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Sammendrag

KONFIDENSIELT

FALKHAMMER - IBESTAD MAGNETITE A.S.
ANDØRJA MAGNETITE PROJECT
SOUTHERN TROMS REGION
NORWAY

FEASIBILITY STUDY
VOLUME II

JULY, 1991.

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FALKHAMMER - IBESTAD MAGNETITE A.S.

ANDORJA MAGNETITE PROJECT

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KONFIDENSIELT

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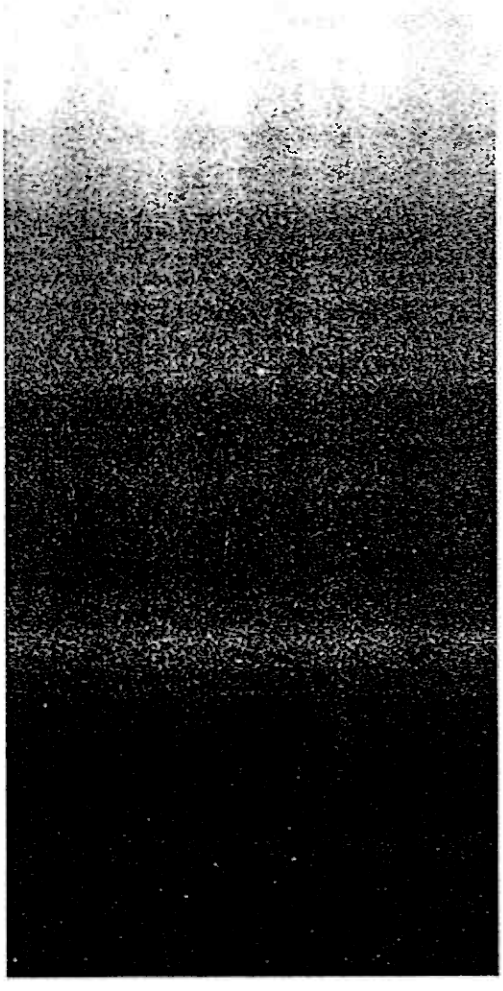
SINTEFF REPORT

STF36 F91039



Feasibility study
at
Andørja Iron ore deposit

In situ resources

1991-05-02

SINTEF

Rock and Mineral Engineering

RAPPORT

RAPPORT

SINTEF REPORT
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Abstract

The Andørja magnetite-apatite deposits are situated in the highly metamorphosed upper allocthon of the Caledonian mountain range on Andørja in Troms.

100 holes with a total length of 12 954 m were drilled during the summers of 1911 and 1958 to 1962. The drillholes were assayed for magnetite and phosphorous. An estimate of in situ resources based on the polygonal method demonstrates the following figures:

40 million metric tons with 30.2% magnetite and 1.2% P at a cut-off of 25 % magnetite.

Additional resources between cut-offs of 20 % and 25 % magnetite are 8 million metric tons at 20.4 % magnetite and 0.8 % P.

The deposit is still open to the north and northeast.

	Indexing terms: English	Norwegian
Group 1	Rock and Mineral Eng.	Bergteknikk
Group 2	Information	Informasjon
Key terms selected by author(s)	Magnetite	Magnetitt
	Feasibility study	Mulighetsstudie
	Mining	Gruvedrift

SLF 127 86

Division Director

FOREWORD

The purpose of this study is to build a 3-D model of the Andørja magnetite-apatite deposit. The work follows an agreement between Kilborn Inc, and SINTEF. (Offer dated 1991-02-18, Authorization to work, fax. dated 1991-04-04)

CONTENT

ABSTRACT

The Andørja magnetite-apatite deposits are situated in the highly metamorphosed upper allocthon of the Caledonian mountain range on Andørja in Troms. Banded magnetite layers occurs within a 100 m thick amfibole-mica-schist formation in a group of mica schists. 2-20 m thick calcite marble marker horizons occur both over and under the amfibole-mica-schist formation. The main orezones Gropa in the west and Kuliberget in the east, are probably the same ore horizon divided by a thin lower grade mineralization referred to as Zone 3 or Lia.

100 holes with a total length of 12 954 m were drilled during the summers of 1911 and 1958 to 1962. The drillholes were assayed for magnetite and phosphorous. An estimate of in situ resources based on the polygonal method demonstrates the following:

> 39.785 million metric tons with 30.2% magnetite and 1.2% P at a cut-off of 25 % magnetite.

Additional resources between 20 % and 25 % magnetite are 8.360 million metric tons at 20.4 % magnetite and 0.8 % P.

The deposit is still open to the north and northeast.

1 INTRODUCTION

The Andørja iron ore deposit has been examined several times. We were familiar with the work done by Johannes Søyland, in his thesis "Procedure for the Development of the Andørja Magnetite Deposit" (1991). Based on this knowledge we made an offer for the part of a feasibility study that should give the in-situ resources for the main ore zone in the deposit.

When we gave the offer, we did not know the extent of the information of the deposit, being held by the Minister of Mines. Neither did we know that the cores from 24 drill holes from the deposit were stored in Løkken at the National diamond drill core archive.

Instead of a survey at the location, as included in the offer, we decided to examine the available reports from the Minister of Mines, and the available cores.

During a meeting with Mike Davie, Kilborn Inc, it was decided that the ore reserve estimation should be based on the polygonal method. The results should be available in digital form for further use. Intergraph (IGDS), Lotus (WK3) or ASCII formats should be used. The report is followed by two diskettes with digital data. The figures in the report are therefore limited to a minimum.

2 GEOLOGY OF THE ANDORJA MAGNETITE-APATITE DEPOSIT.

This report is a composite of the work done by Elkem in 1958 to 1962 found in the files of the norwegian Minister of Mines. The Andørja files of the Minister of Mines are far from complete, some documents are not signed and/or dated and they are thus not referred to in a proper manner. The geological findings of Elkem were controlled with drillhole cores from Andørja stored at the National diamond drill core archive.

A search for references on keywords 'magnetitt' together with 'Troms' and 'Andørja' at the Geological Survey of Norway's reference library, did not add new information to what was known from the files of the Minister of Mines.

2.1 Regional geology.

The Andørja deposits are situated in sedimentary Cambrosilurian in upper allochthon of the Caledonian mountain range. The rocks are of upper amfibolite facies, the metamorphic age is Caledonian (late Silur to middle Devonian). Retrograde metamorphism is not reported from the area.

Hematite-magnetite sedimentary deposits occurs over a distance of more than 550 km in a formation from Vefsn to Tromsø in the lower units of the upper allochthon. Total iron grades are up to 45%. The hematite : magnetite ratio decreases with increasing metamorphosis (Poulsen 1964). Common gangue minerals are quartz, calcite, biotite, epidote, hornblendes and almandine garnet. It is not known what type of garnet that occur in the Andørja deposits. Apatite occurs with variable grades, average is around 0.2 %P. The Andørja deposits are among the more apatite rich deposits. Rana Gruber is mining the only orebodies currently in production north of Mo i Rana in Nordland.

At Andørja there is a group of mica-schist and gneisses below the ore bearing group. Serpentine pods and decimeter thick amfibolite beds are common. Magnetite bearing layers occurs in a amfibole-schist formation in a group of mica-schists, calcite-marbles and quartzite

beds. A group of garnet-mica-schist overlays the magnetite rich horizons. Coarse grained pegmatites and granite lenses are common.

2.2 The magnetite bearing amphibole-schist.

Magnetite deposits occurs within an amphibole-schist formation in the mica schist group. This formation is referred to as an amphibolite (Geis 1962c) and mica-schist (Gustavson 1960)by different sources. Inspections of the cores suggests the name amphibole-biotite-schist. The ore bearing unit will for simpicity be referred to as an amphibole-schist. This amphibole-schist is different from the amfibolites found in the lower mica-schist and gneiss group. The amphibole schist average 100 meter in thickness, the thickest parts coincides with the thickest parts of the eastern part of the magnetite mineralization. The amphibole schist are divided from the garnet-mica-schists by two marble horizons (Geis 1962c).

The amphibole-schist and the magnetite rich layers crops out over a length of more than 2 km along the Astafjord southeast on Andørja. Extensive diamond drilling is carried out in a 2.0 km by 0.7 km area. The same amphibole-schist with magnetite zones crops out 6-7 km to the north at the north side of the Trollan mountain. The Andørja deposits have thus large potential resources.

Several marble formations are found within the garnet-mica-schist group. The marbles are coarse grained and the thickness of the formations ranges from a few decimeters to 20-30 m. Marble beds are always close to the magnetite bearing amphibole-schist, both on the footwall and hanging wall side.

Quartzite lenses are found below the amphibole-schist.

Pegmatites and coarse grained felsic intrusives (Trondhjemitic ?) intrusives crosscutting the stratas are common.

Several magnetite rich zones occur within the amphibole-schist. Geis (1962d) devides them into six different zones, named by numbers with numbers increasing upwards, all these zones can be divided into subunits. Orezone 2 or Kuliberget in the east and Orezone 3 or Gropa in

the west are the only zones with both high grades (>25% magnetite) and thicknesses (>20m). Zone 1 and 5 have less than 15 % magnetite but are up to 17 meter thick. Zone 4 and 6 are mostly less than 10 meter thick, the magnetite grade is up to 35% but is variable. Gropa and Kuliberget orezones are possibly the same stratigraphical unit but are separated by a thin low grade mineralization, sometimes referred to as Lia or Ore Zone 3.

The magnetite bearing layers has the following mineral composition (Geis 1962c):

Hornblende
Biotite
Quartz
Magnetite
Apatite
Plagioclase

Quartz and hornblende are the major minerals. Garnet is rare in the Kuliberget Zone (Geis 1962c), and in the Gropa Zone judged by the corelogs.

The layers low in magnetite are composed of the following minerals :

Augite
Hornblende
Microcline
Plagioclase
Quartz
Biotite

Observations from the cores stored at Løkken (drillhole 25, 23, 24 and 26) confirms this. Calcite is common outside the magnetite rich layers in the cores studied at Løkken, but calcite was not observed in the magnetite layers. Calcite should be paid extra attention due to its similarity with apatite with respect on dressing properties. A muscovite-biotite-garnet-schist bed is found below the hanging wall marble and above the footwall marble. Muscovite is not observed in other layers of the amphibole-schist formation. Layers of garnet-biotite schist occur close to high grade ores (Geis 1962c).

Several different ore types are known to occur, there are however no petrographical or structural descriptions. Three oretypes are briefly mentioned in a report from a flotation test by "Sala" in 1962: (1) normal ore, (2) low grade amphibole ore and (3) low grade garnet ore.

Equal amounts of these ores where mixed in the flotation test. Some efforts have unsuccessfully been made to trace these ore types to different orezones or parts of the orebodies. The only thing known with certainty is that garnet is rare in the Kuliberget zone (Geis 1962c), and in the Gropa zone judged by the core logs for the drillholes. Some of the ore mined in the test tunnel was however rich in garnet.

2.3 Structural geology

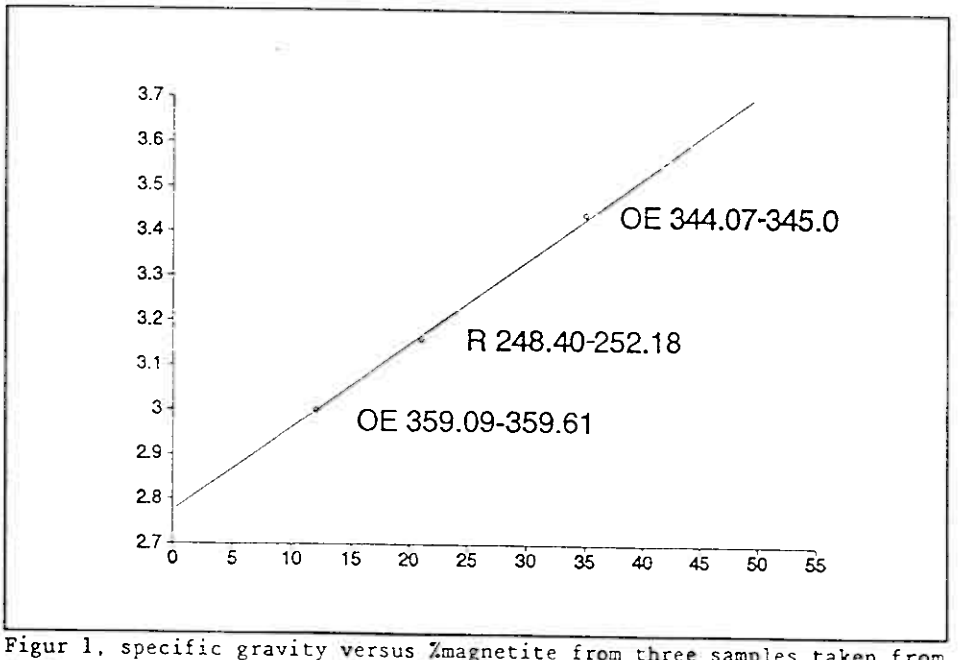
The ore layers dips from 10-20 degrees to the east. Strike varies from approximately N10W in the Gropa area to N70W in the Kuliberget area. Regionally three phases of deformation are identified. Folding is not important in the structural control of the deposits. The folds on Andørja have large wavelengths and are gentle (Gustavson 1960). Small isoclinal folds can be seen in the drillhole cores. Locally small tight to isoclinal folds occurs but they are not significant. Gustavson (1972) is recommended for detailed structural information for the region.

Fault movements have occurred in several periods in this region, also in post-glacial times. There are several fracture and faulting systems, two of which are the most important: (1) striking ESE-WNW and (2) striking NE-SW both with high angle faces. The Astafjord fault is parallel to (2) and is a vertical fault (Gustavsen 1972). One fault parallel to (2) in the test drift has a throw of about 5 meters. This fault is supposed to continue up to drillhole "L". There are however no evidence of faults with large throws in the drillholes from the Kuliberget and Gropa area.

3 DIAMOND DRILLING.

100 drillholes with a total length of 12 954 m were drilled in the Kuliberget and Gropa area in 1911 and 1958 to 1961. In addition 14 holes with a total length of 877 meter of drilling was done in the Måsan area 1.5 km northeast of Gropa in 1961. The limits of Gropa and Måsan magnetite zones are said to be found, but the Kuliberget Zone is open to the north and northeast. The Måsan area did not show up interesting reserve figures: 6.9 million metric tons at 20% magnetite plus 0.3 Mtons at 30.4 % magnetite at Måsan west (Wanvik 1983).

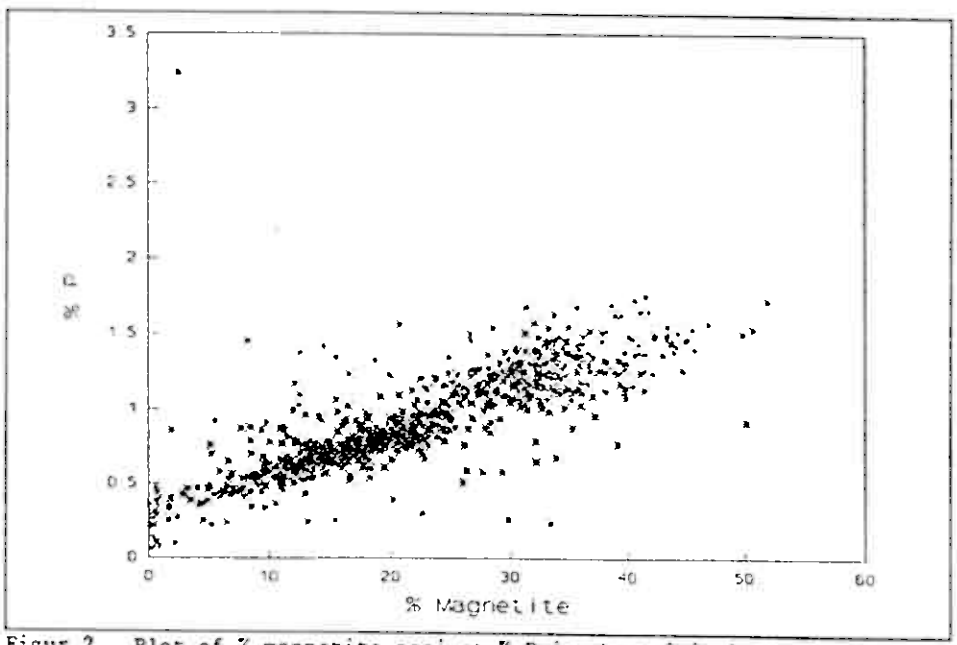
7 holes with a length of 550 m (drillhole nr. 1 to 8 (?) and 9 to 12) were drilled in 1911. The mineralized parts were analyzed for magnetite, total iron, sulphur and phosphorous. Bulk samples where assayed for hydrochloric acid solvent iron and total iron.



Figur 1, specific gravity versus %magnetite from three samples taken from drillhole cores in Kuliberget (Geis 1962a).

Most of the drilling were done during the summers of 1958 to 1962 by Elkem after Elkems takeover of the deposits in 1958: 5 holes with a total length of 620 m were drilled in 1958, 8 holes with a total length of 1918 m in 1959, 57 holes with a total of 5024 m in 1960 and 23

holes with a total of 4842 m were drilled in 1962. These cores were assayed for magnetic minerals by "Dings tube separator" at the Rødsand mine and phosphorous at Cristiania Spikerverk. The magnetic fraction is reported to contain 70-72 % iron. Not all the magnetic assays were found, the missing values were reconstructed from a regression line between phosphorous and magnetite, see figure 2. The assaying interval is generally coincident with the different zones. Only two drillholes OE (OE for norwegian letter Ø) and 5H are assayed in detail including waste rocks. Analysis for hydrochloric acid solvent iron, total iron and sulphur were done by Cristiania Spikerverk, but it is not known how many or which drillholes that were assayed.



Figur 2. Plot of % magnetite against % P in the original samples at Andorja.

Specific gravity was not measured. Only 3 (three) measurements of specific gravities versus magnetite are known, they are all taken from the Kuliberget Ore zone (Geis 1962a), see plot in figure 1. The main minerals of the mineralized zone have the following densities:

Magnetite	5.2
Quartz	2.65
Amphibole	3.0 - 3.4 Increasing with iron content.
Garnet	3.6 - 4.3

Apatite	3.1 - 3.3
Clinopyroxene	3.2 - 3.6 Increasing with iron content.
Biotite	2.7 - 3.2 Increasing with iron content.

(Hamilton, Woolley and Bishop 1974)

As figure 1 shows the three samples plots in a straight line intersecting at a specific gravity of about 2.8. This should show that the major gangue mineral has a low specific gravity as quartz, amphibole and biotite, or else the line should intersect at a higher specific gravity. In case of a low speicific gravity gangue the specific gravity versus magnetite grade should show a neat regression due to magnetites relatively high specific gravity.

The missing specific gravities are calculated from (1), derived from figure 1.

$$spec.gravity = 2.8 + 0.02 * \%Magnetite \qquad (1)$$

Specific gravity was included in the ore calculation to avoid an underestimation of the ore, the numbers used are however considered to be conservative. Rocks lower than 5.1% magnetite and waste rocks are assumed to have a specific gravity of 2.8. (Rana Gruber who is mining a similar deposit ore uses a specific gravity of 2.8 on their waste rock.)

One test with Clericis liquid (Geis 1962b) with ore from the test drift shows that most of the gangue minerals have a density between 2.7 an 4.0.

Phosphorous and magnetite grades of the waste rock are conservatively estimated from figure 2 to 5 % magnetite and 0.25 P. Missing grades of magnetite or phosphorous are calculated from (2).

$$\%P = 0.25 + 0.04 * \%Magnetite \qquad (2)$$

Figure 2 suggests that (2) underestimates magnetite grade but overestimates phosphorous grade.

The collar data for the drillholes were not found in Elkems final report to the Minister of Mines (Wanvik 1983). It is known that the elevation of the drillhole location were controlled

by levelling. Collar data were taken from the maps following Elkems final report to the Minister of Mines (Wanvik 1983).

No deviation measurements are known from Andørja. The corelogs shows that the drillholes drifts so that the foliation is perpendicular to the drillholes.

Drillhole data is included in Appendix No. 1. Figures followed by a bar are calculated figures.

The collar data contains holename x-, y-, z-coordinates, direction, inclination and total hole length.

The assay data contains holename, from - to, Magnetite, Phosphorus, Specific gravity, Sulphur, Fe_{tot}, Fe_{HCl}.

File A_LONG.DGN is a longitudinal section through Gropa, Lia and Kuliberget.

A_G_TRAN.DGN and A_K_TRAN.DGN are transversal sections through Gropa and Kuliberget.

4 MODELLING OF THE KULIBERGET AND GROPA ORE ZONES

The estimation is based on the polygonal method. The polygons are shown in fig. 3.

The resources for two cut-offs, 20 % and 25 % magnetite were calculated from the drillhole assays. The total demonstrated resources are presented in table 1.
The content of phosphorous and magnetite is considered as far more important than the tonnage. The volume of the mineralization is not studied in detail.

TABLE 1. Total demonstrated resources for Gropa, Lia and Kuliberget.

