
- Freight cost of concentrate to smelting plant is estimated at US$10.0/WMT.
- Introduced mill recovery is resulted from the laboratory test.
- Present standard cost is adapted to treatment and refining charge.
- Overall slope angle of each pit is based on the previous study (Feasibility for the Development of a Copper Mine and Recovery Plant at Hayl as Safil and Rakah, Oman Mining Company LLC 1994).
- In addition, neither dilution nor pit loss is considered in this calculation.

The results of pit optimization in the combination of US$400/oz of gold price and varying from US60 ¢ /lb to US120 ¢ /lb of copper price are shown in TableⅢ-2-2. The relations between metal prices and minable ore tonnages are shown in Fig.Ⅲ-2-1.

Rakah and Al Ashgar have minable reserves at lower copper price(US55 ¢ /lb). Similarly Hayl as Safil is minable when copper price is more than US65 ¢ /lb, and Bishara is minable when copper price is more than US105 ¢ /lb. However Al Jadeed has no block which can be exploited economically even at US120 ¢ /lb of copper price and US$400/oz of gold price.

Al Ashgar is minable at lower metal price in spite of the thin ore body (20-30m) and high waste ore ratio (8-10). This is because of high copper grade (2.72%). On the other hand Al Bishara is not minable because of thinner ore body (10-20m) and lower copper grade (1.34%).

In the combination of US60 ¢ /lb of copper price and US$400/oz of gold price, total minable tonnage of all area is 1.3 million ton at 1.35% of average copper grade, and total minable tonnage is 8.4 million ton at 1.23%Cu in case of US120 ¢ /lb of copper price.

The shape of each optimal pit for variation of copper price is shown in Fig.Ⅲ-2-2 to Fig.Ⅲ-2-9.

Table Ⅲ-2-1 Pit Optimisation Parameters

Price and Cut off grade		
Copper	(US ¢ /lb)	55～120
Gold	(US$/Oz)	250～400
Cut Off Grade	(%Cu)	0.50
Operating Cost		
Mining	(US$/Ton mined)	

	Waste	Ore
Hayl as Safil	0.70	1.05
Rakah	0.77	1.36
Al Jadeed	0.70	0.82
Al Asghar	0.70	1.21
Al Bishara	0.70	0.97

Milling	(US$/Ton milled)	5.04
Engineering	(US$/Ton milled)	2.21
Administration	(US$/Ton milled)	2.56
Concentrate		
Cu Grade	(%)	20.00
Moisture	(%)	15.0
Freight	(US$/WMT)	10.00
Mill Recovery		
	Copper (%)	Gold (%)
Rakah Stockwork	88.5	66.0
Hayl as Safil Stockwork	88.5	36.0
Massive Sulfied (Rakah, HAS, Al Asghar)	87.5	25.0
Brecciated (Bishara, Al Jadeed)	60.0	11.0
Treatment and Refining Charge		
T/C	(US$/Ton)	70.0
Copper R/C	(USc/lb)	7.0
Gold R/C	(US$/troz)	5.0
Copper Recovery	(%)	95.0
Gold Recovery	(%)	95.0
Pit Wall Slope		
	Hanging Wall(Waste)	Foot Wall(Ore)
Hayl as Safil	47.0	42.5
Rakah	43.0	39.0
Al Jadeed	65.0	57.5
Al Asghar	44.0	41.5
Al Bishara	39.0	43.0

Table Ⅲ-2-2 Results of Pit Optimisation

Copper Price (US ¢ /lb)	Area	Ore ('000Ton)	Waste ('000Ton)	W/O Ratio	Copper Grade (%)	Gold Grade (g/Ton)	Copper Content (Ton)	Gold Content (kg)
60	Rakah	1,157	1,682	1.5	1.06	1.91	12,340	2,204
	Al Ashgar	150	1,218	8.1	3.51	0.83	5,273	125
	Total	1,308	2,901	2.2	1.35	1.78	17,613	2,329
70	Rakah	1,314	1,824	1.4	1.08	1.71	14,092	2,248
	Al Ashgar	448	4,088	9.1	2.87	0.78	12,847	349
	Hayl as Safil	1,261	4,521	3.6	1.57	0.43	19,807	536
	Total	3,022	10,433	3.5	1.55	1.04	46,747	3,133
80	Rakah	1,590	2,325	1.5	1.06	1.49	16,860	2,369
	Al Ashgar	521	5,504	10.6	2.85	0.79	14,845	411
	Hayl as Safil	2,250	6,127	2.7	1.34	0.47	30,203	1,050
	Total	4,361	13,955	3.2	1.42	0.88	61,908	3,830
90	Rakah	1,950	3,201	1.6	1.05	1.26	20,462	2,469
	Al Ashgar	549	5,895	10.7	2.84	0.79	15,578	433
	Hayl as Safil	3,068	8,400	2.7	1.26	0.47	38,610	1,445
	Total	5,567	17,497	3.1	1.34	0.78	74,650	4,347
100	Rakah	2,131	3,649	1.7	1.03	1.18	22,071	2,528
	Al Ashgar	623	6,566	10.5	2.68	0.78	16,703	486
	Hayl as Safil	3,547	10,504	3.0	1.23	0.47	43,591	1,687
	Total	6,301	20,719	3.3	1.31	0.75	82,366	4,701
110	Rakah	2,516	4,965	2.0	1.01	1.03	25,424	2,601
	Al Ashgar	648	6,938	10.7	2.64	0.79	17,113	512
	Hayl as Safil	3,924	11,657	3.0	1.19	0.46	46,801	1,835
	Al Bishara	673	2,136	3.2	1.26	0.85	8,480	572
	Total	7,761	25,695	3.3	1.26	0.71	97,819	5,520
120	Rakah	2,727	5,733	2.1	0.99	0.97	26,963	2,641
	Al Ashgar	650	6,951	10.7	2.63	0.78	17,091	507
	Hayl as Safil	4,195	12,848	3.1	1.17	0.46	49,009	1,943
	Al Bishara	801	2,466	3.1	1.22	0.85	9,776	681
	Total	8,373	27,998	3.3	1.23	0.69	102,839	5,773

Gold Price = US$400/oz
Cut off grade = 0.5%Cu
"Inferred" blocks are treated as waste for the pit optimisation.
"Inferred" blocks are treated as ore for the established optimal pit.

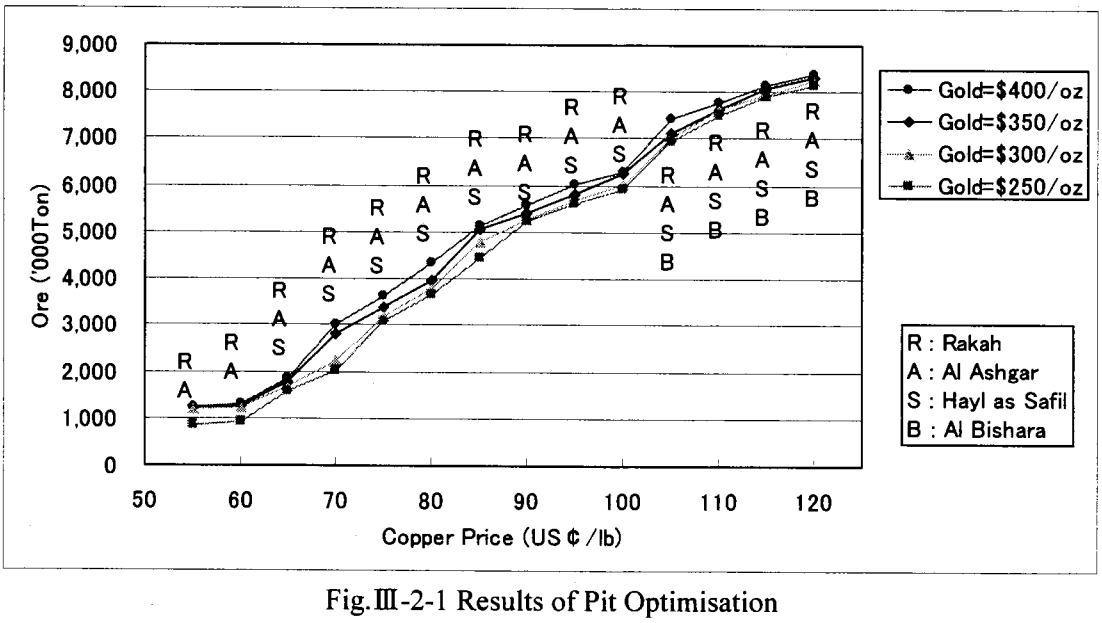


Fig. Ⅲ-2-1 Results of Pit Optimisation

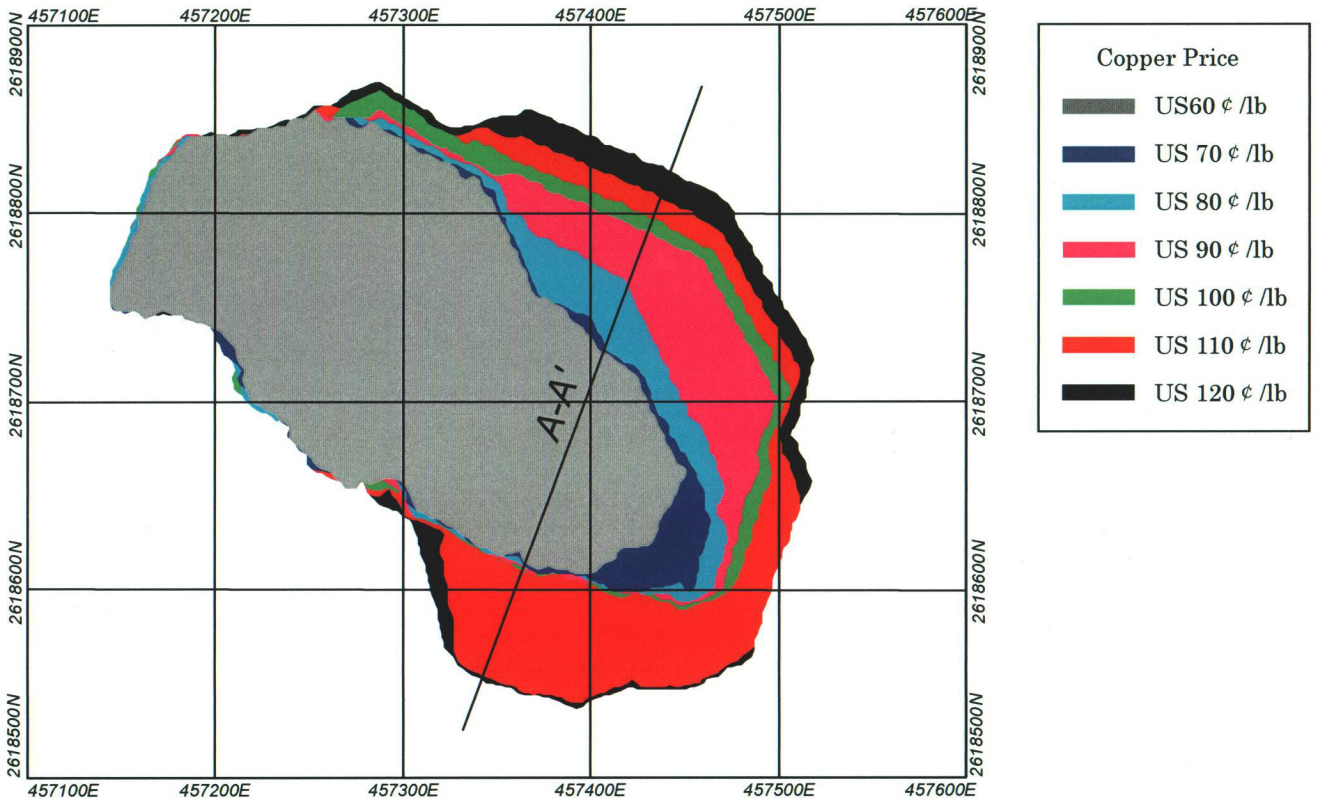


Fig.Ⅲ-2-2 Rakah Pit Layout From Pit Optimisation (Plan View, Gold = US$400/oz)

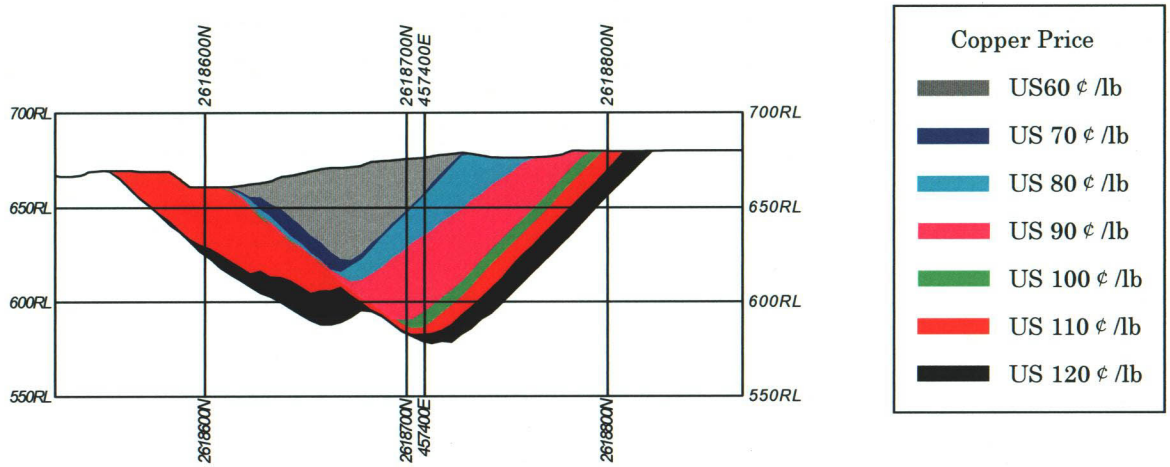


Fig.Ⅲ-2-3 Rakah Pit Layout From Pit Optimisation (Section A-A', Gold = US$400/oz)

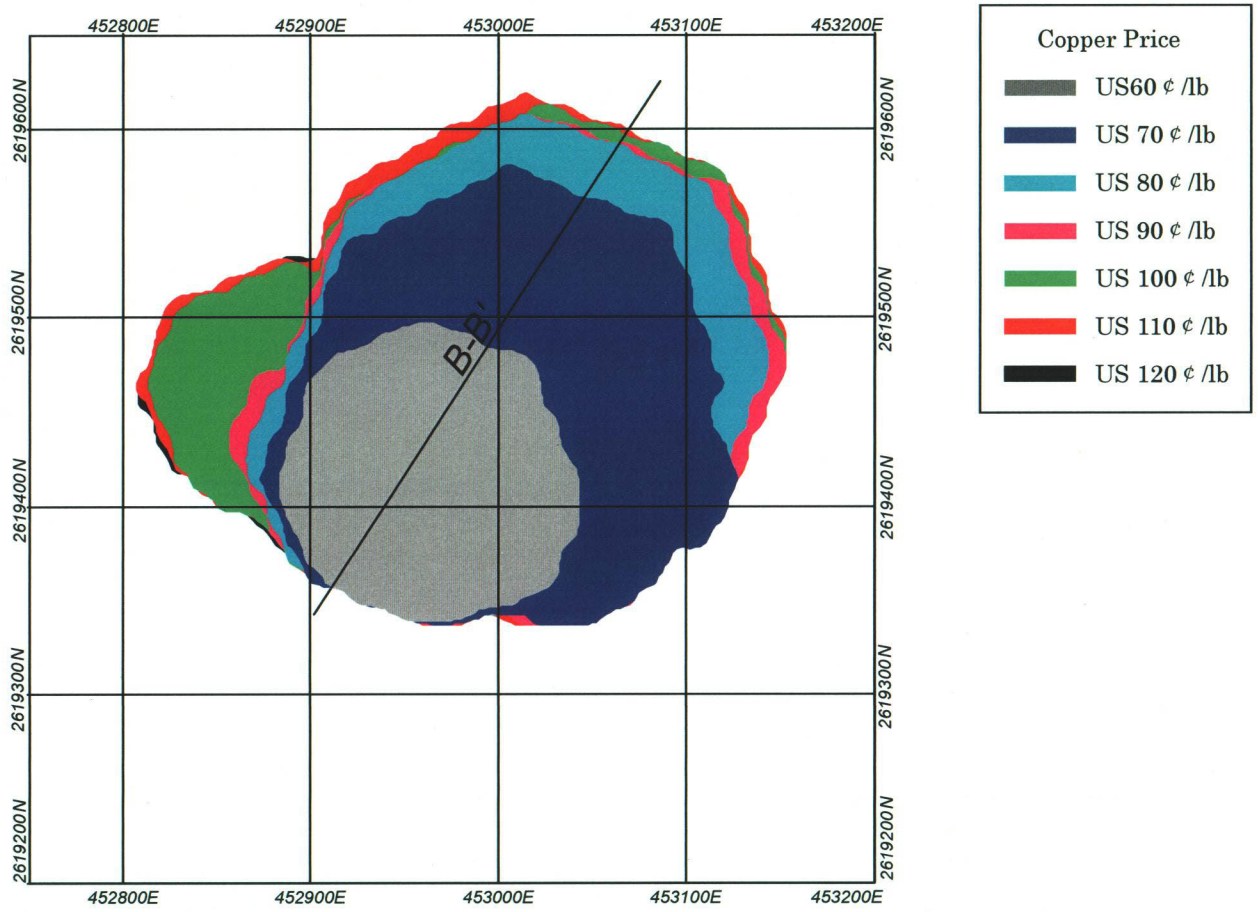


Fig. Ⅲ-2-4 Al Ashgar Pit Layout from Pit Optimisation (Plan View, Gold = US$400/oz)

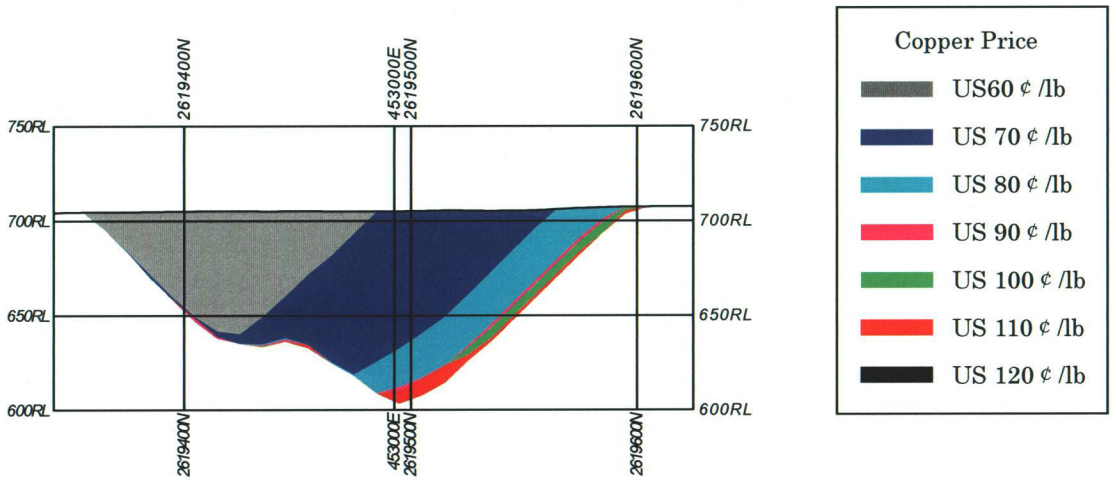


Fig.Ⅲ-2-5 Al Ashgar Pit Layout from Pit Optimisation (Section B-B', Gold = US$400/oz)

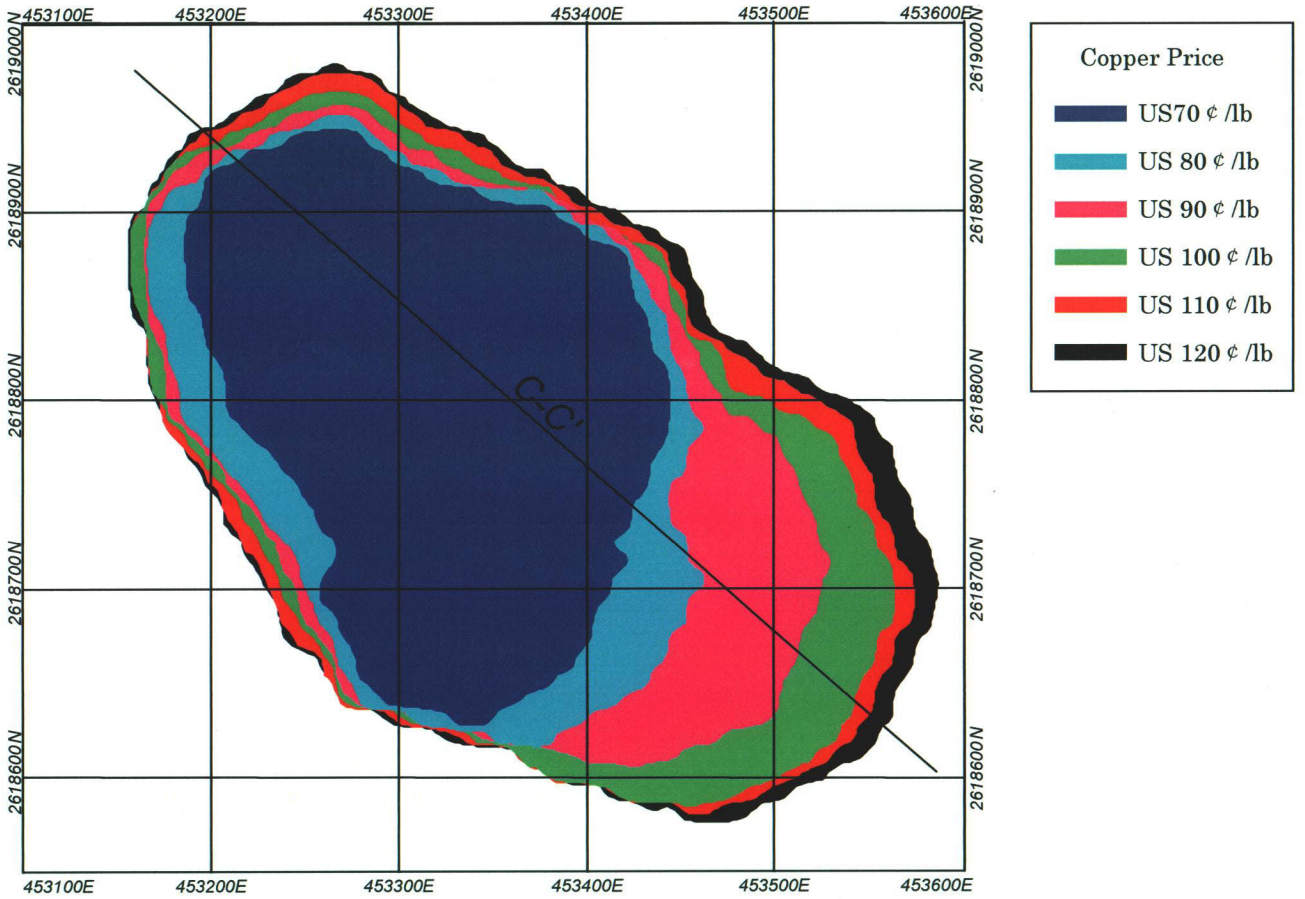


Fig.Ⅲ-2-6 Hayl as Safil Pit Layout from Pit Optimisation (Plan View, Gold = US$400/oz)