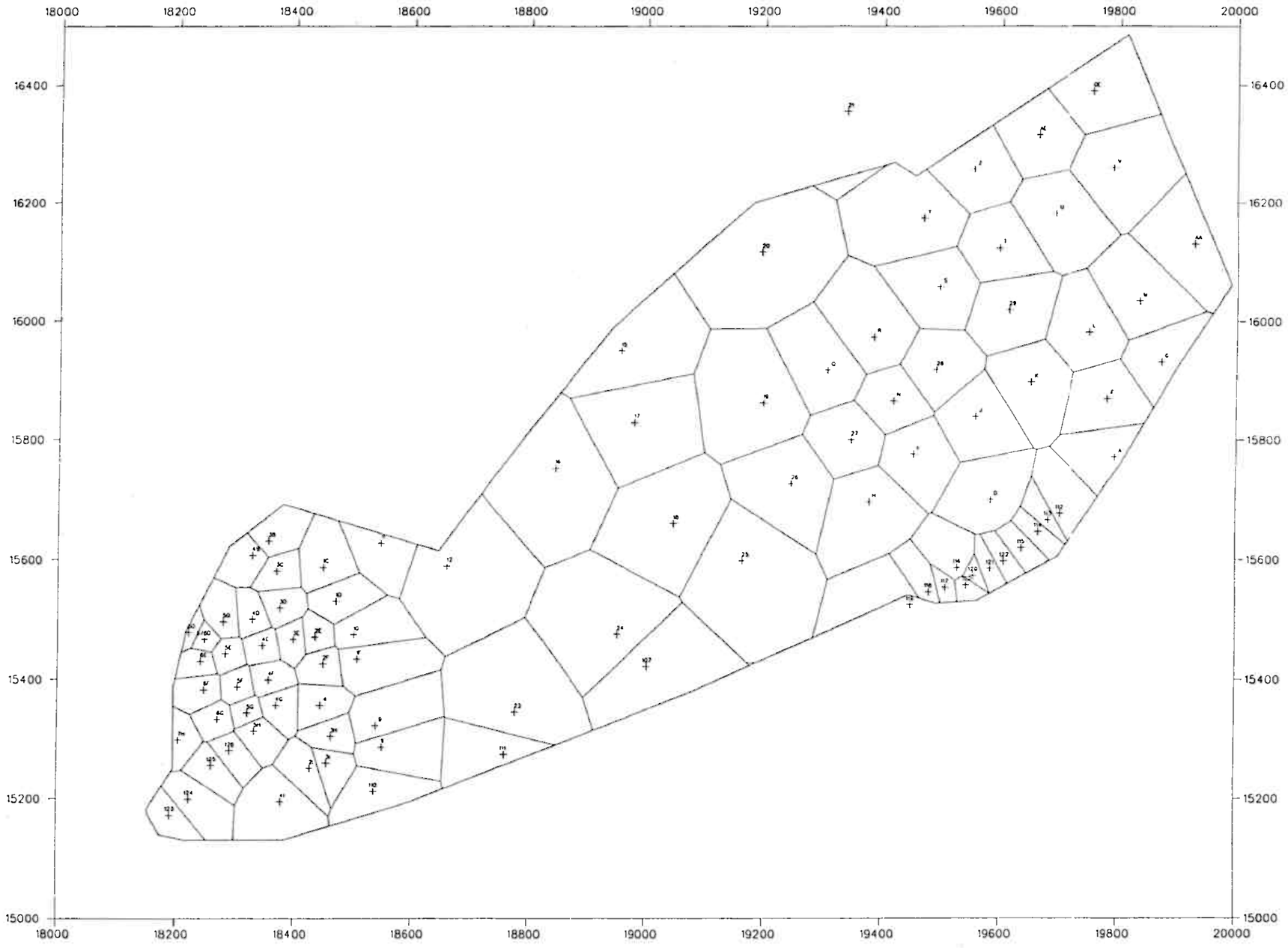
Cut-off	%Magnetite	% P	Spec.grav.	Avg.thick.	Th.Tons
20% Magn	28.48	1.16	3.35	13.17	48145
25% Magn	30.18	1.23	3.39	10.76	39785

Tabulations of the resources in each polygon are in Appendix No. 2.

A_POLYGO.WK3 is a tabulation of the resources in each block.

The resource figures are conservative for the following reasons: (1) The range of influence for the drillholes are low at the outlines of the drilled area. The deposit is still open to the northeast and north. (2) The drillholes are assumed to drift so that the thickness observed may be close to true thickness. (3) The specific gravity is conservatively calculated.
(4) Missing magnetite values are found via a conservative regression with phosphorous. As another consequence the same equation will overestimate the missing phosphorous grades from the magnetite grades.

The composites for the two alternatives are included on the diskettes on the files A_20.CMP and A_25.CMP . (Drillhole 8 is included in the composite files, but not in the estimation of resources).



		DRAWN BY / DATE	SINTEF
		REVISED BY / DATE	ANDØRJA
	100.0 0 100.0 200.0 m	SCALE 1: 5000	Cut-off 20% Fe3O4 22.4.1991
		DWG	**Figure 3**

Diamond drillhole data

ANDORJA.DAT

The drawing A_polygn.dgn shows the defined polygons.

The economic parts of the deposit are Gropa and Kuliberget. We have looked closer to these parts but found that due to the sampling routines, - see the contrast between the accurate assayed drillholes 5H and OE and the others, - other estimation methods for in-situ resources would not result in major improvements.

To be able to intersect the deposit in arbitrary sections, we have fitted a surface to the top and bottom of the 20 % cut-off composites.

File A_G_FOOT.DGN gives the surfaces of the footwall, and A_G_HANG.DGN the hangingwall surface for Gropa, based on the composites from 20% cut-off.

File A_K_FOOT.DGN gives the surfaces of the footwall, and A_K_HANG.DGN the hangingwall surface for Kuliberget, based on the composites from 20% cut-off.

For detatiled mine planning we have build two 3D files (A_MOD20.DGN and A_MOD25.DGN) showing the composites for 20 and 25 % cut-off.

5 CONCLUSIONS

From the files of the Minister of Mines, and from drillholes stored at Løkken, we have given a description of the deposit.

The continuity of the ore when we considered the hole thickness, and the economic interesting parts, makes the polygonal method appropriate for establishing a 3-D model of the deposit, and for reporting in-situ resources.

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3	2I	3.81	6.43	19.20	0.72	3.18	-1.00	-1
3	2I	25.94	36.06	28.00	1.10	3.36	-1.00	-1
3	2I	42.00	44.23	39.80	1.27	3.60	-1.00	-1
3	2I	46.12	52.97	20.00	0.81	3.20	-1.00	-1
3	2I	53.70	55.79	40.00	1.31	3.60	-1.00	-1
3	2I	57.90	58.55	26.30	1.13	3.33	-1.00	-1
1	3A	18321.50	15691.50	405.00	0.00	-90.00	45.26	
3	3A	39.82	42.26	23.00	1.13	3.26	-1.00	-1
1	3B	18355.50	15631.50	401.00	0.00	-90.00	109.00	
3	3B	42.87	45.38	24.00	1.01	3.28	-1.00	-1
3	3B	58.45	61.40	35.00	1.55	3.50	-1.00	-1
3	3B	62.86	75.50	29.40	1.26	3.39	-1.00	-1
3	3B	75.50	82.25	21.70	0.78	3.23	-1.00	-1
3	3B	83.30	85.12	39.20	1.33	3.58	-1.00	-1
3	3B	97.07	99.87	25.70	1.03	3.31	-1.00	-1
1	3C	18370.00	15581.50	391.00	0.00	-90.00	110.00	
3	3C	29.94	32.07	20.00	0.94	3.20	-1.00	-1
3	3C	46.21	48.19	34.00	1.30	3.48	-1.00	-1
3	3C	49.12	68.80	33.80	1.35	3.48	-1.00	-1
3	3C	69.42	76.05	21.80	0.83	3.24	-1.00	-1
3	3C	77.52	79.64	41.00	1.38	3.62	-1.00	-1
3	3C	81.34	81.92	33.00	1.46	3.46	-1.00	-1

1	3D	18376.00	15520.00	380.00	0.00	-90.00	107.00	
3	3D	21.02	24.14	27.30	1.09	3.35	-1.00	-1
3	3D	38.42	43.82	35.40	1.35	3.51	-1.00	-1
3	3D	44.60	46.45	11.60	0.82	3.03	-1.00	-1
3	3D	46.73	65.28	34.80	1.37	3.50	-1.00	-1
3	3D	66.06	72.54	19.40	0.79	3.19	-1.00	-1
3	3D	73.49	75.24	35.40	1.12	3.51	-1.00	-1
3	3D	88.50	90.91	20.10	0.93	3.20	-1.00	-1
1	3E	18399.00	15467.50	377.00	0.00	-90.00	115.00	
3	3E	7.60	10.20	11.20	0.65	3.02	-1.00	-1
3	3E	21.93	24.76	29.70	1.09	3.39	-1.00	-1
3	3E	43.88	47.53	39.30	1.24	3.59	-1.00	-1
3	3E	49.53	55.13	30.20	1.26	3.40	-1.00	-1
3	3E	55.79	66.42	40.20	1.48	3.60	-1.00	-1
3	3E	67.34	74.90	24.30	0.97	3.29	-1.00	-1
3	3E	89.73	93.63	30.30	1.18	3.41	-1.00	-1
1	3H	18464.00	15305.50	365.00	0.00	-90.00	86.00	
3	3H	4.25	9.40	27.50	1.11	3.35	-1.00	-1
3	3H	29.05	41.00	32.00	1.29	3.44	-1.00	-1
3	3H	44.95	62.00	28.20	1.04	3.36	-1.00	-1
3	3H	74.75	81.50	28.50	1.21	3.37	-1.00	-1
1	3I	18457.00	15260.00	363.00	0.00	-90.00	94.00	
3	3I	0.15	2.45	47.00	1.57	3.74	-1.00	-1
3	3I	3.70	5.85	16.60	0.78	3.13	-1.00	-1
3	3I	25.00	37.90	33.10	1.32	3.46	-1.00	-1
3	3I	41.05	50.00	39.40	1.17	3.59	-1.00	-1
3	3I	51.10	53.65	16.30	0.69	3.13	-1.00	-1
3	3I	56.00	57.40	32.20	0.79	3.44	-1.00	-1
3	3I	58.10	59.00	44.40	1.51	3.69	-1.00	-1
3	3I	73.35	79.40	29.40	1.09	3.39	-1.00	-1
1	4B	18328.50	15607.50	392.00	0.00	-90.00	97.00	
3	4B	29.50	31.60	21.80	1.12	3.24	-1.00	-1
3	4B	46.88	57.85	27.40	1.13	3.35	-1.00	-1
3	4B	58.75	64.28	20.50	0.85	3.21	-1.00	-1
3	4B	65.23	66.42	36.00	1.18	3.52	-1.00	-1
3	4B	80.11	84.00	19.20	1.08	3.18	-1.00	-1
1	4D	18329.00	15501.00	370.00	0.00	-90.00	81.00	
3	4D	18.35	23.00	30.30	1.26	3.41	-1.00	-1
3	4D	24.60	38.95	38.20	1.52	3.56	-1.00	-1
3	4D	38.95	49.35	21.70	0.80	3.23	-1.00	-1
3	4D	50.40	51.88	34.60	1.01	3.49	-1.00	-1
3	4D	68.10	71.25	2.00	0.86	2.84	-1.00	-1
1	4E	18345.50	15457.00	372.00	0.00	-90.00	93.63	
3	4E	0.00	3.45	18.20	0.66	3.16	-1.00	-1
3	4E	23.80	28.18	35.90	1.30	3.52	-1.00	-1
3	4E	29.60	46.05	34.00	1.38	3.48	-1.00	-1
3	4E	46.80	52.23	21.20	0.79	3.22	-1.00	-1
3	4E	53.05	54.90	39.80	1.15	3.60	-1.00	-1
3	4E	71.10	74.85	20.00	0.87	3.20	-1.00	-1
1	4F	18356.50	15399.50	376.00	0.00	-90.00	98.00	
3	4F	10.50	13.80	17.10	0.92	3.14	-1.00	-1
3	4F	34.30	45.40	32.10	1.17	3.44	-1.00	-1
3	4F	45.40	47.35	9.70	0.48	2.99	-1.00	-1
3	4F	47.90	55.83	32.90	1.30	3.46	-1.00	-1
3	4F	55.83	64.65	24.30	0.86	3.29	-1.00	-1
3	4F	65.73	69.45	42.40	1.47	3.65	-1.00	-1
3	4F	82.10	85.10	10.00	0.57	3.00	-1.00	-1
3	4F	85.50	87.90	28.40	1.06	3.37	-1.00	-1
1	4G	18370.00	15357.00	366.00	0.00	-90.00	79.00	
3	4G	6.40	13.63	6.70	0.65	2.93	0.50	-1
3	4G	22.90	28.00	34.80	1.38	3.50	0.38	-1
3	4G	29.40	30.59	38.70	1.69	3.57	0.27	-1
3	4G	32.20	51.54	33.70	1.37	3.47	0.34	-1
3	4G	52.25	57.26	20.40	0.93	3.21	0.23	-1

3	4G	58.05	59.55	43.50	1.55	3.67	0.48	-1
3	4G	72.60	75.75	13.00	0.75	3.06	0.44	-1
1	4I	18379.00	15195.00	340.00	0.00	-90.00	46.00	
3	4I	0.00	7.65	45.60	1.53	3.71	-1.00	-1
3	4I	8.64	16.28	21.00	0.76	3.22	-1.00	-1
3	4I	16.60	18.50	37.10	1.35	3.54	-1.00	-1
3	4I	32.94	36.41	28.20	1.36	3.36	-1.00	-1
1	5D	18279.00	15497.00	369.00	0.00	-90.00	63.00	
3	5D	0.00	9.65	35.80	1.40	3.52	-1.00	-1
3	5D	12.15	28.85	30.30	1.07	3.41	-1.00	-1
3	5D	44.30	50.10	20.80	0.92	3.22	-1.00	-1
1	5E	18283.00	15443.00	367.00	0.00	-90.00	61.18	
3	5E	0.00	9.40	36.00	1.03	3.52	-1.00	-1
3	5E	11.18	18.10	18.30	0.54	3.17	-1.00	-1
3	5E	18.70	31.57	27.70	0.58	3.35	-1.00	-1
3	5E	47.47	52.62	20.10	0.66	3.20	-1.00	-1
3	5E	57.80	61.18	9.10	0.49	2.98	-1.00	-1
1	5F	18304.00	15387.50	365.00	0.00	-90.00	70.00	
3	5F	0.00	8.28	35.95	1.69	3.52	-1.00	-1
3	5F	9.60	15.55	33.00	1.57	3.46	-1.00	-1
3	5F	15.77	21.25	33.20	1.58	3.46	-1.00	-1
3	5F	21.65	31.63	23.20	1.18	3.26	-1.00	-1
3	5F	32.88	37.75	33.25	1.58	3.47	-1.00	-1
3	5F	51.05	57.45	15.18	0.86	3.10	-1.00	-1
3	5F	61.65	65.65	12.00	0.73	3.04	-1.00	-1
1	5G	18320.50	15344.50	364.00	0.00	-90.00	71.00	
3	5G	8.68	26.80	33.10	1.22	3.46	-1.00	-1
3	5G	26.80	40.95	22.30	0.73	3.25	-1.00	-1
3	5G	60.00	62.60	18.20	0.94	3.16	-1.00	-1
1	5H	18333.00	15314.00	363.00	70.00	-90.00	68.00	
3	5H	13.95	14.00	12.20	0.78	3.04	0.67	18
3	5H	14.00	14.60	32.10	1.58	3.44	-1.00	29
3	5H	14.60	15.29	40.70	1.72	3.61	-1.00	35
3	5H	15.29	15.70	0.90	0.40	2.82	-1.00	-1
3	5H	15.70	16.50	41.20	1.65	3.62	-1.00	36
3	5H	16.50	17.17	39.80	1.38	3.60	0.30	37
3	5H	17.17	17.35	2.60	3.24	2.85	-1.00	-1
3	5H	17.35	18.00	44.00	1.38	3.68	-1.00	38
3	5H	18.00	18.65	41.50	1.26	3.63	-1.00	35
3	5H	18.65	18.72	5.20	0.76	2.90	-1.00	-1
3	5H	18.72	19.00	39.80	1.13	3.60	-1.00	34
3	5H	19.00	19.22	24.00	1.01	3.28	0.47	25
3	5H	19.22	19.30	4.30	0.36	2.89	-1.00	-1
3	5H	19.30	19.42	31.40	1.68	3.43	-1.00	29
3	5H	19.42	19.78	14.70	0.57	3.09	-1.00	-1
3	5H	19.78	19.83	31.60	1.17	3.43	-1.00	24
3	5H	19.83	19.92	0.90	0.07	2.82	-1.00	-1
3	5H	19.92	20.13	42.30	1.50	3.65	-1.00	36
3	5H	20.13	21.96	0.40	0.30	2.81	-1.00	-1
3	5H	21.96	22.12	50.20	0.92	3.80	0.09	40
3	5H	22.12	22.38	1.70	0.35	2.83	-1.00	-1
3	5H	22.28	22.44	34.10	1.23	3.48	-1.00	31
3	5H	22.44	22.63	4.60	0.25	2.89	-1.00	-1
3	5H	22.63	23.06	37.80	1.51	3.56	-1.00	37
3	5H	23.06	24.07	4.90	0.38	2.90	-1.00	-1
3	5H	24.07	24.71	14.10	0.95	3.08	-1.00	19
3	5H	24.71	24.99	6.60	0.24	2.93	-1.00	-1
3	5H	24.99	25.21	16.50	1.02	3.13	0.26	20
3	5H	25.21	25.43	0.80	0.11	2.82	-1.00	-1
3	5H	25.43	25.54	20.00	1.22	3.20	-1.00	25
3	5H	25.54	25.78	0.30	0.06	2.81	-1.00	-1
3	5H	25.78	25.93	18.80	1.32	3.18	-1.00	23
3	5H	25.93	26.17	32.70	1.24	3.45	-1.00	31
3	5H	26.17	27.00	33.40	1.45	3.47	0.39	32

3	5H	27.00	28.00	32.40	1.40	3.45	-1.00	30
3	5H	28.00	28.85	39.50	1.63	3.59	-1.00	35
3	5H	28.85	28.88	5.60	0.92	2.91	-1.00	-1
3	5H	28.88	29.71	39.00	1.63	3.58	-1.00	33
3	5H	29.71	30.12	26.60	1.50	3.33	0.59	26
3	5H	30.12	30.76	50.80	1.53	3.82	-1.00	43
3	5H	30.76	30.80	9.80	0.91	3.00	-1.00	-1
3	5H	30.80	31.80	52.00	1.72	3.84	-1.00	44
3	5H	31.80	32.80	45.20	1.47	3.70	-1.00	40
3	5H	32.80	33.80	45.80	1.40	3.72	0.10	37
3	5H	33.80	34.35	45.00	1.45	3.70	-1.00	37
3	5H	34.35	34.49	5.30	0.22	2.91	-1.00	-1
3	5H	34.49	34.65	41.50	1.13	3.63	-1.00	37
3	5H	34.65	34.85	1.70	0.25	2.83	-1.00	-1
3	5H	34.85	35.10	23.70	0.96	3.27	-1.00	25
3	5H	35.10	35.14	8.00	0.41	2.96	-1.00	-1
3	5H	35.14	35.20	33.80	1.33	3.48	0.16	32
3	5H	35.20	36.00	17.50	0.86	3.15	-1.00	22
3	5H	36.00	36.78	22.40	0.98	3.25	-1.00	23
3	5H	36.78	37.85	17.10	0.70	3.14	-1.00	-1
3	5H	37.85	38.50	21.80	0.84	3.24	-1.00	45
3	5H	38.50	39.50	22.70	0.80	3.25	0.11	24
3	5H	39.50	40.50	19.50	0.61	3.19	-1.00	20
3	5H	40.50	41.13	23.00	0.82	3.26	-1.00	23
3	5H	41.13	41.30	5.30	0.70	2.91	-1.00	-1
3	5H	41.30	42.30	26.40	0.87	3.33	-1.00	26
3	5H	42.30	43.16	24.40	0.79	3.29	0.06	24
3	5H	43.16	43.27	9.70	0.33	2.99	-1.00	-1
3	5H	43.27	44.27	21.80	0.77	3.24	-1.00	22
3	5H	44.27	45.27	23.00	0.76	3.26	-1.00	22
3	5H	45.27	46.01	23.50	0.89	3.27	-1.00	24
3	5H	46.01	46.45	35.20	1.07	3.50	0.30	29
3	5H	46.45	46.56	15.50	0.25	3.11	-1.00	16
3	5H	46.56	46.63	33.40	0.24	3.47	-1.00	30
3	5H	46.63	47.40	0.10	0.36	2.80	-1.00	-1
3	5H	47.40	47.74	49.90	1.50	3.80	-1.00	42
3	5H	47.74	47.90	1.70	0.32	2.83	-1.00	-1
3	5H	47.90	48.50	41.20	1.24	3.62	0.17	36
3	5H	48.50	49.10	43.10	1.36	3.66	-1.00	36
3	5H	49.10	49.22	8.60	0.34	2.97	-1.00	-1
3	5H	49.22	50.00	43.70	1.43	3.67	-1.00	38
3	5H	50.00	50.72	41.60	1.75	3.63	-1.00	37
3	5H	50.72	53.73	0.10	0.23	2.80	-1.00	-1
3	5H	53.73	54.13	25.50	1.23	3.31	1.60	28
1	6D	18220.50	15479.50	374.00	0.00	-90.00	39.00	
3	6D	6.69	9.16	43.90	1.45	3.68	-1.00	-1
3	6D	24.20	26.95	35.70	1.68	3.51	-1.00	-1
1	6E	18241.00	15430.50	370.50	0.00	-90.00	41.50	
3	6E	0.00	4.65	35.80	1.14	3.52	-1.00	-1
3	6E	7.56	9.80	22.60	0.70	3.25	-1.00	-1
3	6E	11.70	13.93	12.10	0.50	3.04	-1.00	-1
3	6E	15.55	19.63	32.60	1.05	3.45	-1.00	-1
3	6E	21.60	22.96	43.40	1.47	3.67	-1.00	-1
1	6F	18247.00	15383.00	368.50	0.00	-90.00	36.00	
3	6F	0.00	5.50	31.40	1.00	3.43	-1.00	-1
3	6F	7.79	9.82	23.00	0.85	3.26	-1.00	-1
3	6F	11.55	18.68	29.20	0.94	3.38	-1.00	-1
3	6F	20.13	23.26	37.20	0.96	3.54	-1.00	-1
3	6F	28.35	29.90	20.40	0.95	3.21	-1.00	-1
1	6G	18270.00	15333.50	369.00	0.00	-90.00	42.00	
3	6G	0.00	7.90	35.80	1.12	3.52	-1.00	-1
3	6G	10.42	28.42	30.90	1.02	3.42	-1.00	-1
3	6G	30.28	33.19	44.20	1.42	3.68	-1.00	-1
1	7F	94044.00	37096.00	372.00	0.00	-90.00	36.00	