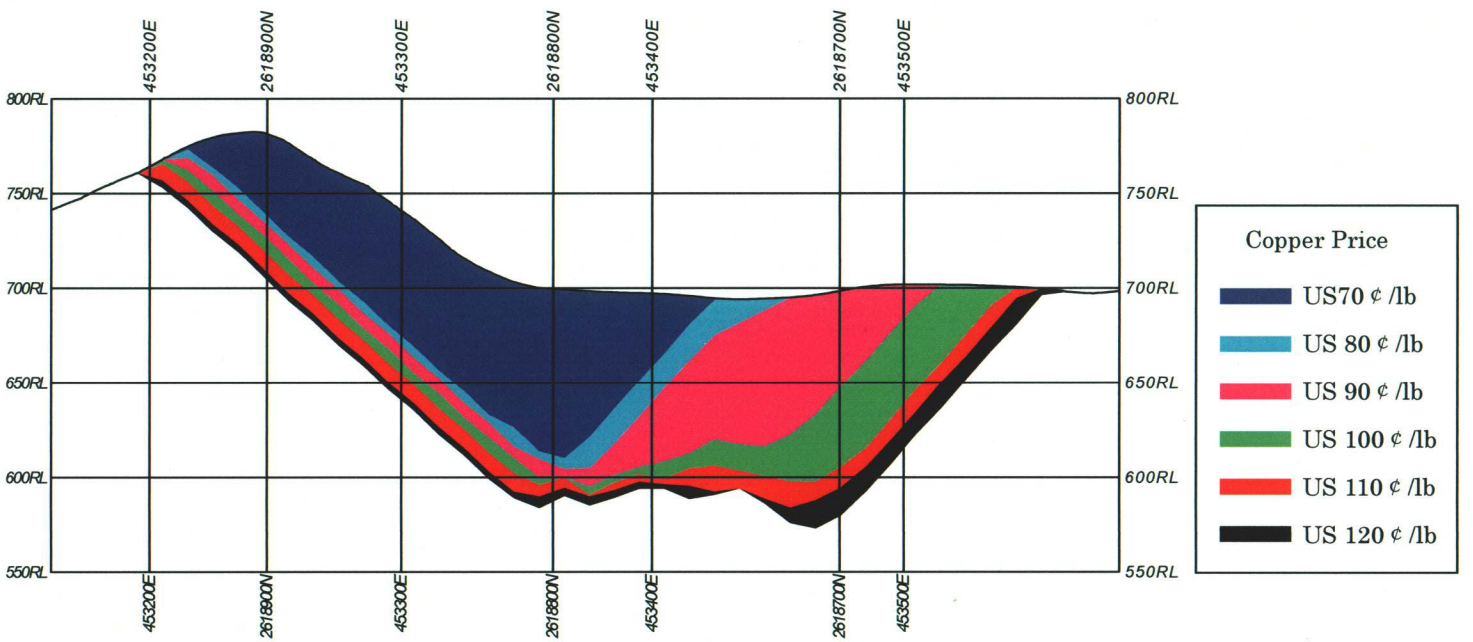


Fig.Ⅲ-2-7 Hayl as Safil Pit Layout from Pit Optimisation (Section C-C', Gold = US$400/oz)

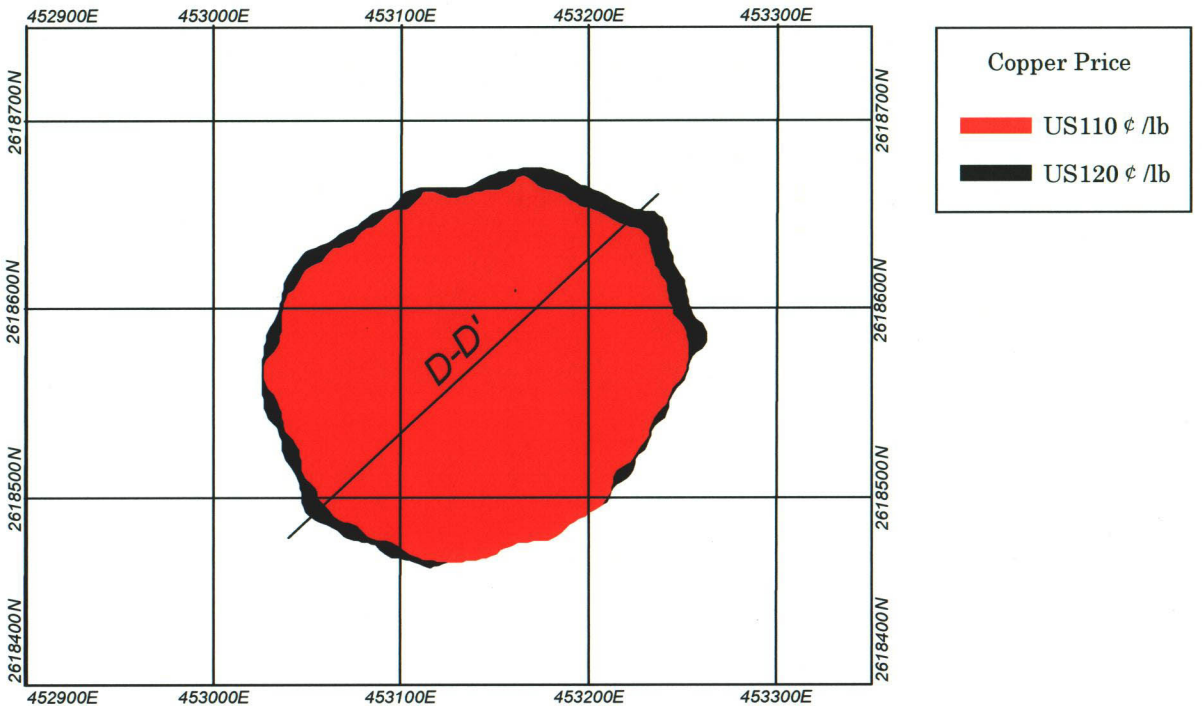


Fig.Ⅲ-2-8 Al Bishara Pit Layout from Pit Optimisation (Plan View, Gold = US$400/oz)

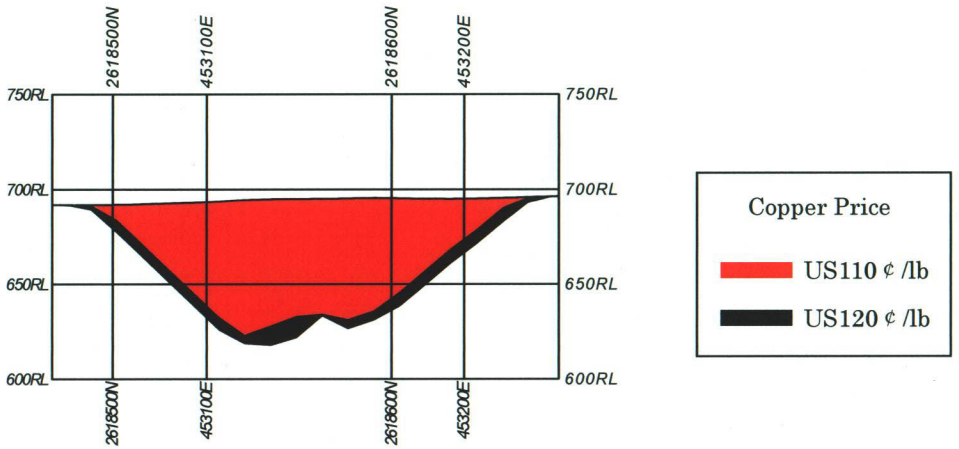


Fig.Ⅲ-2-9 Bishara Pit Layout from Pit Optimisation (Section D-D', Gold = US$400/oz)

2-1-2 Pit Design

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

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

Pit design parameters are shown in TableⅢ-2-3, and the pit design for each area is shown in Fig. Ⅲ-2-10～Fig.Ⅲ-2-14. Hauling road and minimum working space are designed for 32 ton class dump trucks. Although average overall slope angle of highwall is based on the previous study carried out by OMCO, variable bench type and berm width for each wall are set up to maximize ore tonnages.

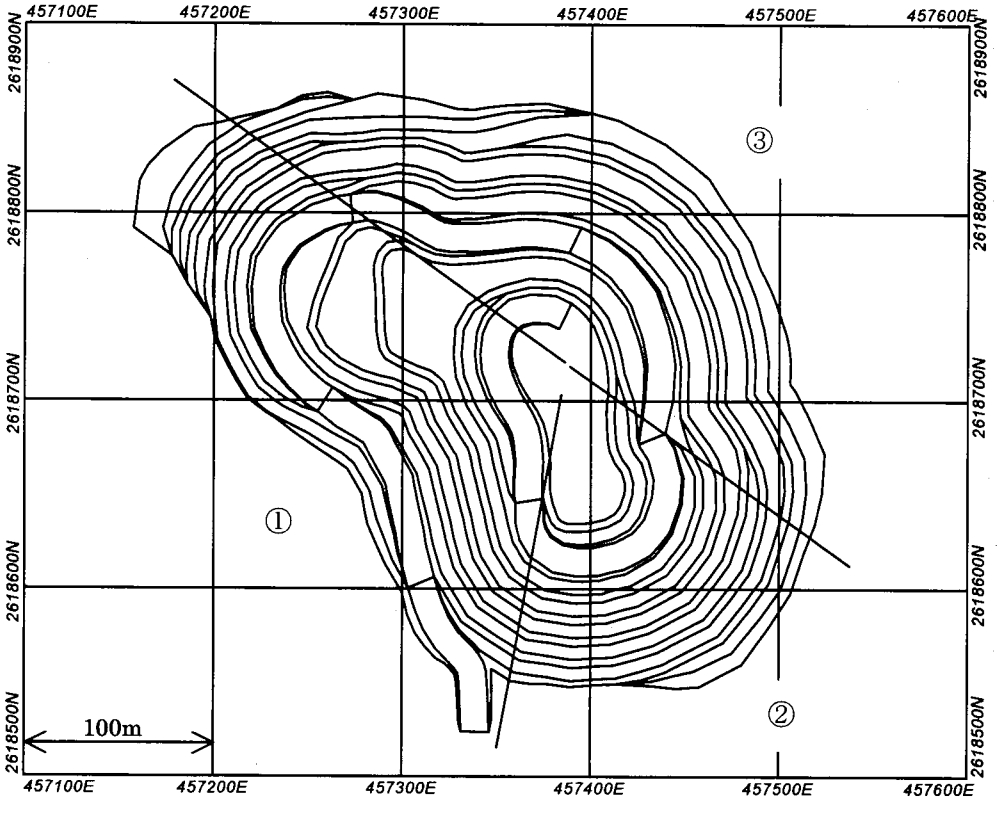
To improve the cash flow and maximize NPV (Net Present Value) by distributing the term of waste mining in the early stage of development, the two stages development of the pit are designed in Hayl as Safil.

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.

The 3D view of the pits and waste dumps are shown in Fig.Ⅲ-2-15 and Fig.Ⅲ-2-16. Waste dumps are described in section2-3 in detail.

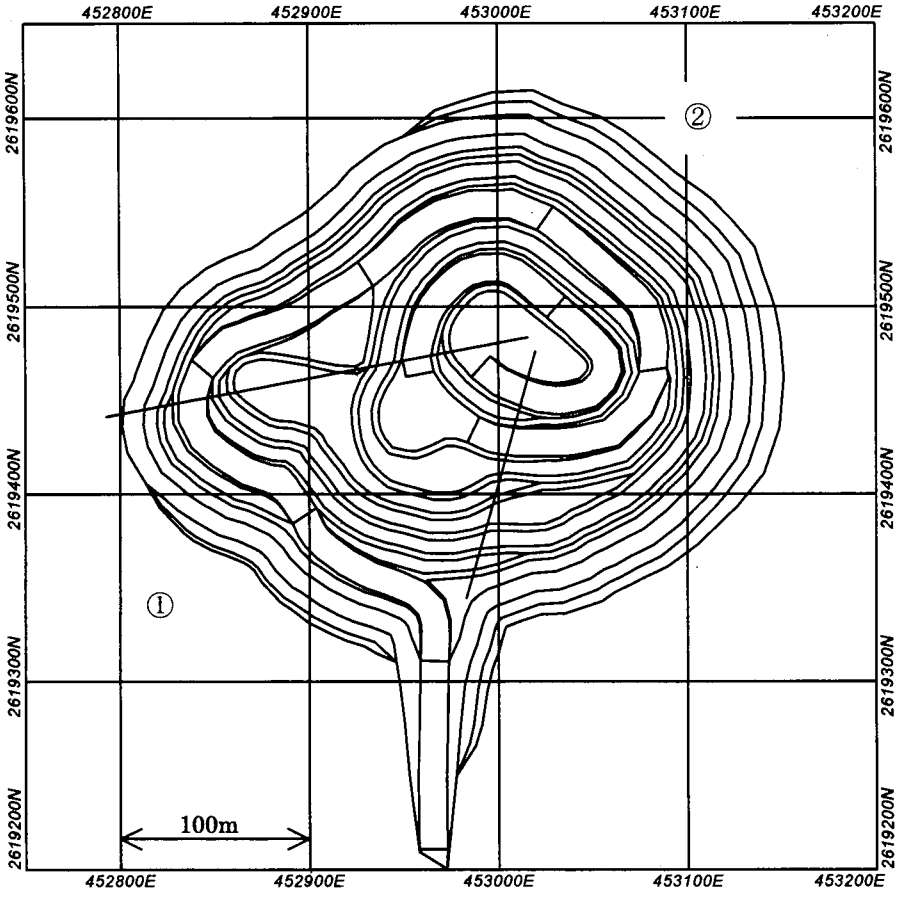
Table Ⅲ-2-3 Pit Design Parameters

Road Width	15m				
Road Gradient	10%				
Minimum Working Space	30m * 30m				
Bench Configuration	Bench Type	Bench Height (m)	Berm Width (m)	Bench Slope Angle (degree)	Overall Slope Angle (degree)
Rakah					
①Western Wall	Single	12	7	70	36
②Southern Wall	Single	12	7	70	41
③Northern Wall	Double	24	11	70	44
Al Ashgar					
①Southern Wall	Single	10	7	70	31
②Northern Wall	Triple	30	8	70	44
Hayl as Safil					
①Southern Wall	Single	10	6	70	42
②Eastern Wall	Double	20	7	70	47
③North-Eastern Wall	Single	10	6	70	44
④Northern Wall	Double	20	7	70	44
⑤Hillside	Single	10	6	70	46
Al Bishara					
①Western Wall	Double	20	10	70	38
②Eastern Wall	Double	20	10	70	43



Length: 410m, Width: 250m, Depth: 85m

Fig.Ⅲ-2-10 Rakah Pit Design



Length: 350m, Width: 300m, Depth: 100m

Fig.Ⅲ-2-11 Al Ashgar Pit Design

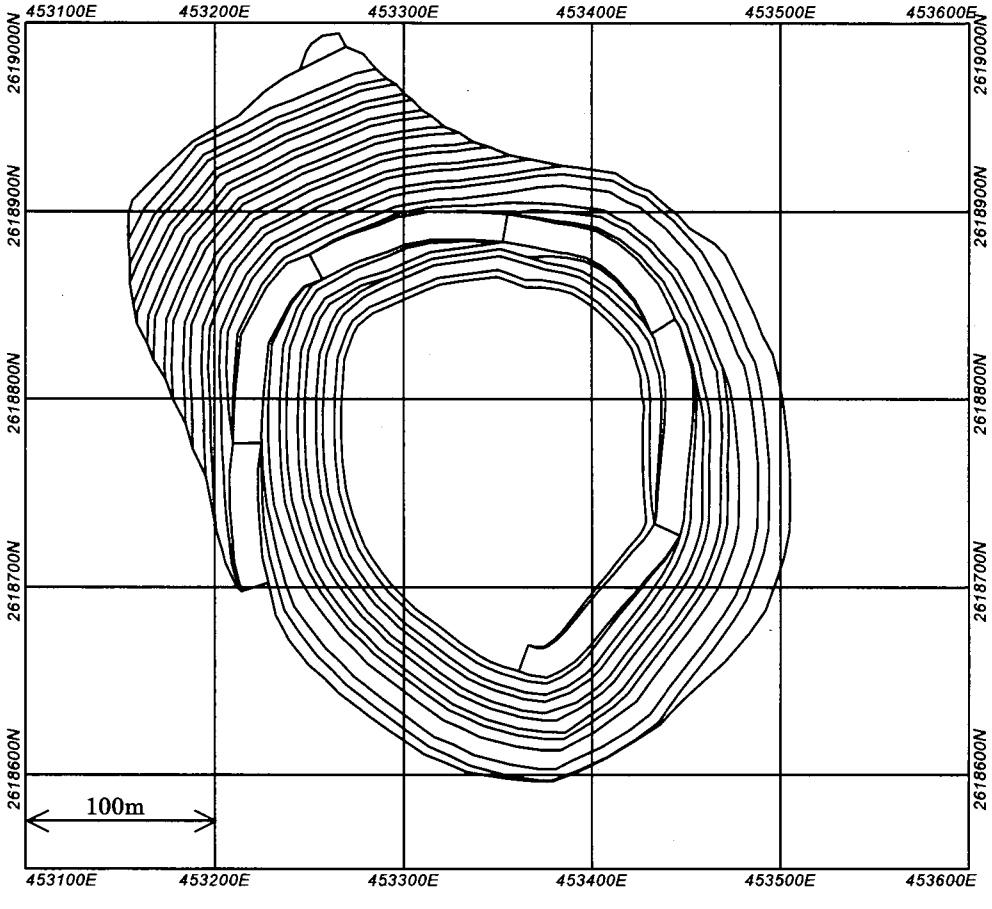
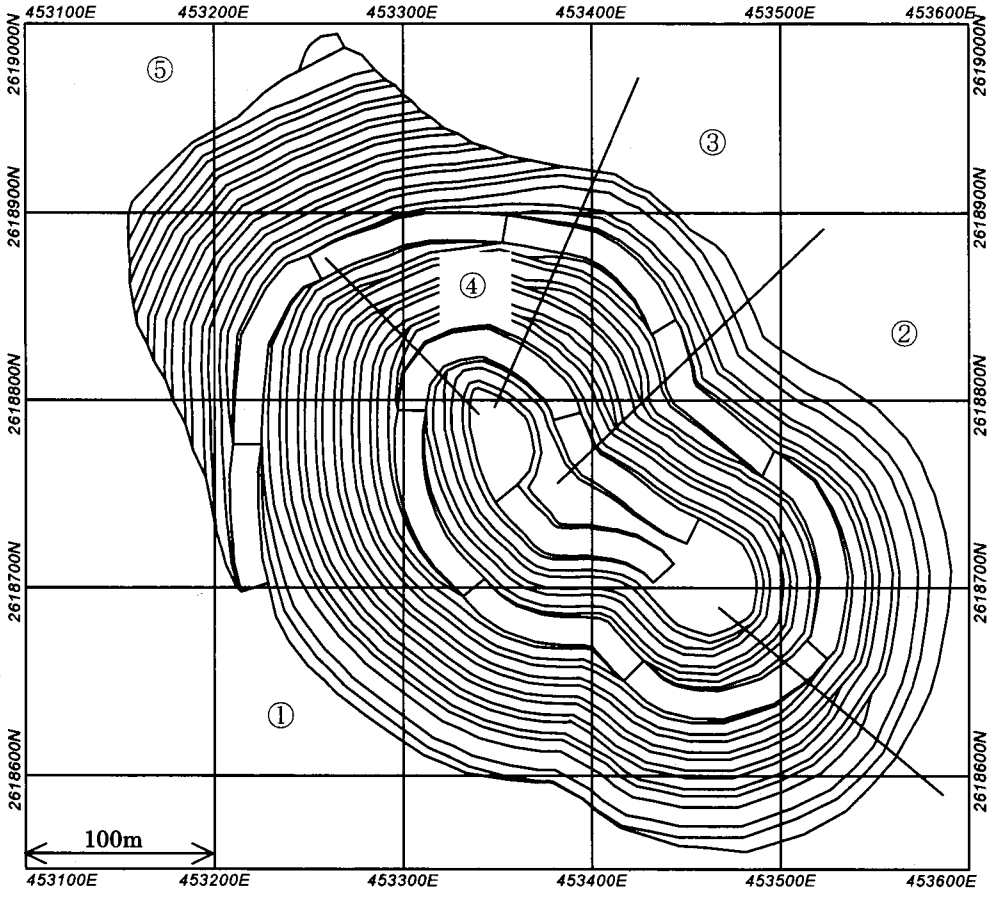
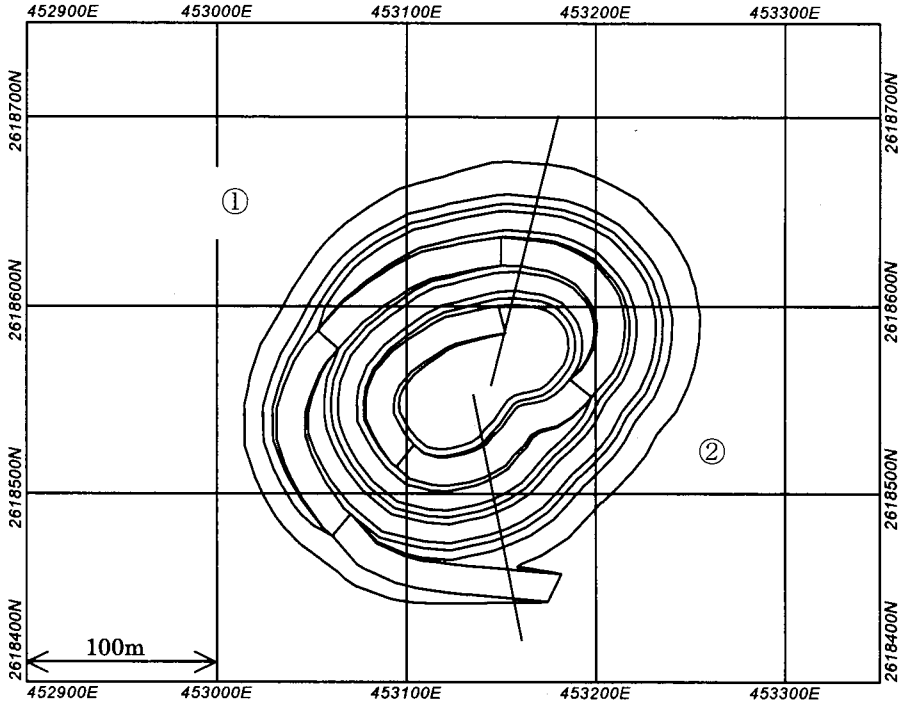


Fig.Ⅲ-2-12 Hayl as Safil Pit Design (Stage 1)



Length: 490m, Width: 300m, Depth: 120m

Fig.Ⅲ-2-13 Hayl as Safil Pit Design (Stage 2)



Length: 250m, Width: 200m, Depth: 65m

Fig.Ⅲ-2-14 Al Bishara Pit Design

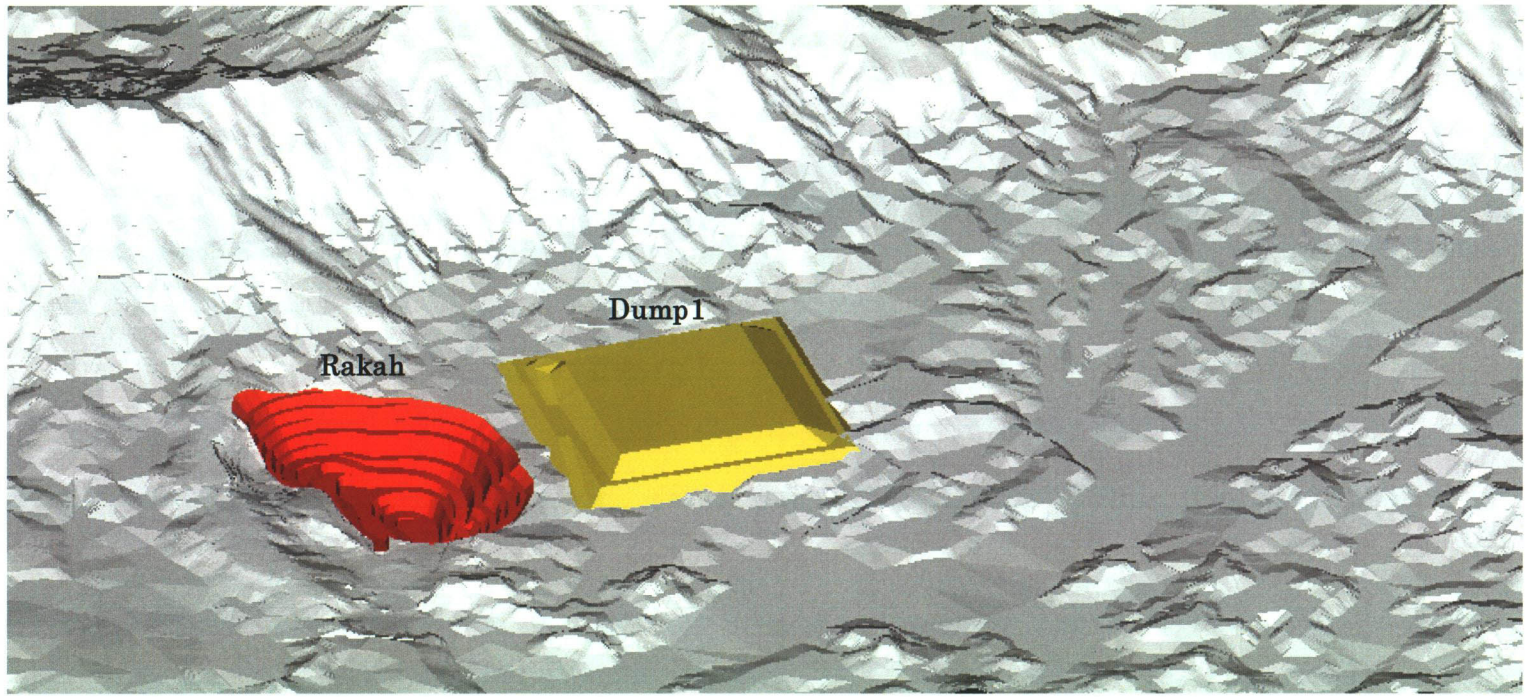


Fig.Ⅲ-2-15 3D View of Pit (Rakah)