3	7F	0.00	1.00	41.90	1.65	3.64	-1.00	-1
3	7F	19.10	23.22	11.50	0.68	3.03	-1.00	-1
1	7H	18205.00	15299.00	367.00	0.00	-90.00	34.00	
3	7H	0.00	1.80	37.00	1.09	3.54	-1.00	-1
3	7H	17.70	18.57	19.00	0.80	3.18	-1.00	-1
3	7H	18.86	20.50	32.40	1.22	3.45	-1.00	-1
3	7H	20.78	22.17	18.80	0.88	3.18	-1.00	-1
3	7H	27.95	28.66	19.30	0.86	3.19	-1.00	-1
3	7H	29.09	30.40	36.60	1.17	3.53	-1.00	-1
1	1	95390.00	37096.00	103.00	0.00	-90.00	12.40	
3	1	0.00	12.40	26.75	1.32	3.33	0.40	35
1	3	94602.00	37103.00	308.00	0.00	-90.00	16.00	
3	3	0.00	4.00	21.75	1.12	3.24	-1.00	26
3	3	5.00	6.00	26.50	1.31	3.33	-1.00	31
3	3	7.00	10.00	32.00	1.53	3.44	-1.00	35
3	3	11.00	13.00	32.50	1.55	3.45	-1.00	38
3	3	14.00	16.00	36.00	1.69	3.52	-1.00	33
1	4	18446.00	15357.00	353.00	0.00	-90.00	46.50	
3	4	17.15	27.80	30.50	1.47	3.41	0.23	35
3	4	30.70	39.00	29.00	1.41	3.38	0.32	34
3	4	39.00	46.50	16.50	0.91	3.13	0.23	23
1	5	95362.00	37568.00	135.00	0.00	-90.00	108.00	
3	5	28.00	38.30	18.50	0.99	3.17	0.28	24
3	5	78.00	80.00	29.25	1.42	3.38	0.36	33
3	5	97.50	108.00	33.50	1.59	3.47	0.25	36
1	5/6D	18247.50	15467.50	371.00	0.00	-90.00	30.00	
3	5/6D	0.00	7.24	35.70	1.25	3.51	-1.00	-1
3	5/6D	10.50	12.63	33.10	1.07	3.46	-1.00	-1
3	5/6D	14.50	23.26	27.90	0.88	3.36	-1.00	-1
3	5/6D	26.21	28.44	39.30	1.32	3.59	-1.00	-1
1	7	94827.00	37392.00	324.00	0.00	-90.00	163.75	
3	7	106.00	111.80	27.00	1.33	3.34	0.34	32
3	7	143.45	149.60	26.25	1.30	3.33	0.30	29
3	7	150.85	153.00	27.75	1.36	3.35	0.62	32
3	7	153.00	161.60	-1.00	-1.00	-1.00	-1.00	22
3	7	163.25	163.75	31.50	1.51	3.43	0.74	29
1	8	18624.50	15299.50	345.00	0.00	-90.00	97.90	
3	8	28.45	34.00	24.20	0.88	3.28	-1.00	-1
3	8	72.20	81.20	12.60	1.37	3.05	0.23	-1
3	8	81.20	83.00	13.20	0.24	3.06	0.25	-1
3	8	83.00	88.20	33.90	0.68	3.48	0.24	-1
3	8	88.20	90.20	8.30	1.45	2.97	0.21	-1
1	9	18539.50	15323.50	362.00	0.00	-90.00	110.15	
3	9	24.90	26.50	32.70	1.01	3.45	-1.00	-1
3	9	27.65	28.45	16.40	0.65	3.13	-1.00	-1
3	9	45.30	47.30	33.70	1.24	3.47	0.23	-1
3	9	47.65	48.55	28.20	1.27	3.36	0.37	-1
3	9	48.80	50.45	32.90	1.24	3.46	0.45	-1
3	9	51.45	52.70	34.50	1.41	3.49	0.43	-1
3	9	54.10	56.20	41.00	1.43	3.62	0.17	-1
3	9	57.30	59.30	31.30	1.03	3.43	0.42	-1
3	9	60.10	60.50	40.50	1.47	3.61	1.93	-1
3	9	61.00	68.00	20.20	0.39	3.20	0.21	-1
3	9	69.00	69.55	29.90	0.26	3.40	0.56	-1
3	9	81.10	83.00	13.80	0.73	3.08	0.27	-1
3	9	83.00	87.50	36.20	1.48	3.52	0.31	-1
3	9	87.50	88.80	16.00	0.89	3.12	0.32	-1
1	10	18501.50	15475.50	363.00	0.00	-90.00	118.35	
3	10	23.65	28.20	28.00	1.02	3.36	-1.00	-1
3	10	47.60	49.00	34.60	1.12	3.49	0.30	-1
3	10	50.20	51.10	35.20	1.37	3.50	0.35	-1
3	10	51.50	54.00	34.60	1.30	3.49	0.40	-1
3	10	55.50	57.40	33.30	1.25	3.47	0.40	-1
3	10	57.70	58.05	35.70	1.37	3.51	0.24	-1

3	10	59.30	59.60	20.80	1.56	3.22	0.37	-1
3	10	60.55	64.00	35.70	1.35	3.51	0.35	-1
3	10	66.80	69.10	33.10	1.41	3.46	0.36	-1
3	10	69.10	73.30	14.50	1.41	3.09	0.30	-1
3	10	74.50	74.80	31.30	1.51	3.43	0.45	-1
1	11	18547.50	15628.00	372.00	0.00	-90.00	126.40	
3	11	75.10	76.66	33.30	1.58	3.47	-1.00	-1
3	11	78.10	78.80	33.80	1.60	3.48	-1.00	-1
3	11	79.33	79.87	33.70	1.60	3.47	-1.00	-1
3	11	80.30	84.20	34.30	1.62	3.49	-1.00	-1
3	11	85.70	95.60	26.20	1.30	3.32	-1.00	-1
1	12	18660.00	15589.50	377.00	0.00	-90.00	168.14	
3	12	110.05	112.00	17.50	0.66	3.15	0.34	-1
3	12	113.80	121.00	26.10	1.09	3.32	0.45	-1
3	12	122.70	124.05	20.60	0.92	3.21	0.37	-1
3	12	126.60	127.30	27.50	1.27	3.35	0.40	-1
3	12	127.30	129.50	12.80	0.66	3.06	0.48	-1
3	12	129.50	135.31	16.40	0.79	3.13	0.24	-1
3	12	144.30	147.30	17.40	0.95	3.15	-1.00	-1
3	12	148.35	150.10	7.50	0.55	2.95	-1.00	-1
1	15	18956.00	15951.00	328.00	0.00	-90.00	247.00	
3	15	140.40	142.50	38.10	1.12	3.56	-1.00	-1
3	15	143.45	146.00	18.50	0.78	3.17	-1.00	-1
3	15	146.20	147.10	36.10	1.11	3.52	-1.00	-1
3	15	148.15	148.45	35.00	1.14	3.50	-1.00	-1
3	15	160.40	162.80	17.70	0.61	3.15	-1.00	-1
3	15	166.00	167.40	11.00	0.87	3.02	-1.00	-1
3	15	168.35	171.90	12.20	0.58	3.04	-1.00	-1
3	15	173.50	174.35	13.30	0.53	3.07	-1.00	-1
3	15	175.50	178.50	34.20	1.11	3.48	-1.00	-1
3	15	184.10	186.35	32.40	1.55	3.45	-1.00	-1
3	15	187.80	188.90	29.80	1.44	3.40	-1.00	-1
3	15	189.60	192.20	32.40	1.55	3.45	-1.00	-1
3	15	193.05	193.45	26.00	1.29	3.32	-1.00	-1
3	15	193.65	200.45	13.50	0.79	3.07	-1.00	-1
3	15	202.35	202.80	10.60	0.67	3.01	-1.00	-1
3	15	202.80	205.15	26.10	1.29	3.32	-1.00	-1
3	15	205.75	208.50	30.30	1.46	3.41	-1.00	-1
3	15	209.50	212.65	17.70	0.96	3.15	-1.00	-1
3	15	215.50	215.90	27.80	1.36	3.36	-1.00	-1
3	15	224.50	232.30	12.20	0.56	3.04	-1.00	-1
1	16	18844.00	15753.00	357.50	0.00	-90.00	249.00	
3	16	156.90	158.50	30.00	1.27	3.40	-1.00	-1
3	16	160.20	164.40	33.30	1.54	3.47	-1.00	-1
3	16	165.00	167.20	33.80	1.12	3.48	-1.00	-1
3	16	168.75	175.15	17.30	0.66	3.15	-1.00	-1
3	16	178.70	179.50	30.30	1.15	3.41	-1.00	-1
3	16	180.00	180.70	30.80	1.06	3.42	-1.00	-1
3	16	181.00	185.50	19.40	0.75	3.19	-1.00	-1
3	16	189.50	189.80	28.40	1.21	3.37	-1.00	-1
1	17	18980.00	15829.00	333.00	0.00	-90.00	242.00	
3	17	135.10	138.20	11.30	0.55	3.03	-1.00	-1
3	17	141.50	145.15	35.30	0.88	3.51	-1.00	-1
3	17	145.90	149.80	20.60	0.83	3.21	-1.00	-1
3	17	162.85	163.20	24.80	0.97	3.30	-1.00	-1
3	17	163.80	165.25	32.20	1.38	3.44	-1.00	-1
3	17	167.35	169.75	13.00	0.96	3.06	-1.00	-1
3	17	170.00	172.20	13.70	0.71	3.07	-1.00	-1
3	17	174.90	177.05	21.00	0.98	3.22	-1.00	-1
3	17	177.50	179.70	33.80	1.38	3.48	-1.00	-1
3	17	184.00	185.15	30.50	1.41	3.41	-1.00	-1
3	17	186.15	188.15	25.30	1.13	3.31	-1.00	-1
3	17	188.90	191.60	34.40	1.27	3.49	-1.00	-1
3	17	192.30	193.00	43.50	1.50	3.67	-1.00	-1

3	17	193.00	201.50	14.20	0.69	3.08	-1.00	-1
3	17	201.50	203.80	25.00	0.93	3.30	-1.00	-1
3	17	203.80	205.10	22.50	0.82	3.25	-1.00	-1
3	17	205.10	208.55	15.20	0.75	3.10	-1.00	-1
3	17	221.45	229.30	8.50	0.44	2.97	-1.00	-1
1	18	19047.00	15661.00	306.50	0.00	-90.00	221.00	
3	18	113.45	113.75	17.50	0.90	3.15	-1.00	-1
3	18	114.10	115.20	15.70	0.85	3.11	-1.00	-1
3	18	118.60	122.10	32.30	1.23	3.45	-1.00	-1
3	18	124.85	126.65	32.50	1.29	3.45	-1.00	-1
3	18	141.60	143.50	27.10	1.25	3.34	-1.00	-1
3	18	145.90	147.80	9.80	0.64	3.00	-1.00	-1
3	18	149.80	150.40	17.50	0.88	3.15	-1.00	-1
3	18	150.80	151.60	17.70	0.88	3.15	-1.00	-1
3	18	152.10	152.40	40.00	1.31	3.60	-1.00	-1
3	18	153.50	153.70	37.90	1.46	3.56	-1.00	-1
3	18	158.40	159.30	27.20	1.16	3.34	-1.00	-1
3	18	159.80	162.40	30.20	1.30	3.40	-1.00	-1
3	18	162.50	163.60	16.30	0.93	3.13	-1.00	-1
3	18	163.60	166.25	22.60	0.97	3.25	-1.00	-1
3	18	167.75	168.85	14.60	0.68	3.09	-1.00	-1
3	18	171.20	174.10	23.20	0.86	3.26	-1.00	-1
3	18	174.10	178.50	15.00	0.78	3.10	-1.00	-1
3	18	181.80	182.70	32.40	1.34	3.45	-1.00	-1
3	18	190.80	193.65	16.10	0.75	3.12	-1.00	-1
3	18	195.70	197.30	9.80	0.57	3.00	-1.00	-1
1	19	19198.00	15862.00	265.00	0.00	-90.00	234.00	
3	19	145.90	147.00	34.80	1.45	3.50	-1.00	-1
3	19	148.10	151.60	21.70	0.90	3.23	-1.00	-1
3	19	151.90	152.55	32.80	1.15	3.46	-1.00	-1
3	19	152.85	153.00	23.30	0.91	3.27	-1.00	-1
3	19	168.85	172.05	7.70	0.87	2.95	-1.00	-1
3	19	173.80	175.55	9.40	0.44	2.99	-1.00	-1
3	19	176.05	179.35	28.40	0.91	3.37	-1.00	-1
3	19	185.50	186.30	12.20	1.17	3.04	-1.00	-1
3	19	187.10	188.90	34.20	1.20	3.48	-1.00	-1
3	19	190.10	192.50	30.80	1.18	3.42	-1.00	-1
3	19	199.40	202.90	16.30	0.75	3.13	-1.00	-1
3	19	207.65	209.35	22.60	0.89	3.25	-1.00	-1
3	19	210.70	216.30	20.30	0.83	3.21	-1.00	-1
3	19	216.65	217.00	11.50	0.65	3.03	-1.00	-1
3	19	217.85	218.60	23.70	1.21	3.27	-1.00	-1
3	19	225.40	228.60	20.50	0.89	3.21	-1.00	-1
3	19	230.90	234.00	16.60	0.76	3.13	-1.00	-1
1	20	19195.00	16116.00	252.50	0.00	-90.00	261.00	
3	20	147.93	149.58	6.00	0.58	2.92	-1.00	-1
3	20	149.95	151.85	11.00	0.48	3.02	-1.00	-1
3	20	154.68	156.05	33.70	1.14	3.47	-1.00	-1
3	20	156.36	158.69	17.20	0.75	3.14	-1.00	-1
3	20	159.05	161.33	9.10	0.54	2.98	-1.00	-1
3	20	161.55	163.85	25.30	0.88	3.31	-1.00	-1
3	20	212.95	214.95	22.28	1.14	3.25	-1.00	-1
3	20	214.95	219.50	22.50	1.15	3.25	-1.00	-1
3	20	219.50	222.25	20.00	1.05	3.20	-1.00	-1
3	20	222.25	223.25	2.30	0.34	2.85	-1.00	-1
3	20	223.25	228.90	18.60	0.99	3.17	-1.00	-1
3	20	228.90	230.80	0.80	0.28	2.82	-1.00	-1
3	20	230.80	233.10	31.00	1.49	3.42	-1.00	-1
3	20	241.95	243.10	6.10	0.45	2.92	-1.00	-1
3	20	243.20	246.70	17.20	0.79	3.14	-1.00	-1
3	20	246.70	247.95	7.00	0.46	2.94	-1.00	-1
3	20	248.10	248.45	18.80	0.74	3.18	-1.00	-1
3	20	248.45	249.50	6.00	0.41	2.92	-1.00	-1
3	20	249.50	252.20	21.80	0.85	3.24	-1.00	-1

1	21	19338.00	16356.00	270.00	0.00	-90.00	326.63	
3	21	195.61	197.64	17.10	0.75	3.14	-1.00	-1
3	21	203.13	206.12	11.30	0.60	3.03	-1.00	-1
3	21	211.45	219.54	22.20	0.92	3.24	-1.00	-1
3	21	238.77	240.55	25.00	1.18	3.30	-1.00	-1
3	21	276.90	279.20	22.00	1.02	3.24	-1.00	-1
3	21	281.08	287.84	24.30	1.04	3.29	-1.00	-1
3	21	291.52	293.80	20.00	0.80	3.20	-1.00	-1
3	21	296.64	304.15	15.20	0.71	3.10	-1.00	-1
3	21	310.55	313.45	4.50	0.36	2.89	-1.00	-1
3	21	313.87	318.23	16.00	0.70	3.12	-1.00	-1
3	21	318.95	321.40	6.50	0.46	2.93	-1.00	-1
3	21	321.70	326.63	18.80	0.80	3.18	-1.00	-1
1	22	19142.00	16300.00	279.00	0.00	-90.00	229.95	
3	22	160.59	164.89	10.10	0.78	3.00	-1.00	-1
3	22	169.20	173.45	18.70	0.77	3.17	-1.00	-1
3	22	174.20	176.81	25.10	1.09	3.30	-1.00	-1
3	22	223.72	225.44	18.30	0.78	3.17	-1.00	-1
3	22	226.93	229.95	17.80	0.74	3.16	-1.00	-1
1	23	18777.50	15346.00	334.00	0.00	-90.00	130.00	
3	23	47.27	51.77	6.70	0.53	2.93	-1.00	-1
3	23	72.02	76.83	7.40	0.44	2.95	-1.00	-1
3	23	78.51	85.47	30.00	1.05	3.40	-1.00	-1
3	23	86.65	88.60	22.50	0.83	3.25	-1.00	-1
3	23	90.65	91.09	31.40	1.11	3.43	-1.00	-1
3	23	92.13	97.04	20.40	0.77	3.21	-1.00	-1
3	23	97.75	98.65	33.50	1.15	3.47	-1.00	-1
3	23	109.91	113.86	18.80	0.84	3.18	-1.00	-1
3	23	117.95	119.47	18.00	0.86	3.16	-1.00	-1
1	24	18951.50	15476.50	316.00	0.00	-90.00	165.00	
3	24	85.42	87.38	14.30	0.73	3.09	-1.00	-1
3	24	88.66	88.93	2.40	0.27	2.85	-1.00	-1
3	24	90.75	95.12	31.30	1.19	3.43	-1.00	-1
3	24	122.86	130.45	28.00	1.12	3.36	-1.00	-1
3	24	130.83	137.41	19.20	0.82	3.18	-1.00	-1
3	24	139.54	143.47	16.30	0.68	3.13	-1.00	-1
3	24	145.94	146.38	33.80	1.63	3.48	-1.00	-1
3	24	152.96	158.40	12.00	0.61	3.04	-1.00	-1
1	25	19164.50	15598.50	257.00	0.00	-90.00	176.00	
3	25	94.28	97.02	10.60	0.61	3.01	-1.00	-1
3	25	99.76	106.43	28.40	1.06	3.37	-1.00	-1
3	25	117.61	120.24	26.70	1.05	3.33	-1.00	-1
3	25	121.58	124.54	8.60	0.70	2.97	-1.00	-1
3	25	124.54	128.30	36.00	1.35	3.52	-1.00	-1
3	25	132.40	137.76	28.80	1.12	3.38	-1.00	-1
3	25	138.91	142.25	30.60	1.30	3.41	-1.00	-1
3	25	142.25	145.45	19.80	0.79	3.20	-1.00	-1
3	25	147.35	151.06	22.60	0.30	3.25	-1.00	-1
1	26	19247.00	15727.50	239.00	0.00	-90.00	187.93	
3	26	105.75	106.45	25.50	1.10	3.31	-1.00	-1
3	26	108.75	110.26	9.50	0.56	2.99	-1.00	-1
3	26	111.72	112.94	8.50	0.88	2.97	-1.00	-1
3	26	113.33	115.55	38.20	1.31	3.56	-1.00	-1
3	26	116.32	119.03	20.50	0.83	3.21	-1.00	-1
3	26	119.03	120.30	31.70	1.08	3.43	-1.00	-1
3	26	136.09	144.86	9.60	0.62	2.99	-1.00	-1
3	26	152.51	154.88	5.30	0.70	2.91	-1.00	-1
3	26	155.59	160.12	28.30	1.02	3.37	-1.00	-1
3	26	166.04	172.81	28.90	1.11	3.38	-1.00	-1
3	26	172.81	175.07	11.40	0.62	3.03	-1.00	-1
3	26	178.00	182.02	14.70	0.78	3.09	-1.00	-1
1	27	19347.00	15800.00	199.00	0.00	-90.00	187.75	
3	27	128.84	130.75	24.80	0.93	3.30	-1.00	-1
3	27	140.92	148.66	32.40	1.21	3.45	-1.00	-1