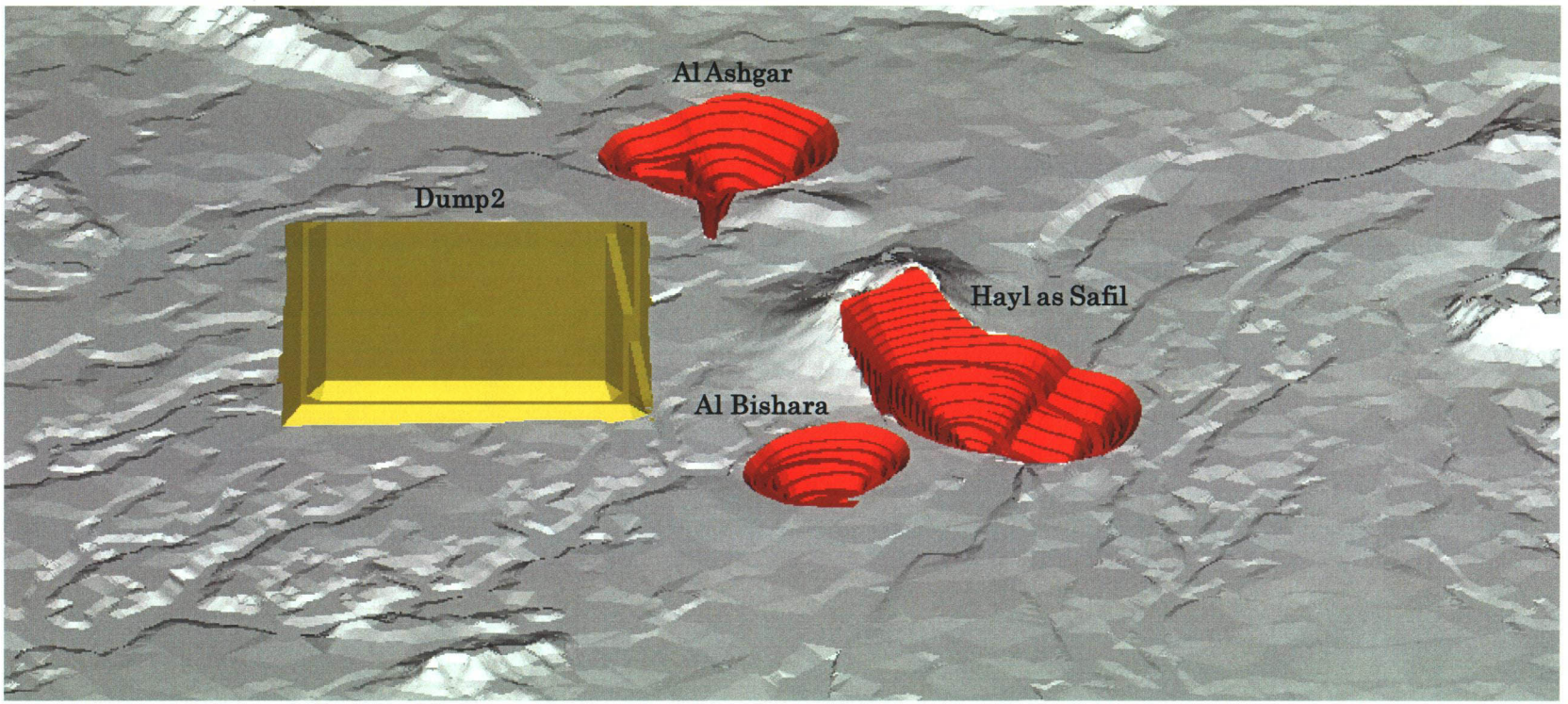


Fig.Ⅲ-2-16 3D View of Pits (Al Ashgar, Hayl as Safil, Al Bishara)

2-1-3 Minable Reserves

Minable reserves from the pit design are shown in TableⅢ-2-4 by ore type and category.

Cut off grade is 0.5%Cu, and no dilution and no pit loss are assumed.

Total minable reserves are 8.2 Million ton with 1.23% of copper and 0.68g/T of gold. Waste ore ratio is 3.66.

Minable reserves by bench level are shown in TableⅢ-2-5.

TableⅢ-2-4 Minable Reserve

Area			Ore ('000T)	Waste ('000T)	W/O Ratio	Copper (%)	Gold (g/T)	Copper (T)	Gold (kg)
Rakah	Ore Type	Waste		6,036					
		Stockwork	2,498	39		0.95	0.72	23,767	1,788
		Massive	203	4		1.47	3.79	2,986	770
	Category	Measured	2,274			0.96	0.77	21,853	1,712
		Indicated	121			0.93	0.38	1,123	45
		Inferred	307			1.23	2.67	3,778	801
	Total		2,701	6,080	2.25	0.99	0.95	26,754	2,558
Al Ashgar	Ore Type	Waste		7,429					
		Stockwork		9				0	0
		Massive	644	5		2.63	0.79	16,923	512
	Category	Measured	524			2.34	0.72	12,199	376
		Indicated	16			4.37	1.24	679	19
		Inferred	105			3.87	1.11	4,045	116
	Total		644	7,443	11.55	2.63	0.79	16,923	512
Hayl as Safil	Ore Type	Waste		13,172					
		Stockwork	3,735	431		1.15	0.41	42,876	1,522
		Massive	366	25		1.35	1.02	4,931	373
	Category	Measured	3,727			1.16	0.44	43,105	1,646
		Indicated	153			1.15	0.46	1,760	71
		Inferred	220			1.34	0.80	2,942	177
	Total		4,101	13,628	3.32	1.17	0.46	47,806	1,894
Al Bishara	Ore Type	Waste		2,740					
		Breccia	729	0		1.23	0.83	8,958	607
	Category	Measured	196			1.13	0.82	2,214	161
		Indicated	532			1.27	0.84	6,743	446
		Inferred	0			0.77	0.24	0	0
	Total		729	2,740	3.76	1.23	0.83	8,958	607
Total	Ore Type	Waste		29,377					
		Stockwork	6,233	479		1.07	0.53	66,643	3,310
		Massive	1,213	34		2.05	1.36	24,840	1,654
		Breccia	729	0		1.23	0.83	8,958	607
	Category	Measured	6,721			1.18	0.58	79,371	3,896
		Indicated	822			1.25	0.71	10,305	581
		Inferred	632			1.70	1.73	10,765	1,094
	Total		8,175	29,891	3.66	1.23	0.68	100,441	5,571

TableIII-2-5 Minable Reserve by Bench Level

	Level	Waste	Ore														
			Stockwork					Massive					Total				
			Ore	Copper		Gold		Ore	Copper		Gold		Ore	Copper		Gold	
	(m)	('000t)	('000t)	(%)	(t)	(g/t)	(kg)	('000t)	(%)	(t)	(g/t)	(kg)	('000t)	(%)	(t)	(g/t)	(kg)
Rakah	- 704	13															
	704 - 692	51															
	692 - 680	204															
	680 - 668	1,126															
	668 - 656	1,573	60	0.97	584	1.18	71	12	1.39	168	4.07	49	72	1.04	751	1.66	120
	656 - 644	1,295	349	1.03	3,593	1.13	394	133	1.47	1,958	3.78	503	482	1.15	5,551	1.86	898
	644 - 632	854	574	1.02	5,851	0.97	556	56	1.51	848	3.80	213	630	1.06	6,699	1.22	770
	632 - 620	476	607	0.94	5,703	0.71	431	2	0.81	13	2.64	4	608	0.94	5,716	0.72	435
	620 - 608	284	485	0.89	4,319	0.45	218						485	0.89	4,319	0.45	218
	608 - 596	139	270	0.91	2,460	0.27	73						270	0.91	2,460	0.27	73
	596 - 584	67	153	0.82	1,258	0.29	44						153	0.82	1,258	0.29	44
	Total	6,080	2,498	0.95	23,767	0.72	1,788	203	1.47	2,986	3.79	770	2,701	0.99	26,754	0.95	2,558
	Level	Waste	Ore														
			Massive										Total				
			Ore	Copper		Gold							Ore	Copper		Gold	
	(m)	('000t)	('000t)	(%)	(t)	(g/t)	(kg)						('000t)	(%)	(t)	(g/t)	(kg)
Al Ashgar	- 700	1,017															
	700 - 690	1,731															
	690 - 680	1,328	2	4.07	82	1.62	3						2	4.07	82	1.62	3
	680 - 670	1,101	86	3.94	3,404	1.16	100						86	3.94	3,404	1.16	100
	670 - 660	798	136	2.88	3,907	0.77	104						136	2.88	3,907	0.77	104
	660 - 650	609	113	2.09	2,352	0.69	78						113	2.09	2,352	0.69	78
	650 - 640	402	134	2.17	2,910	0.75	101						134	2.17	2,910	0.75	101
	640 - 630	242	85	2.19	1,863	0.70	60						85	2.19	1,863	0.70	60
	630 - 620	142	53	2.49	1,315	0.62	33						53	2.49	1,315	0.62	33
	620 - 610	72	36	3.05	1,090	0.93	33						36	3.05	1,090	0.93	33
	Total	7,443	644	2.63	16,923	0.79	512						644	2.63	16,923	0.79	512
	Level	Waste	Ore														
			Stockwork					Massive					Total				
			Ore	Copper		Gold		Ore	Copper		Gold		Ore	Copper		Gold	
	(m)	('000t)	('000t)	(%)	(t)	(g/t)	(kg)	('000t)	(%)	(t)	(g/t)	(kg)	('000t)	(%)	(t)	(g/t)	(kg)
Hayl as Safil	- 770	143															
	770 - 760	278															
	760 - 750	314															
	750 - 740	353															
	740 - 730	389															
	730 - 720	426															
	720 - 710	482															
	710 - 700	671															
	700 - 690	2,176															
	690 - 680	2,326	0	0.86	0	0.64	0						0	0.86	0	0.64	0
	680 - 670	1,982	42	1.52	635	0.42	18						42	1.52	635	0.42	18
	670 - 660	1,373	378	1.66	6,269	0.37	140	16	1.56	249	1.71	27	394	1.66	6,518	0.42	167
	660 - 650	950	571	1.37	7,825	0.35	200	49	1.05	513	1.28	63	620	1.34	8,338	0.42	262
	650 - 640	630	596	1.17	6,978	0.40	239	76	1.19	907	0.84	64	673	1.17	7,886	0.45	303
	640 - 630	455	572	1.05	6,009	0.45	258	68	1.41	960	0.69	47	640	1.09	6,970	0.48	305
	630 - 620	275	521	1.03	5,366	0.43	224	54	1.47	788	0.67	36	575	1.07	6,153	0.45	260
	620 - 610	158	495	1.01	4,998	0.42	208	44	1.48	650	0.99	43	539	1.05	5,648	0.47	251
	610 - 600	88	350	0.90	3,146	0.45	157	31	1.50	472	1.46	46	381	0.95	3,618	0.53	203
	600 - 590	126	171	0.82	1,402	0.41	70	28	1.41	392	1.67	46	199	0.90	1,794	0.59	117
	590 - 580	31	39	0.63	248	0.23	9						39	0.63	248	0.23	9
	Total	13,628	3,735	1.15	42,876	0.41	1,522	366	1.35	4,931	1.02	373	4,101	1.17	47,806	0.46	1,894
	Level	Waste	Ore														
			Breccia										Total				
			Ore	Copper		Gold							Ore	Copper		Gold	
	(m)	('000t)	('000t)	(%)	(t)	(g/t)	(kg)						('000t)	(%)	(t)	(g/t)	(kg)
Al Bishara	- 690	414															
	690 - 680	988															
	680 - 670	736															
	670 - 660	416	92	1.33	1,225	0.85	78						92	1.33	1,225	0.85	78
	660 - 650	142	289	1.27	3,671	0.87	252						289	1.27	3,671	0.87	252
	650 - 640	24	216	1.21	2,610	0.82	177						216	1.21	2,610	0.82	177
	640 - 630	20	132	1.10	1,451	0.76	100						132	1.10	1,451	0.76	100
	Total	2,740	729	1.23	8,958	0.83	607						729	1.23	8,958	0.83	607
Total		29,891											8,175	1.23	100,441	0.68	5,571

2-2 Mining Schedule

Mining schedule is planed in regard to two cases of production rate (3,000ROMt/day and 2,000ROMt/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 exploit even though at lower metal price (See TableⅢ-2-2). After these two pits are mined out, Hayl as Safil and Al Bishara pits are mined in order. Hayl as Safil pit is mined in two stages as mentioned in section 2-1-2.