3	27	148.66	150.50	14.40	0.68	3.09	-1.00	-1
3	27	160.72	170.23	17.30	0.76	3.15	-1.00	-1
3	27	175.54	180.00	13.20	0.64	3.06	-1.00	-1
1	28	19490.00	15918.00	168.00	0.00	-90.00	236.98	
3	28	106.10	112.83	12.40	0.59	3.05	-1.00	-1
3	28	117.62	125.57	17.30	0.79	3.15	-1.00	-1
3	28	187.00	208.90	31.20	1.25	3.42	-1.00	-1
3	28	211.40	215.22	13.50	0.57	3.07	-1.00	-1
3	28	215.97	220.48	15.20	0.65	3.10	-1.00	-1
3	28	224.52	228.19	15.70	0.98	3.11	-1.00	-1
3	28	228.19	229.03	6.30	0.44	2.93	-1.00	-1
3	28	231.87	233.85	14.00	0.67	3.08	-1.00	-1
1	29	19612.50	16020.00	135.00	0.00	-90.00	254.34	
3	29	106.03	109.27	21.20	0.86	3.22	-1.00	-1
3	29	109.27	112.52	6.90	0.42	2.94	-1.00	-1
3	29	129.00	133.00	35.60	1.13	3.51	-1.00	-1
3	29	134.10	137.60	17.10	0.73	3.14	-1.00	-1
3	29	138.31	140.00	24.70	0.96	3.29	-1.00	-1
3	29	172.50	178.03	29.70	1.22	3.39	-1.00	-1
3	29	195.06	218.17	30.60	1.32	3.41	-1.00	-1
3	29	221.35	226.15	15.20	0.67	3.10	-1.00	-1
3	29	229.95	232.18	12.70	0.62	3.05	-1.00	-1
3	29	235.20	238.38	12.30	0.62	3.05	-1.00	-1
1	101	19512.00	15629.00	65.00	0.00	-90.00	21.00	
3	101	0.80	2.50	12.10	0.99	3.04	-1.00	-1
3	101	2.50	4.40	12.50	1.02	3.05	-1.00	-1
3	101	4.75	5.20	12.60	1.09	3.05	-1.00	-1
3	101	20.40	21.00	27.60	1.13	3.35	-1.00	-1
1	102	19544.00	15558.00	43.00	0.00	-90.00	30.00	
3	102	0.00	10.65	32.10	1.19	3.44	-1.00	-1
3	102	16.70	18.85	19.40	0.83	3.19	-1.00	-1
3	102	19.90	22.55	13.70	0.75	3.07	-1.00	-1
3	102	22.55	23.90	18.00	0.97	3.16	-1.00	-1
3	102	23.90	24.65	29.40	0.58	3.39	-1.00	-1
3	102	24.65	25.20	27.20	1.13	3.34	-1.00	-1
3	102	29.20	30.00	18.10	0.85	3.16	-1.00	-1
1	103	19420.00	15503.50	75.00	0.00	-90.00	30.45	
3	103	0.00	7.90	19.50	0.84	3.19	-1.00	-1
3	103	7.90	9.55	13.60	0.65	3.07	-1.00	-1
3	103	13.95	18.65	12.20	0.80	3.04	-1.00	-1
3	103	20.55	22.45	14.20	0.93	3.08	-1.00	-1
1	104	19241.50	15475.00	136.50	0.00	-90.00	25.90	
3	104	0.00	3.00	18.40	0.83	3.17	-1.00	-1
3	104	6.70	10.10	19.30	0.77	3.19	-1.00	-1
3	104	10.10	13.25	16.60	1.23	3.13	-1.00	-1
3	104	14.75	16.15	39.20	0.77	3.58	-1.00	-1
3	104	21.45	23.00	9.10	0.52	2.98	-1.00	-1
3	104	24.55	25.90	7.00	0.56	2.94	-1.00	-1
1	105	95205.00	37455.00	170.00	0.00	-90.00	29.52	
3	105	10.20	13.10	5.00	0.46	2.90	-1.00	-1
3	105	18.80	29.52	0.50	0.12	2.81	-1.00	-1
1	106	19059.50	15393.00	186.00	0.00	-90.00	31.00	
3	106	3.45	6.50	23.00	1.04	3.26	-1.00	-1
3	106	10.00	13.80	22.20	1.06	3.24	-1.00	-1
3	106	13.80	18.95	23.60	0.99	3.27	-1.00	-1
3	106	18.95	27.90	15.30	0.72	3.11	-1.00	-1
3	106	29.50	30.00	31.30	1.39	3.43	-1.00	-1
1	107	19003.00	15422.00	240.00	0.00	-90.00	17.90	
3	107	9.26	13.40	30.70	1.28	3.41	-1.00	-1
3	107	15.05	17.90	24.40	1.16	3.29	-1.00	-1
1	108	18735.00	15292.00	300.00	0.00	-90.00	24.85	
3	108	3.00	5.20	24.40	0.86	3.29	-1.00	-1
3	108	15.65	20.00	24.70	1.02	3.29	-1.00	-1
3	108	24.10	24.85	17.20	0.74	3.14	-1.00	-1

1	109	94624.00	36960.00	230.00	0.00	-90.00	13.25	
3	109	4.80	10.25	22.80	1.14	3.26	-1.00	-1
3	109	12.40	13.25	16.20	0.90	3.12	-1.00	-1
1	110	18537.00	15212.50	336.00	0.00	-90.00	27.85	
3	110	10.15	11.60	24.80	1.24	3.30	-1.00	-1
3	110	13.45	17.90	29.20	1.31	3.38	-1.00	-1
3	110	19.35	21.75	13.30	0.69	3.07	-1.00	-1
3	110	25.65	27.85	33.60	1.21	3.47	-1.00	-1
1	111	18760.00	15275.00	282.00	0.00	-90.00	29.45	
3	111	0.35	2.00	18.90	0.78	3.18	-1.00	-1
3	111	17.10	18.80	32.30	1.29	3.45	-1.00	-1
3	111	19.20	22.75	26.10	1.08	3.32	-1.00	-1
3	111	25.85	29.45	19.10	0.85	3.18	-1.00	-1
1	112	19700.00	15678.00	12.00	0.00	-90.00	55.49	
3	112	4.70	7.13	11.10	0.77	3.02	-1.00	-1
3	112	13.24	32.50	31.20	1.20	3.42	-1.00	-1
3	112	36.35	39.60	13.20	0.64	3.06	-1.00	-1
3	112	40.27	42.75	16.90	0.81	3.14	-1.00	-1
1	113	19680.50	15667.00	16.00	0.00	-90.00	32.17	
3	113	4.88	6.90	1.10	0.29	2.82	-1.00	-1
3	113	13.07	32.02	31.40	1.51	3.43	-1.00	-1
1	114	19664.00	15647.50	16.00	0.00	-90.00	37.99	
3	114	4.75	5.99	29.90	1.33	3.40	0.56	-1
3	114	5.99	6.41	18.80	1.00	3.18	-1.00	-1
3	114	6.41	7.00	24.90	1.25	3.30	-1.00	-1
3	114	7.12	9.20	31.30	1.50	3.43	-1.00	-1
3	114	9.20	11.43	41.60	1.91	3.63	-1.00	-1
3	114	11.48	11.95	41.40	1.91	3.63	-1.00	-1
3	114	11.99	14.41	32.30	1.54	3.45	-1.00	-1
3	114	14.47	16.67	30.10	1.45	3.40	-1.00	-1
3	114	16.67	18.87	35.60	1.67	3.51	-1.00	-1
3	114	18.93	20.15	30.40	1.47	3.41	-1.00	-1
3	114	20.27	21.93	32.80	1.56	3.46	-1.00	-1
3	114	22.00	22.14	54.00	2.41	3.88	-1.00	-1
3	114	22.39	22.46	27.20	1.34	3.34	-1.00	-1
3	114	23.48	24.22	34.10	1.61	3.48	-1.00	-1
3	114	24.33	24.43	44.50	2.03	3.69	-1.00	-1
3	114	24.45	24.60	11.70	0.72	3.03	-1.00	-1
3	114	25.75	26.71	11.10	0.55	3.02	0.22	-1
3	114	27.54	35.66	13.20	0.66	3.06	0.38	-1
1	115	19636.00	15620.00	20.00	0.00	-90.00	38.03	
3	115	0.00	19.92	28.30	1.20	3.37	-1.00	-1
3	115	19.92	21.84	7.10	0.46	2.94	-1.00	-1
3	115	23.70	25.23	10.60	0.36	3.01	-1.00	-1
3	115	25.23	30.84	22.80	0.67	3.26	-1.00	-1
3	115	33.90	36.09	11.40	0.87	3.03	-1.00	-1
1	116	19529.00	15587.00	47.00	0.00	-90.00	36.50	
3	116	7.23	7.32	7.90	0.57	2.96	-1.00	-1
3	116	7.32	9.62	35.90	1.69	3.52	-1.00	-1
3	116	9.62	11.92	35.90	1.69	3.52	-1.00	-1
3	116	12.00	12.05	-1.00	-1.00	-1.00	-1.00	-1
3	116	12.41	13.70	29.70	1.44	3.39	-1.00	-1
3	116	13.84	14.39	39.40	1.83	3.59	-1.00	-1
3	116	14.62	16.85	36.20	1.70	3.52	-1.00	-1
3	116	16.87	17.44	35.70	1.68	3.51	-1.00	-1
3	116	23.15	30.68	16.00	0.64	3.12	-1.00	-1
3	116	33.71	36.50	16.65	0.52	3.13	-1.00	-1
1	117	19508.00	15554.00	52.00	0.00	-90.00	38.66	
3	117	0.00	8.90	30.70	1.48	3.41	-1.00	-1
3	117	12.14	23.22	14.10	0.81	3.08	-1.00	-1
3	117	27.22	29.67	14.30	0.82	3.09	-1.00	-1
3	117	31.66	34.08	15.50	0.87	3.11	-1.00	-1
1	118	19480.00	15546.50	59.00	0.00	-90.00	34.87	
3	118	0.00	7.91	31.80	1.52	3.44	-1.00	-1

3	118	10.00	20.60	16.10	0.89	3.12	-1.00	-1
3	118	25.87	28.85	16.60	0.91	3.13	-1.00	-1
3	118	30.47	33.37	14.20	0.82	3.08	-1.00	-1
1	119	19449.00	15525.00	66.00	0.00	-90.00	30.20	
3	119	0.63	10.78	20.50	0.72	3.21	-1.00	-1
3	119	12.51	13.17	28.70	1.03	3.37	-1.00	-1
3	119	18.10	21.35	18.30	0.60	3.17	-1.00	-1
3	119	23.33	25.33	15.20	0.64	3.10	-1.00	-1
1	120	19554.50	15574.00	40.00	0.00	-90.00	41.47	
3	120	1.40	15.17	30.10	1.08	3.40	-1.00	-1
3	120	21.37	28.92	15.30	0.63	3.11	-1.00	-1
3	120	31.50	34.54	13.00	0.77	3.06	-1.00	-1
1	121	19584.00	15585.50	32.00	0.00	-90.00	40.73	
3	121	0.00	15.70	31.80	1.10	3.44	-1.00	-1
3	121	20.21	28.40	12.80	0.60	3.06	-1.00	-1
3	121	36.39	38.15	14.50	0.74	3.09	-1.00	-1
1	122	19606.50	15598.00	27.00	0.00	-90.00	42.41	
3	122	0.00	19.65	26.30	0.59	3.33	-1.00	-1
3	122	21.72	29.80	13.20	0.73	3.06	-1.00	-1
3	122	33.49	34.90	16.70	0.55	3.13	-1.00	-1
3	122	37.27	39.95	15.60	1.06	3.11	-1.00	-1
1	123	18191.00	15173.00	376.00	0.00	-90.00	24.00	
3	123	0.00	6.00	42.20	1.24	3.64	-1.00	-1
3	123	8.50	10.34	24.00	0.98	3.28	-1.00	-1
3	123	20.41	23.30	11.10	0.46	3.02	-1.00	-1
1	124	18223.00	15199.50	371.00	0.00	-90.00	38.00	
3	124	1.20	3.50	13.00	0.43	3.06	-1.00	-1
3	124	5.85	12.97	37.60	1.26	3.55	-1.00	-1
3	124	23.18	28.10	14.50	0.61	3.09	-1.00	-1
3	124	33.17	36.55	18.50	0.72	3.17	-1.00	-1
1	125	18260.00	15256.50	359.00	0.00	-90.00	41.80	
3	125	2.06	11.50	33.30	0.99	3.47	-1.00	-1
3	125	13.00	17.45	38.90	1.25	3.58	-1.00	-1
3	125	31.05	34.75	17.30	0.74	3.15	-1.00	-1
3	125	39.12	41.80	12.80	0.52	3.06	-1.00	-1
1	126	18291.00	15281.00	360.00	0.00	-90.00	49.50	
3	126	0.00	7.51	39.90	1.08	3.60	-1.00	-1
3	126	9.69	14.20	40.50	1.16	3.61	-1.00	-1
3	126	14.65	19.40	26.10	0.76	3.32	-1.00	-1
3	126	20.61	27.15	28.30	0.85	3.37	-1.00	-1
3	126	28.06	32.02	32.50	1.07	3.45	-1.00	-1
3	126	45.50	49.50	23.80	0.82	3.28	-1.00	-1
1	A	19794.00	15772.00	4.00	0.00	-90.00	79.70	
3	A	22.08	23.80	32.20	0.65	3.44	-1.00	-1
3	A	38.90	48.00	38.10	1.25	3.56	-1.00	-1
3	A	49.78	57.86	23.80	0.90	3.28	-1.00	-1
3	A	61.89	67.48	15.60	1.34	3.11	-1.00	-1
1	D	19584.00	15701.00	62.00	0.00	-90.00	115.35	
3	D	54.84	67.59	29.60	1.38	3.39	-1.00	-1
3	D	67.81	76.45	27.00	1.25	3.34	-1.00	-1
3	D	86.69	88.46	17.30	0.73	3.15	-1.00	-1
3	D	92.62	94.05	17.30	0.76	3.15	-1.00	-1
3	D	97.47	99.32	14.90	0.75	3.10	-1.00	-1
1	F	19781.00	15869.00	23.00	0.00	-90.00	118.60	
3	F	5.06	14.26	9.70	0.58	2.99	-1.00	-1
3	F	17.80	26.73	13.50	0.69	3.07	-1.00	-1
3	F	53.14	57.20	26.70	1.22	3.33	-1.00	-1
3	F	73.92	93.30	31.30	1.25	3.43	-1.00	-1
3	F	93.45	94.78	8.70	0.56	2.97	-1.00	-1
3	F	95.50	102.36	12.60	0.65	3.05	-1.00	-1
1	G	19871.50	15931.50	7.50	0.00	-90.00	124.75	
3	G	24.44	35.95	20.10	0.86	3.20	-1.00	-1
3	G	82.00	85.00	36.80	1.52	3.54	-1.00	-1
3	G	91.20	94.56	28.80	1.20	3.38	-1.00	-1

3	G	96.65	103.20	19.50	0.81	3.19	-1.00	-1
3	G	104.10	105.12	16.70	0.74	3.13	-1.00	-1
3	G	106.05	106.20	34.70	1.22	3.49	-1.00	-1
1	H	19378.00	15697.00	149.00	0.00	-90.00	140.28	
3	H	19.92	22.00	13.40	0.67	3.07	-1.00	-1
3	H	24.60	29.03	3.50	0.39	2.87	-1.00	-1
3	H	30.75	39.15	22.20	0.95	3.24	-1.00	-1
3	H	90.47	100.30	20.70	1.09	3.21	-1.00	-1
3	H	103.65	104.47	13.60	0.53	3.07	-1.00	-1
3	H	107.70	111.32	21.70	0.75	3.23	-1.00	-1
3	H	111.93	117.45	19.70	0.76	3.19	-1.00	-1
3	H	119.45	120.18	25.60	1.05	3.31	-1.00	-1
3	H	125.05	131.90	16.00	0.61	3.12	-1.00	-1
1	I	19452.50	15776.50	138.00	0.00	-90.00	166.72	
3	I	48.66	55.59	24.80	1.24	3.30	-1.00	-1
3	I	55.59	58.50	6.00	0.49	2.92	-1.00	-1
3	I	58.50	61.24	22.80	1.16	3.26	-1.00	-1
3	I	125.57	138.07	33.70	1.43	3.47	-1.00	-1
3	I	141.44	148.62	16.20	0.73	3.12	-1.00	-1
3	I	152.53	154.03	7.70	0.45	2.95	-1.00	-1
3	I	154.94	156.60	18.30	0.71	3.17	-1.00	-1
3	I	157.27	158.03	8.80	0.52	2.98	-1.00	-1
3	I	160.79	164.65	15.70	0.70	3.11	-1.00	-1
1	J	19557.50	15839.00	122.00	0.00	-90.00	185.01	
3	J	34.90	38.53	27.60	1.12	3.35	-1.00	-1
3	J	39.40	47.42	10.40	0.54	3.01	-1.00	-1
3	J	52.10	59.66	9.70	0.49	2.99	-1.00	-1
3	J	65.49	74.75	19.30	0.78	3.19	-1.00	-1
3	J	120.69	124.15	8.50	0.79	2.97	-1.00	-1
3	J	132.43	149.95	28.60	1.54	3.37	-1.00	-1
3	J	151.16	154.29	30.70	1.12	3.41	-1.00	-1
3	J	154.35	155.60	6.90	0.56	2.94	-1.00	-1
3	J	157.62	162.93	13.50	0.73	3.07	-1.00	-1
3	J	163.99	169.75	13.70	0.77	3.07	-1.00	-1
3	J	172.66	176.41	10.70	0.68	3.01	-1.00	-1
3	J	178.34	182.05	15.80	0.88	3.12	-1.00	-1
1	K	19650.00	15897.50	84.00	0.00	-90.00	173.86	
3	K	26.52	30.72	26.00	0.51	3.32	-1.00	-1
3	K	31.56	32.38	9.00	0.56	2.98	-1.00	-1
3	K	33.28	37.39	12.60	0.70	3.05	-1.00	-1
3	K	37.74	44.57	19.00	0.83	3.18	-1.00	-1
3	K	52.20	59.93	10.80	0.54	3.02	-1.00	-1
3	K	68.10	71.00	20.50	0.82	3.21	-1.00	-1
3	K	73.10	79.40	18.60	0.73	3.17	-1.00	-1
3	K	114.10	118.78	32.30	1.25	3.45	-1.00	-1
3	K	133.60	138.93	23.70	1.19	3.27	-1.00	-1
3	K	140.54	153.00	32.00	1.40	3.44	-1.00	-1
3	K	158.60	161.70	12.70	0.76	3.05	-1.00	-1
1	L	19748.00	15983.00	65.50	0.00	-90.00	183.80	
3	L	46.66	60.15	22.10	0.94	3.24	-1.00	-1
3	L	60.15	65.15	11.60	0.60	3.03	-1.00	-1
3	L	80.30	82.35	36.20	1.44	3.52	-1.00	-1
3	L	83.57	84.80	14.20	0.68	3.08	-1.00	-1
3	L	85.90	90.06	12.50	0.60	3.05	-1.00	-1
3	L	113.78	115.03	30.90	1.31	3.42	-1.00	-1
3	L	131.74	155.77	30.30	1.16	3.41	-1.00	-1
3	L	156.89	157.62	34.70	1.45	3.49	-1.00	-1
3	L	159.58	162.96	14.40	0.65	3.09	-1.00	-1
3	L	164.14	165.18	16.10	0.75	3.12	-1.00	-1
1	M	19834.00	16034.50	41.00	0.00	-90.00	169.60	
3	M	47.26	50.50	36.70	1.30	3.53	-1.00	-1
3	M	51.20	53.82	15.20	0.65	3.10	-1.00	-1
3	M	72.73	77.49	30.00	1.24	3.40	-1.00	-1
3	M	77.92	83.81	12.80	0.64	3.06	-1.00	-1

3	M	111.00	112.80	27.00	1.33	3.34	-1.00	-1
3	M	131.05	133.83	26.25	1.30	3.33	-1.00	-1
3	M	140.06	152.38	20.50	1.07	3.21	-1.00	-1
3	M	152.79	153.49	13.50	0.79	3.07	-1.00	-1
3	M	162.33	165.66	15.25	0.86	3.10	-1.00	-1
1	N	19417.50	15865.00	181.00	0.00	-90.00	213.89	
3	N	93.27	94.96	21.00	0.88	3.22	-1.00	-1
3	N	95.43	98.08	16.80	0.69	3.14	-1.00	-1
3	N	98.60	102.28	20.70	0.90	3.21	-1.00	-1
3	N	168.71	178.08	31.60	1.31	3.43	-1.00	-1
3	N	178.56	180.04	14.00	0.63	3.08	-1.00	-1
3	N	185.83	191.61	18.80	0.75	3.18	-1.00	-1
3	N	192.04	196.63	16.80	0.68	3.14	-1.00	-1
3	N	208.57	210.97	15.30	0.73	3.11	-1.00	-1
1	Q	19306.50	15917.00	226.00	0.00	-90.00	231.27	
3	Q	128.32	130.95	25.60	1.16	3.31	-1.00	-1
3	Q	141.90	151.00	21.90	0.85	3.24	-1.00	-1
3	Q	193.96	197.25	11.70	0.64	3.03	-1.00	-1
3	Q	200.37	205.38	24.10	0.97	3.28	-1.00	-1
3	Q	205.38	209.02	15.90	0.75	3.12	-1.00	-1
3	Q	217.85	220.87	18.80	0.82	3.18	-1.00	-1
3	Q	223.54	225.68	19.00	0.84	3.18	-1.00	-1
1	R	19384.00	15974.00	208.00	0.00	-90.00	254.52	
3	R	123.09	127.33	7.80	0.47	2.96	-1.00	-1
3	R	131.77	138.86	20.60	0.80	3.21	-1.00	-1
3	R	208.13	214.65	26.00	1.15	3.32	-1.00	-1
3	R	217.88	218.71	13.30	0.78	3.07	-1.00	-1
3	R	220.57	225.73	20.40	0.81	3.21	-1.00	-1
3	R	226.60	232.00	16.20	0.68	3.12	-1.00	-1
3	R	240.19	243.08	17.00	0.70	3.14	-1.00	-1
3	R	248.40	251.18	21.10	0.74	3.22	-1.00	-1
1	S	19495.50	16058.00	174.00	0.00	-90.00	265.20	
3	S	136.09	142.93	14.80	0.64	3.10	-1.00	-1
3	S	146.34	151.07	24.60	0.95	3.29	-1.00	-1
3	S	151.31	154.88	11.00	0.66	3.02	-1.00	-1
3	S	155.27	157.71	24.30	0.99	3.29	-1.00	-1
3	S	219.00	240.55	33.80	1.47	3.48	-1.00	-1
3	S	241.13	243.33	21.70	0.88	3.23	-1.00	-1
3	S	246.57	252.53	15.20	0.70	3.10	-1.00	-1
3	S	257.49	259.45	16.00	0.76	3.12	-1.00	-1
3	S	261.50	264.16	17.50	0.71	3.15	-1.00	-1
1	T	19596.50	16123.00	156.00	0.00	-90.00	276.30	
3	T	133.90	141.49	23.30	1.18	3.27	-1.00	-1
3	T	141.50	143.30	11.10	0.69	3.02	-1.00	-1
3	T	149.20	158.16	11.30	0.70	3.03	-1.00	-1
3	T	162.30	169.80	26.00	1.29	3.32	-1.00	-1
3	T	170.21	177.32	19.70	1.04	3.19	-1.00	-1
3	T	213.87	215.32	32.20	1.54	3.44	-1.00	-1
3	T	235.50	255.38	27.80	1.36	3.36	-1.00	-1
3	T	257.23	263.23	13.20	0.78	3.06	-1.00	-1
3	T	270.73	273.37	14.60	0.83	3.09	-1.00	-1
1	U	19691.50	16182.00	133.00	0.00	-90.00	270.90	
3	U	134.00	147.30	31.20	1.25	3.42	-1.00	-1
3	U	147.37	150.00	14.20	0.75	3.08	-1.00	-1
3	U	150.00	152.07	7.20	0.44	2.94	-1.00	-1
3	U	168.02	169.50	31.00	1.31	3.42	-1.00	-1
3	U	169.72	176.62	30.20	1.24	3.40	-1.00	-1
3	U	177.60	179.38	24.80	0.86	3.30	-1.00	-1
3	U	179.30	185.00	18.50	0.80	3.17	-1.00	-1
3	U	202.73	205.81	23.20	0.95	3.26	-1.00	-1
3	U	235.78	255.40	29.50	1.19	3.39	-1.00	-1
3	U	256.26	258.71	14.50	0.66	3.09	-1.00	-1
1	V	19789.00	16260.00	136.00	0.00	-90.00	299.00	
3	V	162.10	166.66	36.60	1.38	3.53	-1.00	-1

3	V	174.76	177.50	12.30	0.77	3.05	-1.00	-1
3	V	185.02	189.70	17.90	0.69	3.16	-1.00	-1
3	V	189.70	190.86	8.40	0.54	2.97	-1.00	-1
3	V	191.55	193.42	16.00	0.65	3.12	-1.00	-1
3	V	199.33	203.59	32.40	1.19	3.45	-1.00	-1
3	V	204.09	207.38	19.30	0.74	3.19	-1.00	-1
3	V	207.56	209.71	20.60	0.78	3.21	-1.00	-1
3	V	238.38	242.03	28.20	1.17	3.36	-1.00	-1
3	V	258.11	261.00	33.50	1.33	3.47	-1.00	-1
3	V	261.14	267.29	6.50	0.48	2.93	-1.00	-1
3	V	267.52	276.78	31.40	1.09	3.43	-1.00	-1
3	V	276.78	281.19	17.30	0.73	3.15	-1.00	-1
3	V	282.65	283.93	15.00	0.73	3.10	-1.00	-1
1	Z	19553.50	16257.50	202.00	0.00	-90.00	335.60	
3	Z	188.16	191.00	16.00	0.76	3.12	-1.00	-1
3	Z	198.41	204.29	11.20	0.50	3.02	-1.00	-1
3	Z	206.47	207.02	39.70	1.31	3.59	-1.00	-1
3	Z	207.84	210.08	44.80	1.26	3.70	-1.00	-1
3	Z	210.78	215.58	22.40	0.97	3.25	-1.00	-1
3	Z	215.58	218.62	12.10	0.59	3.04	-1.00	-1
3	Z	219.10	221.50	25.30	1.11	3.31	-1.00	-1
3	Z	259.90	266.50	27.20	1.26	3.34	-1.00	-1
3	Z	282.53	304.55	32.40	1.48	3.45	-1.00	-1
3	Z	304.55	309.30	34.20	1.48	3.48	-1.00	-1
3	Z	312.65	314.25	17.90	0.74	3.16	-1.00	-1
3	Z	325.70	327.67	16.70	0.80	3.13	-1.00	-1
1	Y	19468.00	16174.00	203.00	0.00	-90.00	302.26	
3	Y	164.79	169.35	14.45	0.56	3.09	-1.00	-1
3	Y	182.02	185.00	23.85	0.96	3.28	-1.00	-1
3	Y	228.65	233.31	28.60	1.24	3.37	-1.00	-1
3	Y	254.95	273.38	32.58	1.37	3.45	-1.00	-1
3	Y	273.38	277.63	18.35	0.82	3.17	-1.00	-1
3	Y	279.00	281.84	11.00	0.52	3.02	-1.00	-1
3	Y	281.87	283.30	21.05	0.81	3.22	-1.00	-1
3	Y	288.11	291.15	17.75	0.68	3.15	-1.00	-1
3	Y	295.10	299.29	21.00	0.83	3.22	-1.00	-1
1	AE	19663.00	16316.50	201.00	0.00	-90.00	355.04	
3	AE	216.00	222.28	17.30	0.81	3.15	-1.00	-1
3	AE	227.29	230.88	9.20	0.55	2.98	-1.00	-1
3	AE	238.22	241.88	27.20	1.11	3.34	-1.00	-1
3	AE	243.11	248.32	18.70	0.78	3.17	-1.00	-1
3	AE	250.12	252.12	19.60	0.83	3.19	-1.00	-1
3	AE	274.02	276.87	18.80	0.76	3.18	-1.00	-1
3	AE	310.35	333.00	28.95	1.23	3.38	-1.00	-1
3	AE	333.18	333.58	20.90	0.89	3.22	-1.00	-1
3	AE	336.07	339.00	14.70	0.65	3.09	-1.00	-1
3	AE	339.92	341.73	17.60	0.71	3.15	-1.00	-1
3	AE	349.90	352.40	17.40	0.78	3.15	-1.00	-1
1	OE	19754.00	16390.50	193.00	0.00	-90.00	364.49	
3	OE	236.11	237.86	34.30	1.62	3.49	-1.00	-1
3	OE	238.91	242.11	33.80	1.60	3.48	-1.00	-1
3	OE	243.23	245.28	20.40	1.07	3.21	-1.00	-1
3	OE	263.16	270.60	22.50	1.15	3.25	-1.00	-1
3	OE	270.70	275.42	23.90	1.21	3.28	-1.00	-1
3	OE	305.48	308.45	30.30	1.46	3.41	-1.00	-1
3	OE	326.43	326.69	14.10	0.81	3.08	-1.00	-1
3	OE	326.69	326.76	23.90	1.21	3.28	-1.00	-1
3	OE	326.91	327.51	27.50	1.35	3.35	-1.00	-1
3	OE	327.51	327.86	43.10	1.97	3.66	-1.00	-1
3	OE	328.03	328.37	33.50	1.59	3.47	-1.00	-1
3	OE	328.37	328.53	27.10	1.33	3.34	-1.00	-1
3	OE	328.53	328.79	42.20	1.94	3.64	-1.00	-1
3	OE	329.13	329.35	53.10	2.37	3.86	-1.00	-1
3	OE	330.28	330.83	38.80	1.80	3.58	-1.00	-1

3	OE	330.83	331.67	28.40	1.39	3.37	-1.00	-1
3	OE	331.67	332.42	43.40	1.99	3.67	-1.00	-1
3	OE	332.48	332.52	37.60	1.75	3.55	-1.00	-1
3	OE	332.63	333.48	34.30	1.62	3.49	-1.00	-1
3	OE	333.48	334.11	33.70	1.60	3.47	-1.00	-1
3	OE	334.93	335.21	33.10	1.57	3.46	-1.00	-1
3	OE	335.21	335.49	42.20	1.94	3.64	-1.00	-1
3	OE	335.59	335.78	36.10	1.69	3.52	-1.00	-1
3	OE	335.82	336.43	34.60	1.63	3.49	-1.00	-1
3	OE	336.43	336.72	35.80	1.68	3.52	-1.00	-1
3	OE	337.50	338.19	36.20	1.70	3.52	-1.00	-1
3	OE	338.19	339.59	28.60	1.39	3.37	-1.00	-1
3	OE	340.41	340.70	32.20	1.54	3.44	-1.00	-1
3	OE	340.70	340.80	31.50	1.51	3.43	-1.00	-1
3	OE	341.21	341.86	25.80	1.28	3.32	-1.00	-1
3	OE	341.90	341.97	46.10	2.09	3.72	-1.00	-1
3	OE	342.36	343.22	35.50	1.67	3.51	-1.00	-1
3	OE	343.22	343.72	34.60	1.63	3.49	-1.00	-1
3	OE	343.77	344.00	30.60	1.47	3.41	-1.00	-1
3	OE	344.07	345.04	35.00	1.65	3.50	-1.00	-1
3	OE	345.04	345.53	31.50	1.51	3.43	-1.00	-1
3	OE	345.53	345.95	41.30	1.90	3.63	-1.00	-1
3	OE	345.95	346.97	2.87	0.43	2.86	-1.00	-1
3	OE	346.97	347.04	11.90	0.66	3.04	-1.00	-1
3	OE	347.04	347.46	0.42	0.26	2.81	-1.00	-1
3	OE	347.46	347.61	13.00	0.75	3.06	-1.00	-1
3	OE	347.61	347.71	0.60	0.38	2.81	-1.00	-1
3	OE	347.71	347.91	16.45	0.64	3.13	-1.00	-1
3	OE	347.91	348.56	0.45	0.22	2.81	-1.00	-1
3	OE	348.56	348.65	18.20	0.76	3.16	-1.00	-1
3	OE	348.65	348.72	0.58	0.47	2.81	-1.00	-1
3	OE	348.72	349.80	18.26	0.75	3.17	-1.00	-1
3	OE	349.80	350.07	0.75	0.44	2.81	-1.00	-1
3	OE	350.07	350.36	30.77	1.19	3.42	-1.00	-1
3	OE	350.36	350.96	0.76	0.29	2.82	-1.00	-1
3	OE	350.96	351.62	18.05	0.79	3.16	-1.00	-1
3	OE	351.62	352.78	0.81	0.35	2.82	-1.00	-1
3	OE	352.78	352.88	5.10	0.49	2.90	-1.00	-1
3	OE	352.88	353.86	17.65	0.70	3.15	-1.00	-1
3	OE	353.86	355.79	0.26	0.26	2.81	-1.00	-1
3	OE	355.79	356.18	4.12	0.47	2.88	-1.00	-1
3	OE	356.18	357.21	16.85	0.72	3.14	-1.00	-1
3	OE	357.21	357.44	3.27	0.46	2.87	-1.00	-1
3	OE	357.44	358.15	0.44	0.31	2.81	-1.00	-1
3	OE	358.15	358.27	9.94	0.63	3.00	-1.00	-1
3	OE	358.27	359.09	0.46	0.21	2.81	-1.00	-1
3	OE	359.09	359.61	11.98	0.63	3.04	-1.00	-1
3	OE	359.61	359.70	0.60	0.10	2.81	-1.00	-1
3	OE	359.70	360.00	1.89	0.40	2.84	-1.00	-1
3	OE	360.00	360.67	15.00	0.73	3.10	-1.00	-1
3	OE	360.67	360.71	2.27	0.10	2.85	-1.00	-1
3	OE	360.71	361.06	12.85	0.76	3.06	-1.00	-1
3	OE	361.06	361.32	21.80	0.95	3.24	-1.00	-1
3	OE	361.32	362.39	0.44	0.14	2.81	-1.00	-1
1	AA	19927.00	16130.00	34.00	0.00	-90.00	178.75	
3	AA	73.79	78.45	24.40	1.05	3.29	-1.00	-1
3	AA	78.45	80.11	7.80	0.53	2.96	-1.00	-1
3	AA	81.32	84.08	13.50	0.60	3.07	-1.00	-1
3	AA	86.86	90.35	13.00	0.59	3.06	-1.00	-1
3	AA	91.10	92.72	18.10	0.94	3.16	-1.00	-1
3	AA	98.10	104.00	22.00	0.82	3.24	-1.00	-1
3	AA	126.40	127.28	24.80	1.34	3.30	-1.00	-1
3	AA	146.52	149.24	35.70	1.43	3.51	-1.00	-1
3	AA	150.22	153.33	21.30	0.78	3.23	-1.00	-1

3	AA	154.29	156.38	36.80	1.26	3.54	-1.00	-1
3	AA	156.43	158.84	26.70	1.45	3.33	-1.00	-1
3	AA	159.13	162.20	30.90	1.25	3.42	-1.00	-1
3	AA	163.71	164.90	22.40	0.90	3.25	-1.00	-1
3	AA	166.39	167.42	14.70	0.70	3.09	-1.00	-1

Tabulation of resources in polygons

POLYGONS WTIH CUTOFF 25% MAGNETITE
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Polygon	area	%Magn.	Thick.	%P	D	Ton	Ton Mag.	Ton P	VOLUME
1C	9000	28.47	19.18	1.02	3.32	573118	163167	5846	172626
1D	6401	26.80	2	0.94	3.34	42758	11459	402	12802
1F	11673	26.76	15.2	0.99	3.33	590841	158109	5849	177430
1I	10928	26.70	12.65	1.04	3.33	460337	122910	4787	138239
2E	3009	28.59	25.29	1.09	3.34	254141	72659	2770	76090
2F	4075	24.84	20.47	0.91	3.24	270239	67127	2459	83407
2I	5995	28.00	10.12	1.10	3.36	203832	57073	2242	60664
3B	6084	28.67	17.05	1.24	3.36	348512	99918	4322	103724
3C	4236	32.86	22.59	1.31	3.45	330135	108482	4325	95691
3D	4118	32.56	26.86	1.30	3.44	380497	123890	4946	110609
3E	3113	34.24	22.54	1.27	3.45	242107	82898	3075	70176
3H	4324	27.28	32.95	1.05	3.32	473020	129040	4967	142476
3I	4071	32.57	25	1.15	3.42	348088	113372	4003	101780
4B	5028	27.40	10.97	1.13	3.35	184773	50628	2088	55156
4D	3577	34.36	20.6	1.38	3.47	255670	87848	3528	73680
4E	3099	32.88	22.25	1.31	3.44	237167	77980	3107	68944
4F	3605	29.79	21.53	1.13	3.37	261572	77922	2956	77618
4G	4163	31.64	28.64	1.29	3.41	406520	128623	5244	119214
4I	13656	45.60	7.65	1.53	3.71	387578	176735	5930	104468
5D	4807	30.40	28.85	1.13	3.39	470112	142914	5312	138676
5E	2755	36.00	9.4	1.03	3.52	91161	32818	939	25898
5F	2877	32.58	21.25	1.54	3.44	210323	68523	3239	61141
5G	2035	33.10	18.12	1.22	3.46	127597	42235	1557	36878
5H	4415	31.25	20.65	1.15	3.35	305384	95433	3512	91159
6D	1219	43.90	2.47	1.45	3.68	11081	4865	161	3011
6E	2639	35.80	4.65	1.14	3.52	43189	15462	492	12269
6F	4206	31.40	5.5	1.00	3.43	79354	24917	794	23135
6G	3394	30.55	33.19	1.00	3.38	380735	116315	3807	112644
7H	3550	37.00	1.8	1.09	3.54	22619	8369	247	6390
4	5451	27.06	21.85	1.31	3.32	395441	107006	5180	119109
5/6D	1481	35.70	7.24	1.25	3.51	37633	13435	470	10722
9	12282	28.06	10.9	1.07	3.31	443122	124340	4741	133874
10	8644	25.80	16.4	0.99	3.25	460704	118862	4561	141755
11	9148	26.62	15.3	1.30	3.31	463267	123322	6022	139960
12	38636	26.10	7.2	1.09	3.32	923555	241048	10067	278179
15	26447	26.31	5.7	1.28	3.31	498976	131280	6387	150748
16	38365	27.54	10.3	1.16	3.31	1307978	360217	15173	395160

17	27965	27.68	5.45	1.10	3.33	507523	140482	5583	152409
18	33778	26.86	4	1.16	3.31	447221	120123	5188	135112
19	32400	25.78	3.8	0.84	3.29	405065	104426	3403	123120
20	45948	31.00	2.3	1.49	3.42	361427	112042	5385	105680
21	2248	5.00	0	0.25	2.80	0	0	0	0
23	35370	30.00	6.96	1.05	3.40	836996	251099	8788	246175
24	36091	31.30	4.37	1.19	3.43	540972	169324	6438	157718
25	42314	36.00	3.76	1.35	3.52	560034	201612	7560	159101
26	22164	28.30	4.53	1.02	3.37	338358	95755	3451	100403
27	12060	32.40	7.74	1.21	3.45	322038	104340	3897	93344
28	13170	31.20	21.9	1.25	3.42	986407	307759	12330	288423
29	16000	30.60	23.11	1.32	3.41	1260882	385830	16644	369760
102	1509	32.10	10.65	1.19	3.44	55291	17748	658	16073
107	26766	30.70	4.14	1.28	3.41	377866	116005	4837	110811
110	10061	29.20	4.45	1.31	3.38	151328	44188	1982	44771
111	11669	26.78	5.65	1.10	3.32	218887	58618	2408	65930
112	8882	31.20	19.26	1.20	3.42	585030	182530	7020	171062
113	2867	31.40	18.95	1.51	3.43	186364	58518	2814	54333
114	3170	32.48	17.18	1.53	3.44	187362	60855	2867	54466
115	3402	28.30	19.92	1.20	3.37	228344	64621	2740	67758
116	7529	33.05	9.62	1.56	3.44	249146	82343	3887	72426
117	1670	30.70	8.9	1.48	3.41	50689	15561	750	14865
118	4430	31.80	7.91	1.52	3.44	120548	38334	1832	35043
119	11864	5.00	0	0.25	2.80	0	0	0	0
120	1129	30.10	13.77	1.08	3.40	52872	15914	571	15550
121	2468	31.80	15.7	1.10	3.44	133270	42380	1466	38741
122	2742	26.30	19.65	0.59	3.33	179389	47179	1058	53870
123	4281	42.20	6	1.24	3.64	93495	39455	1159	25685
124	8033	37.60	7.12	1.26	3.55	203050	76347	2558	57197
125	5093	32.74	15.39	1.01	3.44	269610	88270	2723	78375
126	4180	30.38	32.02	0.90	3.38	452337	137420	4071	133828
A	9626	38.10	9.1	1.25	3.56	311850	118815	3898	87598
D	16049	28.36	21.61	1.32	3.36	1165311	330482	15382	346819
F	13467	31.30	19.38	1.25	3.43	895197	280197	11190	260990
G	10929	28.80	3.36	1.20	3.38	124118	35746	1489	36721
H	22035	5.00	0	0.25	2.80	0	0	0	0
I	13400	33.70	12.5	1.43	3.47	581225	195873	8312	167500
J	14628	27.81	21.86	1.42	3.34	1068025	297018	15166	319768
K	17314	32.00	12.46	1.40	3.44	742120	237478	10390	215732
L	15716	30.30	24.03	1.16	3.41	1287805	390205	14939	377655
M	18454	26.25	2.78	1.30	3.33	170836	44844	2221	51302
N	9595	31.60	9.37	1.31	3.43	308365	97443	4040	89902
Q	17766	5.00	0	0.25	2.80	0	0	0	0

R	20210	26.00	6.52	1.15	3.32	437474	113743	5031	131769
S	16244	33.80	21.55	1.47	3.48	1218203	411752	17908	350058
T	13891	27.80	19.88	1.36	3.36	927874	257949	12619	276153
U	19899	29.50	19.62	1.19	3.39	1323518	390438	15750	390418
V	24583	30.88	9.49	1.07	3.41	795528	245659	8512	233293
Z	13895	32.40	22.02	1.48	3.45	1055589	342011	15623	305968
Y	27241	32.58	18.43	1.37	3.45	1732078	564311	23729	502052
AE	14486	28.95	22.65	1.23	3.38	1109005	321057	13641	328108
OE	17947	27.80	19.04	1.32	3.30	1127646	313486	14885	341711
AA	19259	30.35	7.91	1.28	3.40	517952	157198	6630	152339
TOTAL	1090389	30.18	10.76	1.23	3.39	39784651	12005987	490929	11733390

Polygon	area	%Magn.	Thick.	%P	D	Ton	Ton Mag.	Ton P	VOLUME

Polygons with cutoff 20 % magnetite
Andørja

Polygon	area	%area	%Magn.	Thick.	%P	D	Ton	Ton Mag.	Ton P	VOLUME
1C	9000	3.00E-03	28.47	19.18	1.02	3.32	573118	163167	5846	172626
1D	6401	2.13E-03	26.80	2.00	0.94	3.34	42758	11459	402	12802
1F	11673	3.89E-03	26.76	15.20	0.99	3.33	590841	158109	5849	177430
1I	10928	3.64E-03	22.96	23.15	0.89	3.24	819666	188195	7295	252983
2E	3009	1.00E-03	28.59	25.29	1.09	3.34	254141	72659	2770	76090
2F	4075	1.36E-03	24.84	20.47	0.91	3.24	270239	67127	2459	83407
2I	5995	2.00E-03	22.33	29.85	0.85	3.20	572595	127860	4867	178936
3B	6084	2.03E-03	28.67	17.05	1.24	3.36	348512	99918	4322	103724
3C	4236	1.41E-03	32.86	22.59	1.31	3.45	330135	108482	4325	95691
3D	4118	1.37E-03	32.56	26.86	1.30	3.44	380497	123890	4946	110609
3E	3113	1.04E-03	31.17	31.02	1.17	3.39	327398	102050	3831	96578
3H	4324	1.44E-03	27.28	32.95	1.05	3.32	473020	129040	4967	142476
3I	4071	1.36E-03	32.57	25.00	1.15	3.42	348088	113372	4003	101780
4B	5028	1.68E-03	27.40	10.97	1.13	3.35	184773	50628	2088	55156
4D	3577	1.19E-03	34.36	20.60	1.38	3.47	255670	87848	3528	73680
4E	3099	1.03E-03	30.21	31.10	1.17	3.38	325719	98400	3811	96366
4F	3605	1.20E-03	29.41	35.15	1.09	3.37	427044	125594	4655	126719
4G	4163	1.39E-03	29.80	36.65	1.22	3.37	514112	153206	6272	152556
4I	13656	4.55E-03	32.80	18.50	1.14	3.43	866541	284226	9879	252636
5D	4807	1.60E-03	30.40	28.85	1.13	3.39	470112	142914	5312	138676
5E	2755	9.18E-04	26.91	31.57	0.69	3.32	288769	77708	1993	86979
5F	2877	9.59E-04	29.26	37.75	1.41	3.37	366030	107100	5161	108614
5G	2035	6.78E-04	28.53	32.27	1.01	3.37	221328	63145	2235	65676
5H	4415	1.47E-03	28.59	36.12	1.08	3.34	532569	152261	5752	159452
6D	1219	4.06E-04	43.90	2.47	1.45	3.68	11081	4865	161	3011
6E	2639	8.80E-04	35.80	4.65	1.14	3.52	43189	15462	492	12269
6F	4206	1.40E-03	31.40	5.50	1.00	3.43	79354	24917	794	23135
6G	3394	1.13E-03	30.55	33.19	1.00	3.38	380735	116315	3807	112644
7H	3550	1.18E-03	37.00	1.80	1.09	3.54	22619	8369	247	6390
4	5451	1.82E-03	27.06	21.85	1.31	3.32	395441	107006	5180	119109
5/6D	1481	4.94E-04	35.70	7.24	1.25	3.51	37633	13435	470	10722
9	12282	4.09E-03	28.06	10.90	1.07	3.31	443122	124340	4741	133874
10	8644	2.88E-03	25.80	16.40	0.99	3.25	460704	118862	4561	141755
11	9148	3.05E-03	26.62	15.30	1.30	3.31	463267	123322	6022	139960
12	38636	1.29E-02	26.10	7.20	1.09	3.32	923555	241048	10067	278179
15	26447	8.82E-03	26.31	5.70	1.28	3.31	498976	131280	6387	150748
16	38365	1.28E-02	27.54	10.30	1.16	3.31	1307978	360217	15173	395160