Mining schedules in case of 3,000t/day and 2,000t/day are shown in TableⅢ-2-6 and TableⅢ-2-7.

In order to minimize the capital costs and maximize NPV, pre-stripping is carried out only in Rakah pit.

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

Blasting tonnages are estimated on the assumptions of no blasting from present pit surface to 5m in depth at Rakah pit and from topographic surface to 10m in depth at other pits.

Table Ⅲ-2-6 Mining Schedule (3,000t/day)

Production		Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Mining											
Rakah											
Ore	ton		1,095,000	1,092,984	513,330						2,701,314
Waste	ton	2,965,726	2,027,832	827,628	258,442						6,079,628
Total	ton	2,965,726	3,122,832	1,920,612	771,772						8,780,942
Al Ashgar											
Ore	ton			2,016	581,670	60,637					644,323
Waste	ton			4,601,268	2,703,022	139,078					7,443,368
Total	ton			4,603,284	3,284,692	199,715					8,087,691
Hayl As Safil											
Ore	ton				0	1,034,363	1,095,000	1,095,000	876,525		4,100,888
Waste	ton				2,991,170	6,042,622	3,745,187	603,599	245,230		13,627,808
Total	ton				2,991,170	7,076,985	4,840,187	1,698,599	1,121,755		17,728,696
Al Bishara											
Ore	ton							0	218,475	510,370	728,845
Waste	ton							1,401,753	1,214,258	124,299	2,740,310
Total	ton							1,401,753	1,432,733	634,669	3,469,155
Total Mining Tonnage											
Ore	ton	0	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	510,370	8,175,370
Waste	ton	2,965,726	2,027,832	5,428,896	5,952,634	6,181,700	3,745,187	2,005,352	1,459,488	124,299	29,891,114
Total	ton	2,965,726	3,122,832	6,523,896	7,047,634	7,276,700	4,840,187	3,100,352	2,554,488	634,669	38,066,484
Blasting											
Ore	ton	0	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	510,370	8,175,370
Waste	ton	716,147	2,027,832	2,173,594	4,042,180	3,296,485	2,696,374	603,599	1,094,976	124,299	16,775,485
Total	ton	716,147	3,122,832	3,268,594	5,137,180	4,391,485	3,791,374	1,698,599	2,189,976	634,669	24,950,855

TableⅢ-2-7 Mining Schedule (2,000t/day)

Production		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	Total
Mining															
Rakah															
Ore	ton		730,000	730,000	730,000	511,314									2,701,314
Waste	ton	2,965,726	1,533,185	831,073	492,381	257,263									6,079,628
Total	ton	2,965,726	2,263,185	1,561,073	1,222,381	768,577									8,780,942
Al Ashgar															
Ore	ton			0	0	218,686	425,637								644,323
Waste	ton			704,002	2,044,419	3,228,163	1,466,784								7,443,368
Total	ton			704,002	2,044,419	3,446,849	1,892,421								8,087,691
Hayl As Safil															
Ore	ton					0	304,363	730,000	730,000	730,000	730,000	730,000	146,525		4,100,888
Waste	ton					2,991,170	5,319,676	2,527,779	1,681,139	489,390	297,796	221,906	98,952		13,627,808
Total	ton					2,991,170	5,624,039	3,257,779	2,411,139	1,219,390	1,027,796	951,906	245,477		17,728,696
Al Bishara															
Ore	ton											0	583,475	145,370	728,845
Waste	ton											1,401,753	1,316,997	21,560	2,740,310
Total	ton											1,401,753	1,900,472	166,930	3,469,155
Total Mining Tonnage															
Ore	ton	0	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	145,370	8,175,370
Waste	ton	2965726	1,533,185	1,535,075	2,536,800	6,476,596	6,786,460	2,527,779	1,681,139	489,390	297,796	1,623,659	1,415,949	21,560	29,891,114
Total	ton	2,965,726	2,263,185	2,265,075	3,266,800	7,206,596	7,516,460	3,257,779	2,411,139	1,219,390	1,027,796	2,353,659	2,145,949	166,930	38,066,484
Blasting															
Ore	ton	0	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	730,000	145,370	8,175,370
Waste	ton	716,147	1,533,185	831,073	492,381	4,059,261	3,901,244	1,478,966	1,681,139	489,390	297,796	221,906	1,051,437	21,560	16,775,485
Total	ton	716,147	2,263,185	1,561,073	1,222,381	4,789,261	4,631,244	2,208,966	2,411,139	1,219,390	1,027,796	951,906	1,781,437	166,930	24,950,855

2-3 Mining Operation Plan

2-3-1 Working hours etc

Working hours etc. are estimated as shown in TableⅢ-2-8. These parameters are used in mining scheduling and cost estimation. Working hours of mining is same as one of milling.

Rock properties shown in TableⅢ-2-9 are used in following equipment estimation. These are based on experiences gained from similar mine operation with similar conditions.

TableⅢ-2-8 Working Hour etc

Working hour etc		
Working days	day/year	365
Shift/day	shift	3
Hours/shift	hrs	7
Working hours per year	hrs	7,665

TableⅢ-2-9 Rock Properties

Density etc	
Density	
Ore	3.1
Waste	2.8
Swell factor	
Ore	50%
Waste	50%
Loose Density	
Ore	2.07
Waste	1.87

2-3-2 Drilling and Blasting

It is considered the 5.5 " class down-the-hole drills suitable for blasthole drilling. ANFO is used as main blasting explosive, and emulsion explosive is used as primer and maybe required for some wet hole.

Specifications and productivity for drilling and blasting are shown in TableⅢ-2-10.

Table Ⅲ-2-10 Productivity Estimate for Drilling and Blasting

Drilling		
Equipment		5.5 Inch class
Explosive		ANFO
Primer		Emulsion
Drill hole Diameter	Inch	5.5
Drill pattern		4.5m * 4.5m
Bench height	m	10
Bench height (Rakah)	m	12
Drill angle		Vertical
Sub-drilling	m	1.0
Sub-drilling (Rakah)	m	1.2
Re-drill	%	5%
Blasted tonnage		
Ore	ton/m	42.9
Waste	ton/m	38.8
Nominal drilling rate	m/hr	20
Efficiency	%	70%
Drilling rate	m/hr	14
Length of charge	m	7.0
Length of charge (Rakah)	m	8.4
Powder Factor	g/t	190
Mechanical Availability	%	85%
Utilization	%	75%
Available hour per year	hr	4,886
Drilling Ability		
Ore	'000 ton/year	2,938
Waste	'000 ton/year	2,653
No Blasting Materials		10m below from G.L.
No Blasting Materials (Rakah)		5m below from G.L.

2-3-3 Loading and Hauling

It is considered that front end loader approximate $6m^3$ capacity class are suitable for main loading equipment. A front end loader of approximate $4m^3$ capacity assists $6m^3$ loaders. This smaller loader is also used for re-handling of stockpiled ore to the primary crusher.

Productivity for loading is shown in TableⅢ-2-11.

A fleet of 32ton class dump trucks is adopted in this project.

Specifications of hauling is shown in TableⅢ-2-12.

TableⅢ-2-11 Productivity Estimate for Loading

Loading			
Equipment		FEL 6.1m^3 Bucket class	FEL 4.2 m^3 Bucket class
Bucket capacity	m^3	6.1	4.2
Pass/Truck	pass	3	4
Fill factor			
Ore		90%	90%
Waste		95%	95%
Loading time	sec/pass	50	50
Nominal ability			
Ore	ton/hr	817	562
Waste	ton/hr	779	536
Efficiency (Truck Availability etc)	%	70%	70%
Loading Ability			
Ore	ton/hr	572	394
Waste	ton/hr	545	375
Mechanical Availability	%	85%	85%
Utilization	%	95%	95%
Available hour per year	hr	6,189	6,189
Net Loading Ability			
Ore	'000 ton/year	3,539	2,437
Waste	'000 ton/year	3,374	2,323

Table Ⅲ-2-12 Specifications of Hauling

Hauling		
Equipment		Off Highway Dump Truck 32.5ton class
Vessel capacity	ton	32.5
Fill factor		
Ore	%	95%
Waste	%	100%
Traveling Speed		
Up - Load	km/hr	10
Up - Empty	km/hr	25
Down - Load	km/hr	25
Down - Empty	km/hr	30
Flat - Load	km/hr	25
Flat - Empty	km/hr	30
Efficiency	%	80%
Mechanical Availability	%	85%
Utilization	%	95%
Available hour per year	hr	6,189

2-3-4 Mining Support

Mining support equipments are shown in Table Ⅲ-2-13.

Dozers are used for collecting blasted materials, maintenance of loading area and waste dump area.

Motor grader and vibrating roller are required for road maintenance.

Breaker is used for fragmentation of bolders and occasionally for constructing with a bucket attachment.

Table Ⅲ-2-13 Mining Support Equipments

Mining Support	
Dozer	305hp class, Blade Width : 4.26m
Motor Grader	165hp class, Blade Width : 3.66m
Breaker (Backhoe)	
Vibrating Roller	
Water Truck	

2-3-5 Pit Dewatering

Water volume flowing into each pit is estimated as the following, based on the previous study (Environmental Impact Assessment and Mine Inflow, Hydrotechnica 1991).

Hayl as Safil pit 4,000m^3/day

Other pits 300m^3/day

Drained water is used for sprinkling on the haul road, and surplus water is discharged to lower stream of wadi.

It is considered that the combinations of submersible pump and diesel generator are suitable in terms of mobility, because the working bench must advance rapidly in such small pits. Specifications for dewatering facilities are shown in TableⅢ-2-14.

TableⅢ-2-14 Specification of Dewatering

Dewatering				
Pump				
Equipment		Submersible Pump A	Submersible Pump B	Submersible Pump C
Size	Inch	3	8	8
Capacity	m^3/min	0.5	4	4.5
Head	m	85	35	90
Motor	kW	19	37	110
Diesel Generator	kW	20	40	110

2-3-6 Miscellaneous Equipments

Required miscellaneous equipments are shown in TableⅢ-2-15. Light vehicles for traveling, a crane for maintenance of equipments and light towers for the night shift are necessary.

TableⅢ-2-15 Miscellaneous Equipments

Miscellaneous Equipment	
Light Vehicle	4WD
Crane	10t
Light Tower	30ft, 4 lights

2-3-7 Numbers of Required Equipments

Based on annual tonnages of ore and waste mined, productivities of loading and hauling (Table Ⅲ-2-11 and TableⅢ-2-12) and dumping schedule mentioned in section2-3-8, truck study is carried out. Required working hours for main equipments and the number of required equipments from the truck study etc. are shown in TableⅢ-2-16～TableⅢ-2-19.