17	27965	9.32E-03	27.68	5.45	1.10	3.33	507523	140482	5583	152409
18	33778	1.13E-02	23.76	7.85	1.05	3.26	864413	205384	9076	265157
19	32400	1.08E-02	25.78	3.80	0.84	3.29	405065	104426	3403	123120
20	45948	1.53E-02	31.00	2.30	1.49	3.42	361427	112042	5385	105680
21	2248	7.49E-04	20.90	10.94	0.92	3.20	78705	16449	724	24595
23	35370	1.18E-02	30.00	6.96	1.05	3.40	836996	251099	8788	246175
24	36091	1.20E-02	31.30	4.37	1.19	3.43	540972	169324	6438	157718
25	42314	1.41E-02	22.60	26.52	0.82	3.21	3602157	814087	29538	1122167
26	22164	7.39E-03	28.30	4.53	1.02	3.37	338358	95755	3451	100403
27	12060	4.02E-03	32.40	7.74	1.21	3.45	322038	104340	3897	93344
28	13170	4.39E-03	31.20	21.90	1.25	3.42	986407	307759	12330	288423
29	16000	5.33E-03	30.60	23.11	1.32	3.41	1260882	385830	16644	369760
102	1509	5.03E-04	32.10	10.65	1.19	3.44	55291	17748	658	16073
107	26766	8.92E-03	30.70	4.14	1.28	3.41	377866	116005	4837	110811
110	10061	3.35E-03	29.20	4.45	1.31	3.38	151328	44188	1982	44771
111	11669	3.89E-03	26.78	5.65	1.10	3.32	218887	58618	2408	65930
112	8882	2.96E-03	31.20	19.26	1.20	3.42	585030	182530	7020	171062
113	2867	9.56E-04	31.40	18.95	1.51	3.43	186364	58518	2814	54333
114	3170	1.06E-03	32.48	17.18	1.53	3.44	187362	60855	2867	54466
115	3402	1.13E-03	28.30	19.92	1.20	3.37	228344	64621	2740	67758
116	7529	2.51E-03	33.05	9.62	1.56	3.44	249146	82343	3887	72426
117	1670	5.57E-04	30.70	8.90	1.48	3.41	50689	15561	750	14865
118	4430	1.48E-03	31.80	7.91	1.52	3.44	120548	38334	1832	35043
119	11864	3.95E-03	20.50	10.15	0.72	3.21	386547	79242	2783	120420
120	1129	3.76E-04	30.10	13.77	1.08	3.40	52872	15914	571	15550
121	2468	8.23E-04	31.80	15.70	1.10	3.44	133270	42380	1466	38741
122	2742	9.14E-04	26.30	19.65	0.59	3.33	179389	47179	1058	53870
123	4281	1.43E-03	42.20	6.00	1.24	3.64	93495	39455	1159	25685
124	8033	2.68E-03	37.60	7.12	1.26	3.55	203050	76347	2558	57197
125	5093	1.70E-03	32.74	15.39	1.01	3.44	269610	88270	2723	78375
126	4180	1.39E-03	30.38	32.02	0.90	3.38	452337	137420	4071	133828
A	9626	3.21E-03	29.59	18.96	1.03	3.37	615068	181999	6335	182513
D	16049	5.35E-03	28.36	21.61	1.32	3.36	1165311	330482	15382	346819
F	13467	4.49E-03	31.30	19.38	1.25	3.43	895197	280197	11190	260990
G	10929	3.64E-03	28.80	3.36	1.20	3.38	124118	35746	1489	36721
H	22035	7.35E-03	20.70	9.83	1.09	3.21	695299	143927	7579	216604
I	13400	4.47E-03	33.70	12.50	1.43	3.47	581225	195873	8312	167500
J	14628	4.88E-03	27.81	21.86	1.42	3.34	1068025	297018	15166	319768
K	17314	5.77E-03	32.00	12.46	1.40	3.44	742120	237478	10390	215732
L	15716	5.24E-03	30.30	24.03	1.16	3.41	1287805	390205	14939	377655
M	18454	6.15E-03	26.25	2.78	1.30	3.33	170836	44844	2221	51302
N	9595	3.20E-03	31.60	9.37	1.31	3.43	308365	97443	4040	89902
Q	17766	5.92E-03	24.10	5.01	0.97	3.28	291945	70359	2832	89008

Polygon	area	%area	%Magn.	Thick.	%P	D	Ton	Ton Mag.	Ton P	VOLUME
R	20210	6.74E-03	18.28	17.60	0.80	3.13	1113328	203516	8907	355696
S	16244	5.41E-03	32.21	24.33	1.40	3.44	1359545	437909	19034	395217
T	13891	4.63E-03	27.80	19.88	1.36	3.36	927874	257949	12619	276153
U	19899	6.63E-03	29.50	19.62	1.19	3.39	1323518	390438	15750	390418
V	24583	8.19E-03	30.88	9.49	1.07	3.41	795528	245659	8512	233293
Z	13895	4.63E-03	32.40	22.02	1.48	3.45	1055589	342011	15623	305968
Y	27241	9.08E-03	32.58	18.43	1.37	3.45	1732078	564311	23729	502052
AE	14486	4.83E-03	28.95	22.65	1.23	3.38	1109005	321057	13641	328108
OE	17947	5.98E-03	27.80	19.04	1.32	3.30	1127646	313486	14885	341711
AA	19259	6.42E-03	30.35	7.91	1.28	3.40	517952	157198	6630	152339
TOTAL	1090389		28.48	13.17	1.16	3.35	48145069	13709408	557314	14364223

Between cutoff 20% and 25 % magnetite
Andørja

Polygon	Area	% Mag	% P	D	Thick.	Ton	Ton Mag	Ton P	Volume
1C	0	ERR	ERR	ERR	0.0000	0	0	0	0
1D	0	ERR	ERR	ERR	0.0000	0	0	0	0
1F	0	ERR	ERR	ERR	0.0000	0	0	0	0
1I	0	18.17	0.70	0.00	10.5000	359329	65285	2508	114744
2E	0	ERR	ERR	ERR	0.0000	0	0	0	0
2F	0	ERR	ERR	ERR	0.0000	0	0	0	0
2I	0	19.20	0.71	0.00	19.7300	368762	70787	2625	118271
3B	0	ERR	ERR	ERR	0.0000	0	0	0	0
3C	0	ERR	ERR	ERR	0.0000	0	0	0	0
3D	0	ERR	ERR	ERR	0.0000	0	0	0	0
3E	0	22.46	0.89	0.00	8.4800	85291	19153	756	26402
3H	0	ERR	ERR	ERR	0.0000	0	0	0	0
3I	0	ERR	ERR	ERR	0.0000	0	0	0	0
4B	0	ERR	ERR	ERR	0.0000	0	0	0	0
4D	0	ERR	ERR	ERR	0.0000	0	0	0	0
4E	0	23.06	0.80	0.00	8.8500	88552	20419	704	27423
4F	0	28.81	1.03	0.00	13.6200	165472	47671	1699	49101
4G	0	22.85	0.96	0.00	8.0100	107593	24583	1028	33342
4I	0	22.44	0.82	0.00	10.8500	478964	107490	3949	148168
5D	0	ERR	ERR	ERR	0.0000	0	0	0	0
5E	0	22.72	0.53	0.00	22.1700	197608	44890	1054	61081
5F	0	24.78	1.23	0.00	16.5000	155707	38577	1922	47474
5G	0	22.31	0.72	0.00	14.1500	93731	20910	679	28798
5H	0	25.01	0.99	0.00	15.4700	227185	56829	2240	68292
6D	0	ERR	ERR	ERR	0.0000	0	0	0	0
6E	0	ERR	ERR	ERR	0.0000	0	0	0	0
6F	0	ERR	ERR	ERR	0.0000	0	0	0	0
6G	0	ERR	ERR	ERR	0.0000	0	0	0	0
7H	0	ERR	ERR	ERR	0.0000	0	0	0	0
4	0	ERR	ERR	ERR	0.0000	0	0	0	0
5/6D	0	ERR	ERR	ERR	0.0000	0	0	0	0
9	0	ERR	ERR	ERR	0.0000	0	0	0	0
10	0	ERR	ERR	ERR	0.0000	0	0	0	0
11	0	ERR	ERR	ERR	0.0000	0	0	0	0
12	0	ERR	ERR	ERR	0.0000	0	0	0	0
15	0	ERR	ERR	ERR	0.0000	0	0	0	0
16	0	ERR	ERR	ERR	0.0000	0	0	0	0

R	0	13.28	0.57	0.00	11.0800	675855	89773	3876	223927
S	0	18.51	0.80	0.00	2.7800	141342	26157	1126	45158
T	0	ERR	ERR	ERR	0.0000	0	0	0	0
U	0	ERR	ERR	ERR	0.0000	0	0	0	0
V	0	ERR	ERR	ERR	0.0000	0	0	0	0
Z	0	ERR	ERR	ERR	0.0000	0	0	0	0
Y	0	ERR	ERR	ERR	0.0000	0	0	0	0
AE	0	ERR	ERR	ERR	0.0000	0	0	0	0
OE	0	ERR	ERR	ERR	0.0000	0	0	0	0
AA	0	ERR	ERR	ERR	0.0000	0	0	0	0
TOTAL	0	20.37	0.79	3.18	2.41	8360418	1703421	66385	2630833

Polygon	Area	% Magn.	%P	D	Thick.	Ton	Ton Mag.	Ton P	VOLUME

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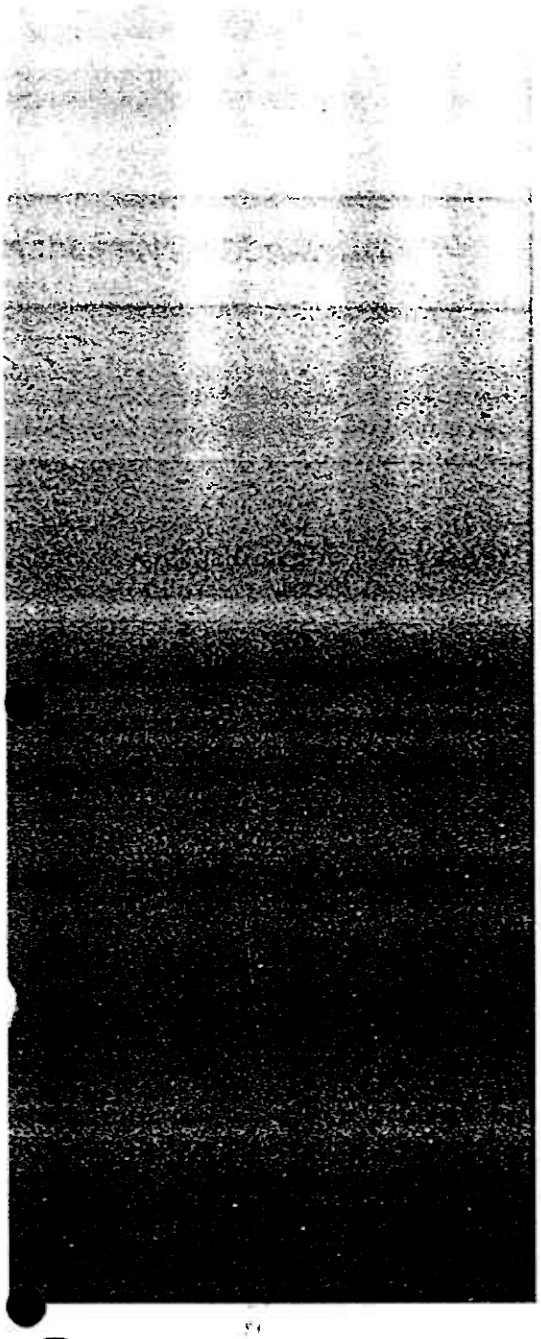

Feasibility Study
at
Andørja Iron Ore Deposit

In Situ Resources, Multiseam Model

1991-06-21

SINTEF

Rock and Mineral Engineering

RAPPORT

RAPPORT

SINTEF REPORT

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Kilborn Inc.	B. Tyson

Abstract

This report is an extension of the work reported in "Feasibility Study at Andørja Iron Ore Deposit. In Situ Resources".

Including all ore zones an estimate of in situ resources, based on the polygonal method, demonstrates the following:

51,4 million metric tons with 30.3% magnetite and 1.2% P at a cut-off of 25 % magnetite.

Additional resources between cut-offs of 20 % and 25 % magnetite are 23.2 million metric tons at 21.9 % magnetite and 0.9 % P.

The deposit is still open to the north and northeast.

	Indexing terms: English	Norwegian
Group 1	Rock and Mineral Eng.	Bergteknikk
Group 2	Information	Informasjon
Key terms selected by author(s)	Magnetite	Magnetitt
	Feasibility study	Mulighetsstudie
	Mining	Gruvedrift

Division Director

FOREWORD

The purpose of this study is to expand the in situ resources of Andørja magnetite-apatite deposit to include all mineralized zones that can be classed as demonstrated. In our first study we agreed to consider a main zone. The expansion of the contract is formulated in a letter from Kilborn dated June 5, 1991.

Resources in different zones.

In our first study in situ resources were limited to a "main ore zone".

We were asked to add the following items:

(1) Expansion of the In-Situ inventory to include all zones (or seams) with values exceeding 20% magnetite over 3 metres, provided that they can be classified as Demonstrated.

(2) Expansion of summary tabulations to show reserves by Area (Gropa, Lia, Kuliberget) at the two cut-off grades of 20% and 25% magnetite.

(3) For the 20% cut-off, please review your calculations with the objective of maximizing tonnage. In some cases this may involve a combination of two zones in one composite.

Due to the distance between the zones a combination of zones will not give any extra tonnage except for Ore Zone 1 in drillhole 119. (3) Drillhole 119 has been excluded from the "main ore zone" defined in our first study.

We have generally been less conservative defining the composites.

To the drillhole file we have added geological records. We have distinguished between zones as shown in figure 1.

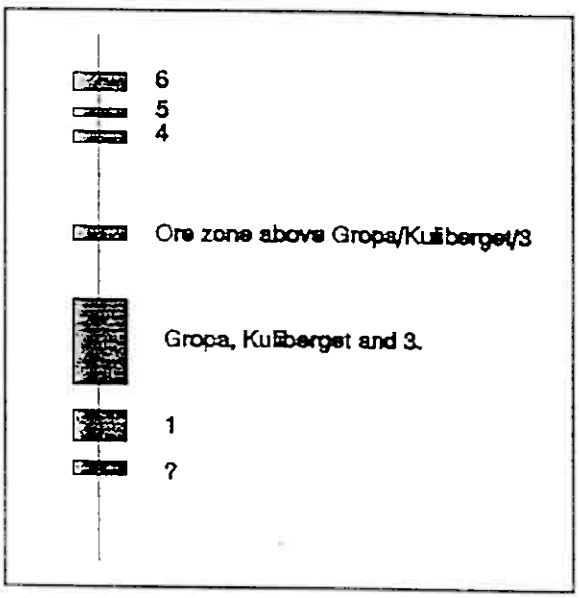


Figure 1 Principle - different ore zones.

The geological records are based on Elkems sections. The coordinates for hole 7F, 13 and 14 have been corrected. These holes was not considered in our first study.

We feel we can model a main ore zone through the deposit. We have not tried to make a continuoues model of the minor zones.

Estimation of recoverable magnetite is dependant on the assaying procedure. The actual variation in this mineralization can be seen from the detailed assayed holes 5H and OE. A histogram based on 0.5 m composites from the Kuliberget and Gropa zone in these holes, is shown in Figure 2.

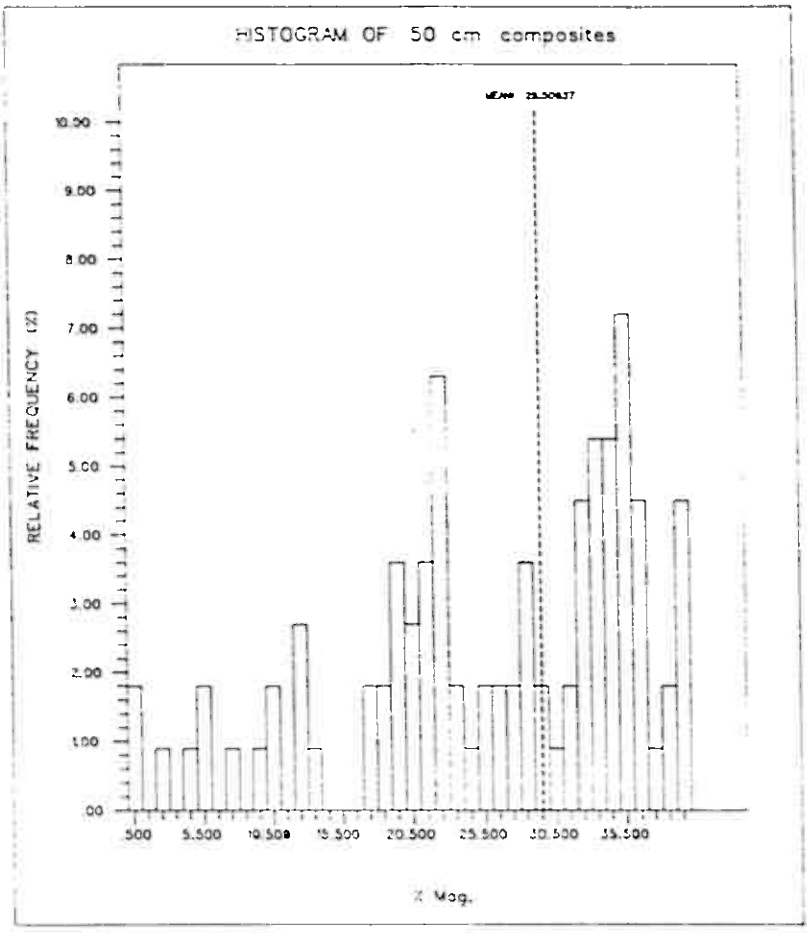


Figure 2, frequency histogram of magnetite with data from 5H and OE.

In the other holes this variation is more ore less camouflaged by the assaying procedures. Composites in the minor zones less than 3 m, are considered if diluted to 3 m composites are above 20 % cut-off. Forming these composites, waste is not given a grade. Composites less than 3 m starting on the surface are not diluted.

The definition of polygons for the different zones can be seen in Figure 3,4 and 5.

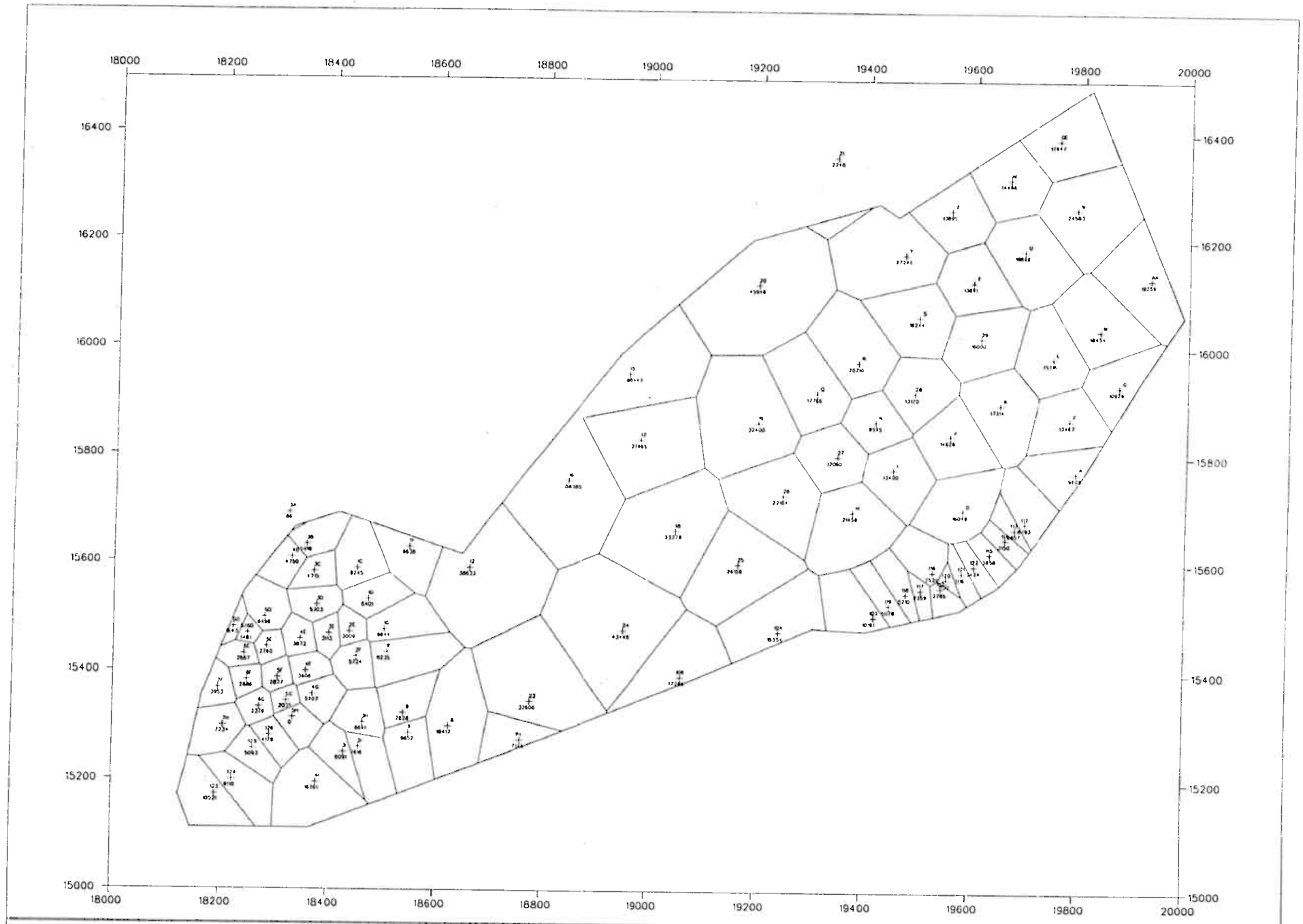
Appendix 1 gives a tabulation of the resources in each polygon for the different ore zones. Including all ore zones an estimate of in situ resources, based on the polygonal method, demonstrates the following:

51.4 million metric tons with 30.3% magnetite and 1.2% P at a cut-off of 25 % magnetite.

Additional resources between cut-offs of 20 % and 25 % magnetite are 23.2 million metric tons at 21.9 % magnetite and 0.9 % P.

The deposit is still open to the north and northeast.

One diskette (DOS 4.01) with the following files are enclosed:
ANDORJA.DAT, A_TOP_DH.DGN, A_UPPERZ.DGN, A_POZ_1.DGN, A_POZ_3.DGN, CO20_1.WK3, CO25_1.WK3, CO20_3.WK3, CO25_3.WK3, CO20_O.WK3, CO25_0.WK3, CO20_4.WK3, CO25_4.WK3, CO20_5, CO20_6.WK3 and CO25_6.WK3.



Legend

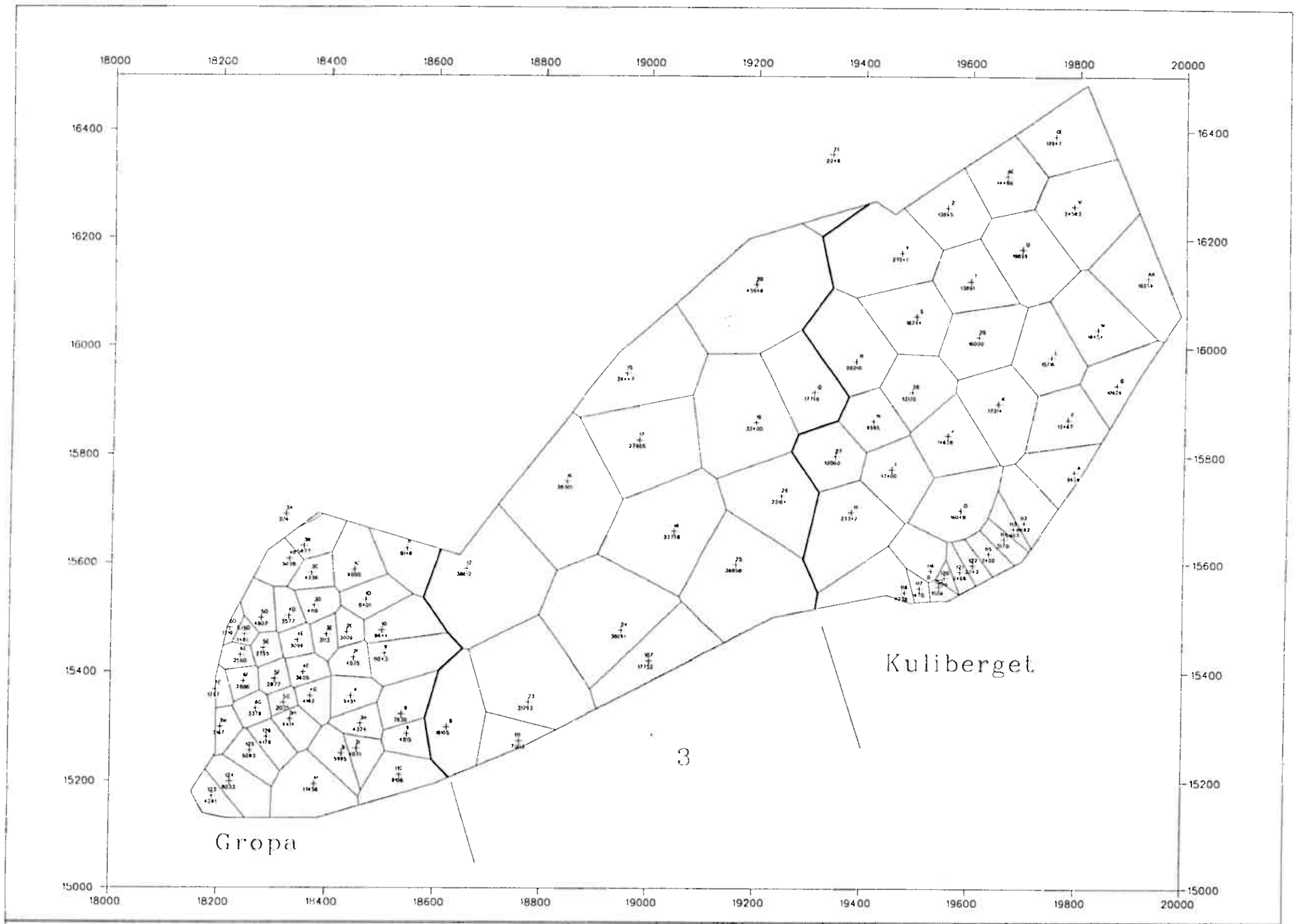
Drillhole

Area

100.0 0 100.0 200.0 m

DRAWN BY	DATE	SINTEF	
REVISED BY	DATE	Andørja	
		Ore Zone 1	
SCALE 1: 5000			
DWG			

Figure 3



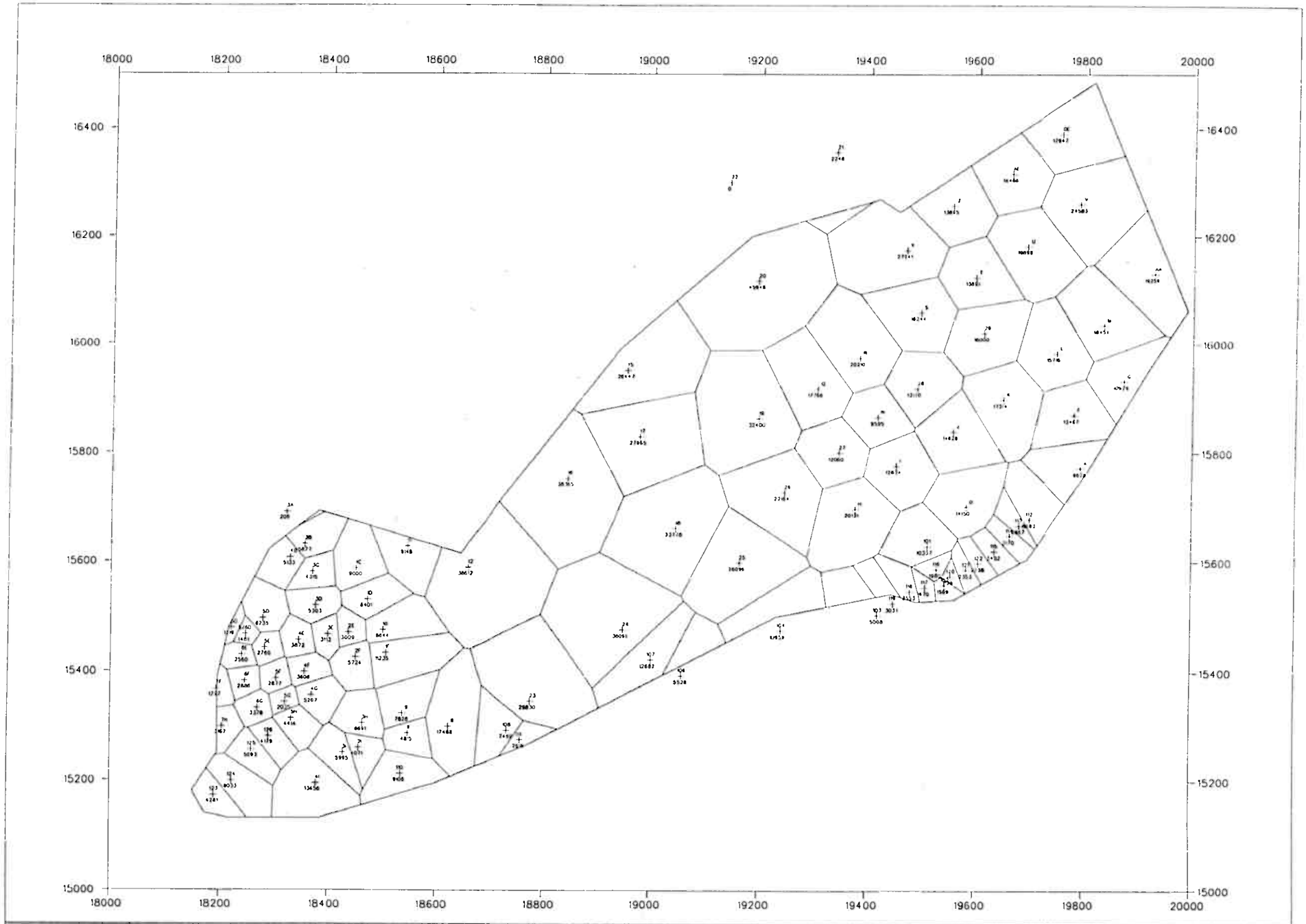
Legend

Drillhole

Area

100.0 0 100.0 200.0 m

DRAWN BY / DATE	SINTEF
REVISED BY / DATE	Andørja
	Ore Zone 3/ Kuliberget / Gropa
SCALE 1: 5000	**Figure 4**
DWG	



Legend

Drillhole

Area

100.0 0 100.0 200.0 m

DRAWN BY	DATE	SINTEF
REVISED BY	DATE	Andørja
		Polygons for seams above Kuliberget/3/Gropa.
SCALE 1: 5000		Figure 5
DWG		

Tabulation of in situ resources in polygons.

Andørja
Ore Zone 1
Cut off 20 % Magnetite
Diluted to 3 m length

Area	Hole	Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Composites Elevation Top	Bottom
Gropa	9	7829	1	35228	124003	36.20	1.48	3.52	4.50	44889	1835	279.00	274.50
Gropa	1C	9245	0	0	0	10.94	0.52	3.01	3.00	0	0	278.14	275.95
Gropa	1D	6401	1	24323	79294	23.20	0.87	3.26	3.80	18396	690	284.90	281.10
Gropa	1F	11235	1	44154	157187	38.00	1.33	3.56	3.93	59731	2091	281.73	277.80
Gropa	1I	9652	1	65151	213044	23.40	0.97	3.27	6.75	49852	2067	275.50	268.75
Gropa	2F	5724	0	0	0	19.20	0.84	3.18	6.68	0	0	289.15	282.47
Gropa	2I	7616	0	0	0	6.51	0.28	2.91	3.00	0	0	298.10	297.45
Gropa	3B	5918	0	0	0	24.24	0.97	3.28	3.00	0	0	303.93	301.13
Gropa	3D	5303	0	0	0	16.55	0.77	3.12	3.00	0	0	291.50	289.09
Gropa	3E	3113	1	12142	41405	30.30	1.18	3.41	3.90	12546	489	287.27	283.37
Gropa	3H	6691	1	45163	152199	28.50	1.21	3.37	6.75	43377	1842	290.25	283.50
Gropa	3I	6091	1	36850	124921	29.40	1.09	3.39	6.05	36727	1362	289.65	283.60
Gropa	4B	4750	0	0	0	19.20	1.08	3.18	3.89	0	0	311.89	308.00
Gropa	4E	3872	1	14522	46469	20.00	0.87	3.20	3.75	9294	404	300.90	297.15
Gropa	4F	3606	1	10817	35235	24.09	0.90	3.26	3.00	9003	338	290.90	288.10
Gropa	4G	5207	0	0	0	13.00	0.75	3.06	3.15	0	0	293.40	290.25
Gropa	4I	16261	1	56426	189590	28.20	1.36	3.36	3.47	53464	2578	307.06	303.59
Gropa	5D	6498	1	37688	121357	20.80	0.92	3.22	5.80	25242	1116	324.70	318.90
Gropa	5E	2760	1	14216	45491	20.10	0.66	3.20	5.15	9144	300	319.53	314.38
Gropa	5F	2877	0	0	0	15.18	0.86	3.10	6.40	0	0	313.95	307.55
Gropa	5G	2035	0	0	0	16.02	0.83	3.11	3.00	0	0	304.00	301.40
Gropa	5H	4414	0	0	0	3.92	0.19	2.87	3.00	0	0	309.27	308.87
Gropa	6D	1643	0	0	0	33.29	1.57	3.45	3.00	0	0	349.80	347.05
Gropa	6F	2886	0	0	0	11.23	0.52	3.01	3.00	0	0	340.15	338.60
Gropa	7F	3953	0	0	0	11.50	0.68	3.03	4.12	0	0	350.40	346.28
Gropa	7H	7234	1	22281	72412	24.34	0.95	3.25	3.08	17625	688	349.30	346.22
Gropa	123	10521	0	0	0	10.72	0.44	3.01	3.00	0	0	355.59	352.70
Gropa	124	9118	0	0	0	18.50	0.72	3.17	3.38	0	0	337.83	334.45
Gropa	125	5093	0	0	0	17.30	0.74	3.15	3.70	0	0	327.95	324.25
Gropa	126	4180	1	16718	54835	23.80	0.82	3.28	4.00	13051	450	314.50	310.50

Kuliberg.	A	9606	0	0	0	15.60	1.34	3.11	5.59	0	0	-57.89	-63.48
Kuliberg.	D	16049	0	0	0	8.98	0.41	2.90	5.93	0	0	-24.69	-30.62
Kuliberg.	F	13467	0	0	0	12.60	0.65	3.05	6.86	0	0	-72.50	-79.36
Kuliberg.	H	21458	1	77678	250900	21.70	0.75	3.23	3.62	54445	1882	41.30	37.68
Kuliberg.	I	13400	0	0	0	16.20	0.73	3.12	7.18	0	0	-3.44	-10.62
Kuliberg.	J	14628	0	0	0	13.50	0.73	3.07	5.31	0	0	-35.62	-40.93
Kuliberg.	K	17314	0	0	0	12.70	0.76	3.05	3.10	0	0	-74.60	-77.70
Kuliberg.	L	15716	0	0	0	5.98	0.28	2.91	3.00	0	0	-98.64	-99.68
Kuliberg.	M	18454	0	0	0	15.25	0.86	3.10	3.33	0	0	-121.33	-124.66
Kuliberg.	N	9595	0	0	0	18.80	0.75	3.18	5.78	0	0	-4.83	-10.61
Kuliberg.	R	20210	1	104284	334750	20.40	0.81	3.21	5.16	68289	2711	-12.57	-17.73
Kuliberg.	S	16244	0	0	0	15.20	0.70	3.10	5.96	0	0	-72.57	-78.53
Kuliberg.	T	13891	0	0	0	13.20	0.78	3.06	6.00	0	0	-101.23	-107.23
Kuliberg.	U	19899	0	0	0	12.05	0.55	3.04	3.00	0	0	-123.26	-125.71
Kuliberg.	V	24583	0	0	0	6.78	0.33	2.93	3.00	0	0	-146.65	-147.93
Kuliberg.	Y	27241	1	114140	367530	21.00	0.83	3.22	4.19	77181	3051	-92.10	-96.29
Kuliberg.	Z	13895	0	0	0	11.38	0.55	3.02	3.00	0	0	-123.70	-125.67
Kuliberg.	AA	19259	1	301981	999558	26.93	1.10	3.31	15.68	223901	8996	-129.71	-130.90
Kuliberg.	AE	14486	0	0	0	12.53	0.52	3.01	3.00	0	0	-138.00	-140.73
Kuliberg.	OE	17947	0	0	0	4.50	0.25	2.88	3.00	0	0	-157.36	-158.62
Kuliberg.	102	2785	0	0	0	17.33	0.76	3.13	8.50	0	0	26.30	17.80
Kuliberg.	103	10191	0	0	0	19.50	0.84	3.19	7.90	0	0	75.00	67.10
Kuliberg.	112	8793	0	0	0	13.88	0.67	3.06	6.40	0	0	-24.35	-30.75
Kuliberg.	114	3150	0	0	0	13.20	0.66	3.06	8.12	0	0	-11.54	-19.66
Kuliberg.	115	3859	1	21646	70567	22.80	0.67	3.26	5.61	16089	473	-5.23	-10.84
Kuliberg.	116	7529	0	0	0	16.00	0.64	3.12	7.53	0	0	23.85	16.32
Kuliberg.	117	2359	0	0	0	14.10	0.81	3.08	11.08	0	0	39.86	28.78
Kuliberg.	118	5210	0	0	0	16.10	0.89	3.12	10.60	0	0	49.00	38.40
Kuliberg.	119	5076	0	0	0	19.70	0.70	3.19	10.78	0	0	66.00	55.22
Kuliberg.	120	1130	0	0	0	15.30	0.63	3.11	7.55	0	0	18.63	11.08
Kuliberg.	121	3116	0	0	0	12.80	0.60	3.06	8.19	0	0	11.79	3.60
Kuliberg.	122	3424	0	0	0	13.20	0.73	3.06	8.08	0	0	5.28	-2.80
Lia	8	19412	1	100942	351280	33.90	0.68	3.48	5.20	119084	2389	262.00	256.80
Lia	Q	17766	1	89008	291945	24.10	0.97	3.28	5.01	70359	2832	25.63	20.62
Lia	12	38633	0	0	0	17.40	0.95	3.15	3.00	0	0	232.70	229.70
Lia	15	26447	0	0	0	12.20	0.56	3.04	7.80	0	0	103.50	95.70
Lia	16	38365	1	260882	832214	20.54	0.78	3.19	6.80	170937	6491	178.80	172.00

Lia	17	27965	0	0	0	8.50	0.44	2.97	7.85	0	0		
Lia	18	33778	0	0	0	15.37	0.72	3.10	3.00	0	0	111.55	103.70
Lia	20	45948	0	0	0	19.89	0.78	3.20	3.00	0	0	115.70	112.85
Lia	21	2248	0	0	0	16.00	0.70	3.12	4.36	0	0	3.00	0.30
Lia	23	32606	0	0	0	18.80	0.84	3.18	3.95	0	0	224.09	220.14
Lia	24	43446	0	0	0	12.00	0.61	3.04	5.44	0	0	163.04	157.60
Lia	25	26159	1	97050	315412	22.60	0.30	3.25	3.71	71283	946	109.65	105.94
Lia	26	22164	0	0	0	14.70	0.78	3.09	4.02	0	0	61.00	56.98
Lia	27	12060	0	0	0	17.30	0.76	3.15	9.51	0	0	38.28	28.77
Lia	28	13170	0	0	0	15.20	0.65	3.10	4.51	0	0	-47.97	-52.48
Lia	29	16000	0	0	0	15.20	0.67	3.10	4.80	0	0	-86.35	-91.15
Lia	104	18354	0	0	0	19.98	0.89	3.15	6.05	0	0	126.40	120.35
Lia	106	17285	1	154701	504324	23.01	1.02	3.26	8.95	116045	5144	176.00	167.05
Lia	111	7145	0	0	0	19.10	0.85	3.18	3.60	0	0	256	252.55
Total	Sum:	1034638	24	1757990	5775922	24.06	0.89	3.29	1.70	1389954	51164		
Lia	Sum:	458951	5	702583	2295175	23.86	0.78	3.27	1.53	547707	17802		
Gropa	Sum:	181726	14	435679	1457443	27.61	1.11	3.35	2.40	402341	16249		
Kuliberg.	Sum:	393962	5	619729	2023304	21.74	0.85	3.26	1.57	439906	17113		

Andørja
Ore Zone 3 + Kuliberget+Gropa
Cut off 20 % Magnetite
Diluted to 3 m length