Many dump trucks are required for periods of stripping waste in Al Ashgar and Hayl as Safil pits where there are large volumes of waste.

Table Ⅲ-2-16 Required Working Hours for Main Equipments (3,000t/day)

Required Working Hours for Main Equipments			Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Drill	5.5 Inch	hrs	1,319	5,556	5,824	9,265	7,892	6,787	2,933	3,838	1,078
FEL	6.1 M3 Backet	hrs	5,440	5,634	11,873	12,833	13,253	8,784	5,593	4,592	1,120
Dump Truck	32.5 TON	hrs	17,302	26,520	45,379	48,976	49,833	32,502	22,255	18,708	4,707

Table Ⅲ-2-17 Number of Required Equipments (3,000t/day)

No. of Required Equipments			Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Drill	5.5 Inch	No.	1	2	2	2	2	2	1	1	1
FEL	6.1 M3 Backet	No.	1	1	2	2	2	2	1	1	1
	4.2 M3 Backet	No.	1	1	1	1	1	1	1	1	1
Dump Truck	32.5 TON	No.	3	5	8	8	9	6	4	4	2
Dozer		No.	3	3	3	3	3	3	3	3	3
Motorgrader		No.	1	1	1	1	1	1	1	1	1
Breaker (Backhoe)		No.	1	1	1	1	1	1	1	1	1
Vibrating Roller		No.	1	1	1	1	1	1	1	1	1
Crane	10t	No.	1	1	1	1	1	1	1	1	1
Water Truck		No.	1	1	1	1	1	1	1	1	1
Pump	Submersible Pump A	No.	1	1	2	2	1		1	1	1
	Submersible Pump B	No.					1	1	1	1	
	Submersible Pump C	No.					1	1	1	1	
Generator	20kW	No.	1	1	2	2	1		1	1	1
	40kW	No.					1	1	1	1	
	110kW	No.					1	1	1	1	
Light Tower	30ft, 4 lights	No.	1	1	2	2	2	2	2	2	1
Light Vehicle	4WD	No.	4	4	4	4	4	4	4	4	4

Table Ⅲ-2-18 Required Working Hours for Main Equipments (2,000t/day)

Required Working Hours for Main Equipments			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
Drill	5.5 Inch	hrs	1,319	4,038	2,745	2,121	8,689	8,398	3,938	4,310	2,115	1,763	1,623	3,150	281
FEL	6.1 M3 Backet	hrs	5,440	4,089	4,092	5,930	13,156	13,724	5,913	4,360	2,174	1,823	4,255	3,874	294
Dump Truck	32.5 TON	hrs	17,302	18,738	18,599	24,159	48,187	49,868	21,857	16,699	9,438	8,271	16,701	14,949	1,274

Table Ⅲ-2-19 Number of Required Equipments (2,000t/day)

No. of Required Equipments			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
Drill	5.5 Inch	No.	1	1	1	1	2	2	1	1	1	1	1	1	1
FEL	6.1 M3 Backet	No.	1	1	1	1	2	2	1	1	1	1	1	1	1
	4.2 M3 Backet	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Dump Truck	32.5 TON	No.	3	4	4	4	8	8	4	3	2	2	3	3	2
Dozer		No.	3	3	3	3	3	3	3	3	3	3	3	3	3
Motorgrader		No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Breaker (Backhoe)		No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Vibrating Roller		No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Crane	10t	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Water Truck		No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Pump	Submersible Pump A	No.	1	1	2	2	2						1	1	1
	Submersible Pump B	No.						1	1	1	1	1	1	1	
	Submersible Pump C	No.						1	1	1	1	1	1	1	
Generator	20kW	No.	1	1	2	2	2								1
	40kW	No.						1	1	1	1	1	1	1	
	110kW	No.						1	1	1	1	1	1	1	
Light Tower	30ft, 4 lights	No.	1	1	2	2	2	1	1	1	1	1	2	2	1
Light Vehicle	4WD	No.	4	4	4	4	4	4	4	4	4	4	4	4	4

2-3-8 Waste Dump

The locations of waste dumps are shown in Fig.Ⅲ-2-17 and Fig.Ⅲ-2-18. Waste dump design parameters are shown in TableⅢ-2-20.

All waste from Rakah pit is dumped to Dump1 that is located on the east of the pit.

Likewise all waste from Al Ashgar pit is dumped to Dump2 that is located on the south east of the pit.

After Al Ashgar pit is mined out, waste from Hayl as Safil pit are dumped into Al Ashgar pit up to original topographic level. Thereafter residual waste is dumped to Dump2.

After Hayl as Safil pit is mined out, waste from Bishara pit are dumped into Hayl as Safil pit.

Dumping schedules are shown in TableⅢ-2-21 and TableⅢ-2-22.

Volume of Dump1 and Dump2 is 2.9 million m^3 and 8.5 million m^3 respectively with dry in-situ density of 2.1.

The further study for acid rock drainage from waste dumps should be executed before development.

TableⅢ-2-20 Waste Dump Design Parameters

Waste Dump		
Bench Height	m	20
Berm Width	m	10
Bench Slope Angle	degree	38
Maximum Height	m	40

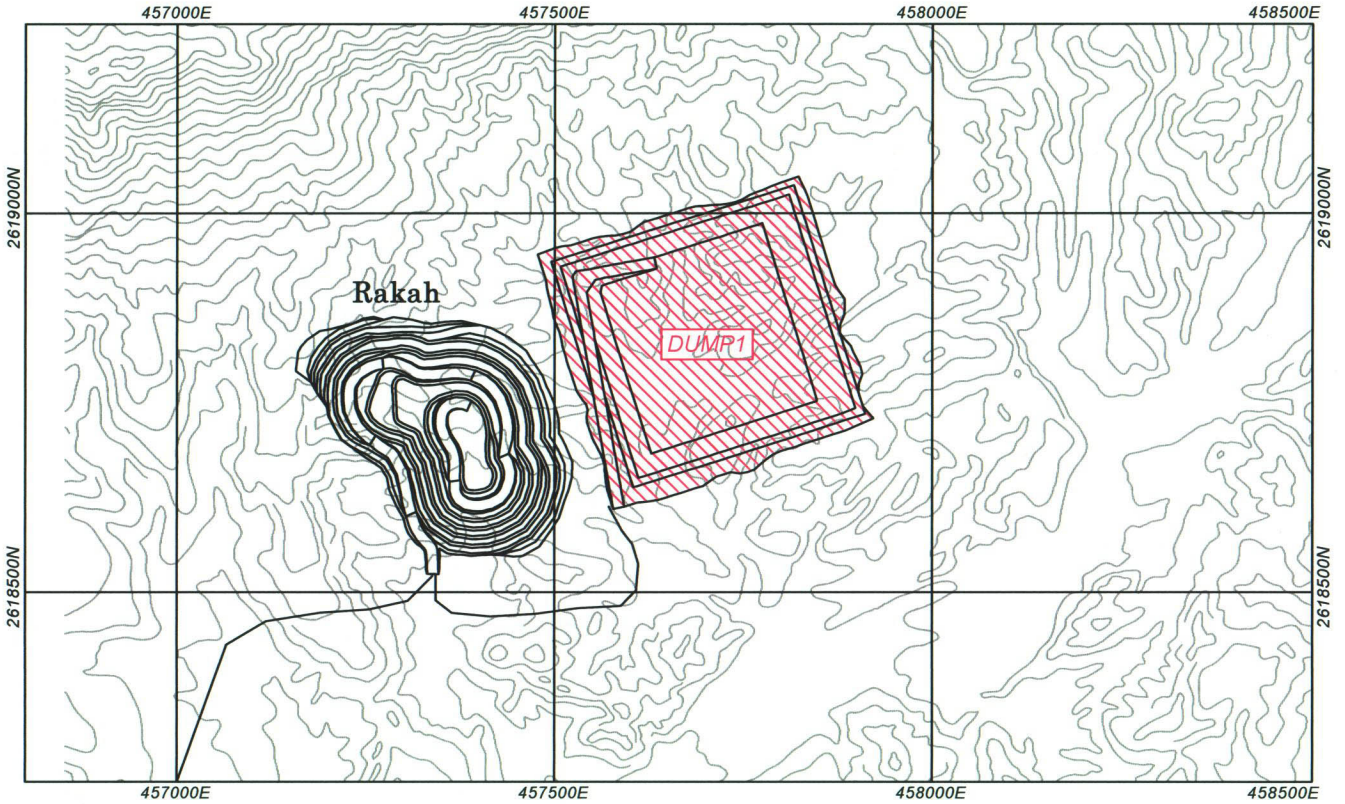


Fig.Ⅲ-2-17 Dumping Area (Rakah)

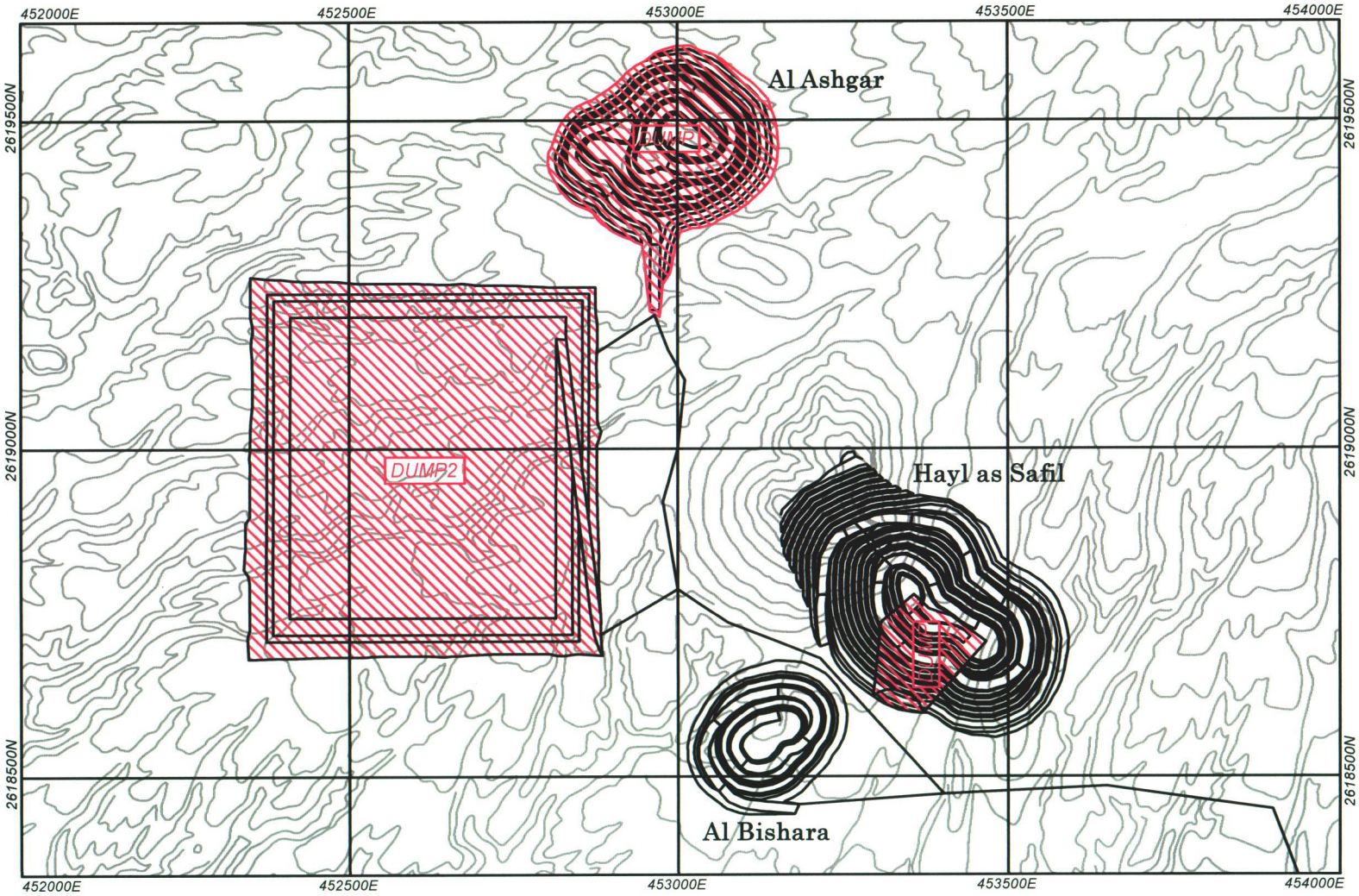


Fig.Ⅲ-2-18 Dumping Area (Al Ashgar, Hayl as Safil, Bishara)

Table Ⅲ-2-21 Dumping Schedule (3,000t/day)

Waste Dump	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Rakah										
to Dump1	2,966	2,028	828	258						6,080
Al Ashgar										
to Dump2			4,601	2,703	139					7,443
Hayl As Safil										
to Dump2				2,991	6,043			106		9,140
to Ashgar Pit						3,745	604	139		4,488
Al Bishara										
to Dump2								1,214		1,214
to Ashgar Pit							1,402			1,402
to Safil Pit									124	124

Total Dumping Tonnage	
Dump1	6,080
Dump2	17,797
Ashgar Pit	5,890
Safil Pit	124
Total	29,891

Unit : '000Ton

TableⅢ-2-22 Dumping Schedule (2,000t/day)

Waste Dump	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	Total
Rakah														
to Dump1	2,966	1,533	831	492	257									6,080
Al Ashgar														
to Dump2			704	2,044	3,228	1,467								7,443
Hayl As Safil														
to Dump2					2,991	5,320						99		8,410
to Ashgar Pit							2,528	1,681	489	298	222			5,218
Al Bishara														
to Dump2											730	1,317		2,047
to Ashgar Pit											672			672
to Safil Pit													22	22

Total Dumping Tonnage	
Dump1	6,080
Dump2	17,900
Ashgar Pit	5,890
Safil Pit	22
Total	29,891

Unit : '000Ton

2-4 Mining Organization

Recently contract mining is popular in mining industry, and adopted in many mines.

It is considered 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.

Advantages of contract mining in this project are as follows.

* Number of required equipments varies year by year considerably (especially dump trucks).
* The depreciation of heavy equipment is quite heavy with such short mine life, particularly in case of introduction in the halfway of mine life.
* Capital cost can be minimized.
* Contractors purveying flexibly all equipments and manpower reduce the risk of management and investment.
* It is confirmed during a site visit that contractors in Oman seems to have sufficient capability and experiences.

The Number of mining staff under direct control in case of full contract mining is shown in Table Ⅲ-2-23.

This number of staff is based on contracting for drilling, blasting, loading, hauling (including road maintenance) and dozing with all equipments, labors etc. Therefore this number may increase depending on the agreements with the contractors.

Table Ⅲ-2-23 Number of Mining Staff

Staff	No
Mining Manager	1
Chief Geologist	1
Superintendent	1
Chief Mine Planning Engineer	1
Surveyer	1
Assistant Surveyer	1
Shift Boss	4
Sampler	2
Office Clerk	1
Total Staff	13

2-5 Mining Operating Cost

Cost data obtained in Rial Omani is converted to US dollar as following exchange rate.

US$1.0 = RO 0.3845

"Cost Reference Guide for Construction Equipment" (The Dun & Bradstreet Corporation) that collects general costs in mining industry is referred for some unavailable data during site inspection.

2-5-1 drilling and Blasting

Operating costs of drilling and blasting are shown in TableⅢ-2-24.

These costs are based on the quotations from the local contractors, and include following items.

* Drill equipments
* Maintenance of equipments
* Fuel and lubricant
* Explosives and cost of transportation for explosives
* Cost of escorting police
* Light vehicles
* Labor costs

TableⅢ-2-24 Operating Cost of Drilling and Blasting

Drilling and Blasting		
Operating Cost	US$/t	0.39

2-5-2 Loading and Hauling

Operating costs of loading and hauling are shown in TableⅢ-2-25.

These costs are based on the quotations from the local contractors, and include following items.

* Loaders and dump trucks
* Mining support equipments
* Maintenance of equipments
* Fuel and lubricant
* Costs for road maintenance
* Light vehicle
* Labor cost

TableⅢ-2-25 Operating Costs of Loading and Hauling

Loading and Hauling	
Haul Distance	Operating Cost (US$/t)
0-1 km	0.26
1-2 km	0.39
2-3 km	0.52
3-4 km	0.65
4-5 km	0.78
Rehandling (Loader Only)	0.18

2-5-3 Waste Dump

Contractor cost of dumping at waste dump are shown in TableⅢ-2-26.

This cost includes all of equipments, maintenance of equipments, fuel, lubricant, labor cost etc.

TableⅢ-2-26 Operating Cost of Dumping

Waste Dump		
Dozer	US$/hr/unit	46.8

2-5-4 Labor Cost

Mining labor costs are shown in TableⅢ-2-27.

TableⅢ-2-27 Mining Labor Costs

Labor Cost (R.O.)								
Staff	No	Grade	Basic salary /month	Alloance /month	Total basic salary /month	Total basic salary /year	overtime, overhead, etc	Grand total /year
Mining Manager	1	2G	850		850	10,200	3,060	13,260
Chief Geologist	1	5G	500		500	6,000	1,800	7,800
Superintendent	1	5G	500		500	6,000	1,800	7,800
Chief Mine Planning Engineer	1	5G	500		500	6,000	1,800	7,800
Surveyer	1	6G	400		400	4,800	1,440	6,240
Assistant Surveyer	1	8O	230	92	322	3,864	1,352	5,216
Shift Boss	4	7O	300	120	420	5,040	1,764	6,804
Sampler	2	8O	230	92	322	3,864	1,352	5,216
Office Clerk	1	8O	230	92	322	3,864	1,352	5,216
Total Staff	13							
Total labor cost (R.O./year)	90,980							
Total labor cost (US$/year)	236,619							

2-5-5 Pit Service etc.

Costs of pit services are shown in TableⅢ-2-28.

The cost of dewatering at Hayl as Safil pit is expensive, because dewatering volume is large and pit wall is high at there, so big size of pumps and generators are required.

TableⅢ-2-28 Operating Costs of Pit Services

Pit Services etc		
Dewatering		
Hayl Al Safil	US$/year	169,178
Other	US$/year	15,695
Lighting	US$/year/unit	9,461
Light Vehicle	US$/year/unit	7,186

2-5-7 Annual Mining Operating Costs

Annual mining operating costs are shown in TableⅢ-2-29 and TableⅢ-2-30.

TableⅢ-2-29 Mining Operating Cost (3,000t/day)

Operating Cost		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Total Operating Cost	**US$**	**3,498,042**	**4,345,331**	**4,649,145**	**5,538,429**	**4,282,304**	**2,543,947**	**2,547,229**	**714,921**	**28,119,348**
Direct	US$	287,234	309,104	309,104	410,027	388,156	410,027	410,027	133,877	2,657,556
Labor	US$	236,619	236,619	236,619	236,619	236,619	236,619	236,619	110,286	1,766,619
Pit Service (Dewatering, Lighting etc)	US$	21,871	43,742	43,742	144,664	122,793	144,664	144,664	10,194	676,333
Other (Light vehicle etc)	US$	28,744	28,744	28,744	28,744	28,744	28,744	28,744	13,397	214,603
Contractor	US$	3,044,235	3,829,306	4,118,653	4,864,667	3,690,229	2,012,780	2,015,905	547,000	24,122,775
Drilling & Blasting Cost	US$	1,218,270	1,275,134	2,004,101	1,713,193	1,479,080	662,652	854,347	165,063	9,371,841
Loading , Hauling and Road Maintenance	US$	1,655,094	2,383,301	1,943,680	2,980,603	2,040,278	1,179,256	990,687	302,295	13,475,194
Dozing (Dumping area)	US$	170,871	170,871	170,871	170,871	170,871	170,871	170,871	79,642	1,275,740
Contingency (5%)	US$	166,573	206,921	221,388	263,735	203,919	121,140	121,297	34,044	1,339,017

TableⅢ-2-30 Mining Operating Cost (2,000t/day)

Operating Cost		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
Total Operating Cost	**US$**	**2,640,892**	**2,280,904**	**2,648,623**	**5,252,893**	**5,550,188**	**2,932,710**	**2,668,721**	**1,525,889**	**1,395,087**	**1,930,497**	**2,071,944**	**228,001**	**31,126,348**
Direct	US$	287,234	309,104	309,104	309,104	410,027	388,156	388,156	388,156	388,156	400,566	400,566	57,199	4,035,528
Labor	US$	236,619	236,619	236,619	236,619	236,619	236,619	236,619	236,619	236,619	236,619	236,619	47,120	2,649,928
Pit Service (Dewatering, Lighting etc)	US$	21,871	43,742	43,742	43,742	144,664	122,793	122,793	122,793	122,793	135,203	135,203	4,355	1,063,695
Other (Light vehicle etc)	US$	28,744	28,744	28,744	28,744	28,744	28,744	28,744	28,744	28,744	28,744	28,744	5,724	321,905
Contractor	US$	2,227,901	1,863,185	2,213,393	4,693,651	4,875,867	2,404,901	2,153,483	1,065,072	940,498	1,438,003	1,572,714	159,945	25,608,613
Drilling & Blasting Cost	US$	882,907	609,001	476,872	1,868,372	1,806,727	861,755	940,627	317,137	267,307	247,570	463,313	43,415	8,785,002
Loading , Hauling and Road Maintenance	US$	1,174,123	1,083,313	1,565,650	2,654,407	2,898,268	1,372,274	1,041,986	577,064	502,320	1,019,562	938,530	82,503	14,910,000
Dozing (Dumping area)	US$	170,871	170,871	170,871	170,871	170,871	170,871	170,871	170,871	170,871	170,871	170,871	34,027	1,913,611
Contingency (5%)	US$	125,757	108,614	126,125	250,138	264,295	139,653	127,082	72,661	66,433	91,928	98,664	10,857	1,482,207

2-6 Mining Capital Cost

2-6-1 Pre-stripping

Cost of pre-stripping consists of the costs of all contractors (drilling, blasting, loading, hauling and dozing at waste dump) and direct labors.

Unit costs of the contractors and direct labor are same as operating costs.

2-6-2 Equipments

Capital costs of equipments are shown in TableⅢ-2-31.

TableⅢ-2-31 Capital Costs of Equipments

Pump		
Submersible Pump A	US$/unit	11,000
Submersible Pump B	US$/unit	12,000
Submersible Pump C	US$/unit	20,000
Generator		
20kW	US$/unit	3,200
40kW	US$/unit	160,000
110kW	US$/unit	200,000
Light		
30ft, 4lights	US$/unit	14,000
Light Veihicl		
4WD	US$/unit	29,000

2-6-3 Annual Mining Capital Cost

Annual mining capital costs are shown in TableⅢ-2-32 and TableⅢ-2-33.

TableⅢ-2-32 Mining Capital Cost (3,000t/day)

Capital Cost		Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Total Capital Cost	**US$**	**1,961,185**		**29,610**		**399,042**					**2,389,837**
Pre-Stripping	US$	1,723,595									1,723,595
Direct	US$	287,234									287,234
Contractor	US$	1,436,361									1,436,361
Equipment	US$	144,200		28,200		380,040					552,440
Pump	US$	3,200		3,200		360,000					366,400
Generator	US$	11,000		11,000		20,040					42,040
Light Tower	US$	14,000		14,000							28,000
Light Vehicle	US$	116,000									116,000
Others (5%)	US$	93,390		1,410		19,002					113,802

TableⅢ-2-33 Mining Capital Cost (2,000t/day)

Capital Cost		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	Total
Total Capital Cost	**US$**	**1,961,185**		**29,610**			**399,042**								**2,389,837**
Pre-Stripping	US$	1,723,595													1,723,595
Direct	US$	287,234													287,234
Contractor	US$	1,436,361													1,436,361
Equipment	US$	144,200		28,200			380,040								552,440
Pump	US$	3,200		3,200			360,000								366,400
Generator	US$	11,000		11,000			20,040								42,040
Light Tower	US$	14,000		14,000											28,000
Light Vehicle	US$	116,000													116,000
Others	US$	93,390		1,410			19,002								113,802