Area	Hole	Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Elevation composites Top	Bottom
Gropa	4	5451	1	119109	395441	27.06	1.31	3.32	21.85	107006	5180	335.85	314.0
Gropa	9	7630	1	173199	561164	24.10	0.79	3.24	22.70	135240	4433	316.70	294.0
Gropa	10	8644	1	141755	460704	25.80	0.99	3.25	16.40	118862	4561	315.40	299.0
Gropa	11	9148	1	187528	613216	25.45	1.24	3.27	20.50	156063	7604	296.90	276.4
Gropa	1C	9000	1	172626	573118	28.47	1.02	3.32	19.18	163167	5846	318.86	299.6
Gropa	1D	6401	0	0	0	17.48	0.73	3.13	16.70	0	0	310.48	293.7
Gropa	1F	11043	1	259069	849746	24.40	0.93	3.28	23.46	207338	7903	318.90	295.4
Gropa	1I	4815	1	60912	202838	26.70	1.04	3.33	12.65	54158	2110	311.35	298.7
Gropa	2E	3009	1	76090	254141	28.59	1.09	3.34	25.29	72659	2770	322.12	296.8
Gropa	2F	4075	1	109240	353938	24.08	0.87	3.24	26.81	85228	3079	332.00	305.1
Gropa	2I	4071	1	121525	388881	22.33	0.85	3.20	29.85	86837	3305	330.06	300.2
Gropa	3B	5877	1	156748	520402	26.94	1.10	3.32	26.67	140196	5724	342.55	315.8
Gropa	3C	4236	1	151268	506746	28.93	1.14	3.35	35.71	146602	5777	344.79	309.0
Gropa	3D	4118	1	151625	510975	29.43	1.16	3.37	36.82	150380	5927	341.58	304.7
Gropa	3E	3113	1	96578	327398	31.17	1.17	3.39	31.02	102050	3831	333.12	302.1
Gropa	3H	4324	1	142476	473020	27.28	1.05	3.32	32.95	129040	4967	335.95	303.0
Gropa	3I	5995	1	149863	512530	32.57	1.15	3.42	25.00	166931	5894	338.00	313.0
Gropa	4B	5028	1	98245	321262	24.23	0.98	3.27	19.54	77842	3148	345.12	325.5
Gropa	4D	3577	1	119927	404153	29.85	1.16	3.37	33.53	120640	4688	351.65	318.1
Gropa	4E	3099	1	96366	325719	30.21	1.17	3.38	31.10	98400	3811	348.20	317.1
Gropa	4F	3605	1	126719	427044	29.41	1.09	3.37	35.15	125594	4655	341.70	306.5
Gropa	4G	4163	1	152556	514112	29.80	1.22	3.37	36.65	153206	6272	343.10	306.4
Gropa	4I	13656	1	252636	866541	32.80	1.14	3.43	18.50	284226	9879	340.00	321.5
Gropa	5D	4807	1	138676	470112	30.40	1.13	3.39	28.85	142914	5312	369.00	340.1
Gropa	5E	2755	1	86979	288769	26.91	0.69	3.32	31.57	77708	1993	367.00	335.4
Gropa	5F	2877	1	108614	366030	29.26	1.41	3.37	37.75	107100	5161	365.00	327.2
Gropa	5G	2035	1	65676	221328	28.53	1.01	3.37	32.27	63145	2235	355.32	323.0
Gropa	5H	4415	1	162321	542153	28.63	1.09	3.34	36.77	155218	5909	349.05	312.2
Gropa	6D	1219	0	0	0	37.74	1.25	3.52	3.00	0	0	367.31	364.8
Gropa	6E	2560	1	58773	186898	22.26	0.76	3.18	22.96	41604	1420	370.50	347.5

Gropa	6F	2886	1	67138	219540	25.49	0.81	3.27	23.26	55961	1778	368.50	345.2
Gropa	6G	3379	1	112139	379030	30.55	1.00	3.38	33.19	115794	3790	369.00	335.8
Gropa	7F	1797	1	1797	6540	41.90	1.65	3.64	1.00	2740	108	369.50	368.5
Gropa	7H	3167	1	5701	18493	24.23	0.71	3.24	3.00	6843	202	367.00	365.2
Gropa	110	9106	1	53727	174074	24.06	1.08	3.24	5.90	41882	1880	322.55	316.6
Gropa	123	4281	1	25685	93495	42.20	1.24	3.64	6.00	39455	1159	376.00	370.0
Gropa	124	8033	1	57197	203050	37.60	1.26	3.55	7.12	76347	2558	365.15	358.0
Gropa	125	5093	1	78375	269610	32.74	1.01	3.44	15.39	88270	2723	356.94	341.5
Gropa	126	4180	1	133828	452337	30.38	0.90	3.38	32.02	137420	4071	360.00	327.9
Gropa	5/6D	1481	1	42117	137301	25.85	0.88	3.26	28.44	35492	1208	371.00	342.5
Kuliberg.	A	9626	1	182513	615068	29.59	1.03	3.37	18.96	181999	6335	-34.90	-53.8
Kuliberg.	D	16049	1	346819	1165311	28.36	1.32	3.36	21.61	330482	15382	7.16	-14.4
Kuliberg.	F	13467	1	260990	895197	31.30	1.25	3.43	19.38	280197	11190	-50.92	-70.3
Kuliberg.	G	10929	1	32787	116066	36.80	1.52	3.54	3.00	42712	1764	-74.50	-77.5
Kuliberg.	H	23342	1	229452	736540	20.70	1.09	3.21	9.83	152464	8028	58.53	48.7
Kuliberg.	I	13400	1	167500	581225	33.70	1.43	3.47	12.50	195873	8312	12.43	-0.0
Kuliberg.	J	14628	1	319768	1068025	27.81	1.42	3.34	21.86	297018	15166	-10.43	-32.2
Kuliberg.	K	17314	1	335892	1121878	27.89	1.26	3.34	19.40	312892	14136	-49.60	-69.0
Kuliberg.	L	15716	1	377655	1287805	30.30	1.16	3.41	24.03	390205	14939	-66.24	-90.2
Kuliberg.	M	18454	1	227353	729804	20.50	1.07	3.21	12.32	149610	7809	-99.06	-111.3
Kuliberg.	N	9595	1	89902	308365	31.60	1.31	3.43	9.37	97443	4040	12.29	2.9
Kuliberg.	R	20210	1	131769	437474	26.00	1.15	3.32	6.52	113743	5031	-0.13	-6.6
Kuliberg.	S	16244	1	395217	1359545	32.21	1.40	3.44	24.33	437909	19034	-45.00	-69.3
Kuliberg.	T	13891	1	276153	927874	27.80	1.36	3.36	19.88	257949	12619	-79.50	-99.3
Kuliberg.	U	19899	1	390418	1323518	29.50	1.19	3.39	19.62	390438	15750	-102.78	-122.4
Kuliberg.	V	24583	1	233293	795528	30.88	1.07	3.41	9.49	245659	8512	-131.29	-140.7
Kuliberg.	Y	27241	1	502052	1732078	32.58	1.37	3.45	18.43	564311	23729	-51.95	-70.3
Kuliberg.	Z	13895	1	371969	1287013	32.72	1.48	3.46	26.77	421111	19048	-80.53	-107.3
Kuliberg.	27	12060	1	93344	322038	32.40	1.21	3.45	7.74	104340	3897	58.08	50.3
Kuliberg.	28	13170	1	288423	986407	31.20	1.25	3.42	21.90	307759	12330	-19.00	-40.9
Kuliberg.	29	16000	1	369760	1260882	30.60	1.32	3.41	23.11	385830	16644	-60.06	-83.1
Kuliberg.	AA	19259	1	301981	999558	26.93	1.10	3.31	15.68	269181	10995	-112.52	-128.2
Kuliberg.	AE	14486	1	328108	1109005	28.95	1.23	3.38	22.65	321057	13641	-109.35	-132.0
Kuliberg.	OE	17947	1	341711	1127646	27.79	1.32	3.30	19.04	313373	14885	-133.91	-152.9
Kuliberg.	102	1509	1	16073	55291	32.10	1.19	3.44	10.65	17748	658	43.00	32.3
Kuliberg.	112	8882	1	171062	585030	31.20	1.20	3.42	19.26	182530	7020	-1.24	-20.5
Kuliberg.	113	2867	1	54333	186364	31.40	1.51	3.43	18.95	58518	2814	2.93	-16.0

Kuliberg.	114	3170	1	56146	192581	32.25	1.52	3.43	17.71	62107	2927	11.25	-6.4
Kuliberg.	115	3402	1	67758	228344	28.30	1.20	3.37	19.92	64621	2740	20.00	0.0
Kuliberg.	116	7529	1	76868	264426	33.00	1.56	3.44	10.21	87261	4125	39.77	29.5
Kuliberg.	117	1670	1	14865	50689	30.70	1.48	3.41	8.90	15561	750	52.00	43.1
Kuliberg.	118	11239	1	88900	305818	31.80	1.52	3.44	7.91	97250	4648	59.00	51.0
Kuliberg.	120	1129	1	15550	52872	30.10	1.08	3.40	13.77	15914	571	38.60	24.8
Kuliberg.	121	2468	1	38741	133270	31.80	1.10	3.44	15.70	42380	1466	32.00	16.3
Kuliberg.	122	2742	1	53870	179389	26.30	0.59	3.33	19.65	47179	1058	27.00	7.3
Lia	8	19105	1	166214	561802	29.24	1.44	3.38	8.70	164271	8090	297.50	288.8
Lia	Q	17766	0	0	0	5.00	0.25	2.80	8.83	0	0	16.98	8.1
Lia	12	38612	1	278006	922981	26.10	1.09	3.32	7.20	240898	10060	263.20	256.0
Lia	15	26447	1	214221	700502	25.81	1.24	3.27	8.10	180799	8686	143.90	135.8
Lia	16	38365	1	395160	1307978	27.54	1.16	3.31	10.30	360217	15173	200.60	190.3
Lia	17	27965	1	251685	823010	25.76	1.04	3.27	9.00	212007	8559	149.00	140.0
Lia	18	33778	1	265157	864413	23.76	1.05	3.26	7.85	205384	9076	148.10	140.2
Lia	19	32400	1	181440	582422	20.30	0.83	3.21	5.60	118232	4834	54.30	48.7
Lia	20	45948	1	427316	1384505	21.72	1.12	3.24	9.30	300715	15506	39.55	30.2
Lia	21	2248	1	15198	50001	24.30	1.04	3.29	6.76	12150	520	-11.08	-17.8
Lia	23	31293	1	217799	740518	30.00	1.05	3.40	6.96	222155	7775	255.49	248.5
Lia	24	36091	1	273931	920407	28.00	1.12	3.36	7.59	257714	10309	193.14	185.5
Lia	25	36858	1	652755	2114927	24.73	0.99	3.24	17.71	523021	20938	132.46	114.7
Lia	26	22164	1	150050	507170	28.90	1.11	3.38	6.77	146572	5630	72.96	66.1
Lia	107	17752	1	73493	250612	30.70	1.28	3.41	4.14	76938	3208	230.74	226.6
Lia	111	7003	1	39566	131360	26.78	1.10	3.32	5.65	35178	1445	264.90	259.2
Total	Sum:	1069952	88	15165788	50782380	28.32	1.17	3.35	14.17	14380433	594676		
Lia	Sum:	433795	15	3601992	11862608	25.76	1.09	3.29	8.30	3056253	129810		
Gropa	Sum:	198146	38	4314800	14391848	28.28	1.06	3.34	21.78	4069555	152873		
Kulib	Sum:	438011	35	7248997	24527924	29.58	1.27	3.38	16.55	7254625	311993		

Andørja Ore Zone above Gropa/3/Kuliberget
Cut off 20 % Magnetite
DILUTED TO 3 M LENGTH

Area	Hole	Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Magn	P	Composites Elevation Top	Bottom
Gropa	9	7829	1	27793	88104	21.14	0.71	3.17	3.55	18625	626	337.10	333.55
Gropa	10	8644	1	39330	132149	28.00	1.02	3.36	4.55	37002	1348	339.35	334.80
Gropa	1C	9000	1	35550	119448	28.00	1.17	3.36	3.95	33445	1398	337.85	333.90
Gropa	1D	6401	1	32773	113065	32.40	1.24	3.45	5.12	36633	1402	331.92	326.80
Gropa	1F	11235	1	46064	155695	28.90	1.14	3.38	4.10	44996	1775	342.10	338.00
Gropa	1I	4815	1	25760	85782	26.70	1.26	3.33	5.35	22904	1081	333.20	327.85
Gropa	2E	3009	1	16939	55221	23.20	0.96	3.26	5.63	12811	530	344.75	339.12
Gropa	2F	5724	0	0	0	9.19	0.70	2.96	7.05	0	0	356.55	349.50
Gropa	2I	4071	1	10585	38422	41.60	1.37	3.63	2.60	15984	526	356.00	353.40
Gropa	3B	5877	1	17631	56447	20.57	0.87	3.20	3.00	13547	570	358.13	355.62
Gropa	3D	5303	1	16545	55427	27.30	1.09	3.35	3.12	15132	604	358.98	355.86
Gropa	3E	3113	1	9340	31351	28.30	1.04	3.36	3.00	9311	342	355.07	352.24
Gropa	3H	6691	1	34459	115436	27.50	1.11	3.35	5.15	31745	1281	360.75	355.60
Gropa	3I	5995	1	17985	63319	38.28	1.28	3.52	3.00	29760	994	362.85	360.55
Gropa	4B	5113	0	0	0	15.91	0.82	3.11	3.00	0	0	362.50	360.40
Gropa	4E	3872	0	0	0	18.20	0.66	3.16	3.45	0	0	372.00	368.55
Gropa	4F	3606	0	0	0	17.10	0.92	3.14	3.30	0	0	365.50	362.20
Gropa	4G	5207	0	0	0	6.70	0.65	2.93	7.23	0	0	359.60	352.37
Kuliberg.	A	9626	1	28878	91455	20.05	0.40	3.17	3.00	29448	594	-18.08	-19.80
Kuliberg.	F	13467	1	54676	182071	26.70	1.22	3.33	4.06	48613	2221	-30.14	-34.20
Kuliberg.	J	14628	0	0	0	8.50	0.79	2.97	3.46	0	0	1.31	-2.15
Kuliberg.	K	17314	1	81030	279552	32.30	1.25	3.45	4.68	90295	3494	-30.10	-34.78
Kuliberg.	L	15716	0	0	0	14.40	0.61	3.06	3.00	0	0	-48.28	-49.53
Kuliberg.	M	18454	0	0	0	17.32	0.85	3.12	3.00	0	0	-70.00	-71.80
Kuliberg.	T	13891	0	0	0	17.22	0.82	3.11	3.00	0	0	-57.87	-59.32
Kuliberg.	U	19899	1	61289	199802	23.20	0.95	3.26	3.08	46354	1898	-69.73	-72.81
Kuliberg.	V	24583	1	89728	301486	28.20	1.17	3.36	3.65	85019	3527	-102.38	-106.03
Kuliberg.	Y	27241	1	126943	427798	28.60	1.24	3.37	4.66	122350	5305	-25.65	-30.31
Kuliberg.	Z	13895	1	91707	306301	27.20	1.26	3.34	6.60	83314	3859	-57.90	-64.50
Kuliberg.	27	12060	0	0	0	16.71	0.63	3.12	3.00	0	0	70.16	68.25
Kuliberg.	29	16000	1	88480	299947	29.70	1.22	3.39	5.53	89084	3659	-37.50	-43.03
Kuliberg.	AA	19259	0	0	0	8.15	0.44	2.95	3.00	0	0	-92.40	-93.28

Kuliberg.	AE	14486	0	0	0	17.97	0.73	3.16	3.00	0	0	-73.02	-75.87
Kuliberg.	OE	17947	1	53841	183269	30.05	1.45	3.40	3.00	55531	2676	-112.48	-115.45
Lia	8	17488	1	97058	318352	24.20	0.88	3.28	5.55	77041	2801	316.55	311.00
Lia	15	26447	1	79341	276107	34.20	1.11	3.48	3.00	94428	3065	152.50	149.50
Lia	17	27965	1	134232	442966	25.91	1.12	3.30	4.80	114772	4961	158.10	153.30
Lia	18	33778	1	118223	407869	32.30	1.23	3.45	3.50	131742	5017	187.90	184.40
Lia	19	32400	1	174960	577368	27.13	1.01	3.30	5.40	156640	5831	77.90	72.50
Lia	21	2248	0	0	0	15.81	0.75	3.10	3.00	0	0	31.23	29.45
Lia	23	29830	0	0	0	6.70	0.53	2.93	4.50	0	0	286.73	282.23
Lia	25	26096	1	174060	586583	28.40	1.06	3.37	6.67	166590	6218	157.24	150.57
Lia	26	22164	1	100403	338358	28.30	1.02	3.37	4.53	95755	3451	83.41	78.88
Total	Sum:	592387	29	1885602	6329151	28.58	1.12	3.36	3.18	1808873	71056		
Lia	Sum:	218416	7	878278	2947602	28.39	1.06	3.36	4.02	836969	31345		
Kuliberg.	Sum:	268466	9	676571	2271682	28.61	1.20	3.36	2.52	650009	27235		
Gropa	Sum:	105504	13	330753	1109867	29.00	1.12	3.36	3.13	321895	12477		

Andørja Ore Zone 4
Cut off 20 % Magnetite
DILUTED TO 3 M

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Magn	P	Composites Elevation Top	Bottom
Kuliberg.	F	13467	0	0	0	13.50	0.69	3.07	8.93	0	0	5.20	-3.73
Kuliberg.	G	10929	1	125793	402537	20.10	0.86	3.20	11.51	80910	3462	-16.94	-28.45
Kuliberg.	H	20131	1	169100	547885	22.20	0.95	3.24	8.40	121631	5205	118.25	109.85
Kuliberg.	I	12834	1	88940	293501	24.80	1.24	3.30	6.93	72788	3639	89.34	82.41
Kuliberg.	J	14628	0	0	0	19.30	0.78	3.19	9.26	0	0	56.51	47.25
Kuliberg.	K	17314	0	0	0	19.90	0.80	3.20	3.00	0	0	15.90	13.00
Kuliberg.	L	15716	1	47148	155211	26.45	1.05	3.29	3.00	56186	2235	-14.80	-16.85
Kuliberg.	M	18454	1	87841	298660	30.00	1.24	3.40	4.76	89598	3703	-31.73	-36.49
Kuliberg.	N	9595	1	35308	113340	20.70	0.90	3.21	3.68	23461	1020	82.40	78.72
Kuliberg.	R	20210	1	143289	459957	20.60	0.80	3.21	7.09	94751	3680	76.23	69.14
Kuliberg.	S	16244	1	76834	252784	24.60	0.95	3.29	4.73	62185	2401	27.66	22.93
Kuliberg.	T	13891	1	104183	345886	26.00	1.29	3.32	7.50	89930	4462	-6.30	-13.80
Kuliberg.	U	19899	1	171131	580135	29.81	1.23	3.39	8.60	172938	7136	-35.02	-43.62
Kuliberg.	V	24583	1	104724	361296	32.40	1.19	3.45	4.26	117060	4299	-63.33	-67.59
Kuliberg.	Y	27241	1	81723	267790	23.71	0.95	3.28	3.00	63868	2571	20.98	18.00
Kuliberg.	Z	13895	1	50161	174560	36.72	1.08	3.48	3.61	64098	1885	-4.47	-8.08
Kuliberg.	28	13170	0	0	0	17.30	0.79	3.15	7.95	0	0	50.38	42.43
Kuliberg.	29	16000	1	64000	224640	35.60	1.13	3.51	4.00	79972	2538	6.00	2.00
Kuliberg.	AA	19259	1	113628	368155	22.00	0.82	3.24	5.90	80994	3019	-64.10	-70.00
Kuliberg.	AE	14486	1	53019	177083	27.20	1.11	3.34	3.66	48166	1966	-37.22	-40.88
Kuliberg.	OE	17947	1	220030	717299	22.92	1.17	3.26	12.26	164405	8392	-70.16	-82.42
Lia	Q	17766	1	161671	523813	21.90	0.85	3.24	9.10	114715	4452	84.10	75.00
Lia	19	32400	1	106920	360320	28.40	0.91	3.37	3.30	102331	3279	88.95	85.65
Lia	20	45948	1	137844	439860	20.12	0.70	3.19	3.00	111285	3871	90.95	88.65
Lia	21	2248	1	18186	58924	22.20	0.92	3.24	8.09	13081	542	58.55	50.46
Total	Sum:	448255	21	2161473	7123637	25.61	1.04	3.30	4.82	1824355	73758		
Lia	Sum:	98362	4	424621	1382917	24.69	0.88	3.26	4.32	341412	12144		
Kuliberg.	Sum:	349893	17	1736852	5740720	25.83	1.07	3.31	4.96	1482943	61614		

Andørja Ore Zone 5
Cut off 20 %/ 25 % Magnetite
DILUTED TO 3 M LENGTH

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Composites Elevation Top	Bottom
Kuliberg.	F	13467	0	0	0	9.70	0.58	2.99	9.20	0	0	17.94	8.74
Kuliberg.	H	20131	0	0	0	9.55	0.48	2.99	3.00	0	0	129.08	127.00
Kuliberg.	J	14628	0	0	0	9.70	0.49	2.99	7.56	0	0	69.90	62.34
Kuliberg.	K	17314	0	0	0	10.80	0.54	3.02	7.73	0	0	31.80	24.07
Kuliberg.	R	20210	0	0	0	7.80	0.47	2.96	4.24	0	0	84.91	80.67
Kuliberg.	S	16244	0	0	0	14.80	0.64	3.10	6.84	0	0	37.91	31.07
Kuliberg.	T	13891	0	0	0	11.30	0.70	3.03	8.96	0	0	6.80	-2.16
Kuliberg.	V	24583	0	0	0	17.90	0.69	3.16	4.68	0	0	-49.02	-53.7
Kuliberg.	Y	27241	0	0	0	14.45	0.56	3.09	4.56	0	0	38.21	33.65
Kuliberg.	Z	13895	0	0	0	11.20	0.50	3.02	5.88	0	0	3.59	-2.29
Kuliberg.	28	13170	0	0	0	12.40	0.59	3.05	6.73	0	0	61.90	55.17
Kuliberg.	AA	19259	0	0	0	13.00	0.59	3.06	3.49	0	0	-52.86	-56.35
Kuliberg.	AE	14486	0	0	0	9.20	0.55	2.98	3.59	0	0	-26.29	-29.88
Lia	17	27965	1	102072	358274	35.30	0.88	3.51	3.65	126471	3153	191.50	187.85
Lia	19	32400	0	0	0	14.61	0.61	3.06	3.00	0	0	119.10	118.00
Lia	20	45948	0	0	0	17.19	0.58	3.11	3.00	0	0	97.82	96.45
Lia	21	2248	0	0	0	11.27	0.60	3.03	3.00	0	0	66.87	63.88
Total	Sum:	337080	1	102072	358274	35.30	0.88	3.51	0.30	126471	3153		
Lia	Sum:	108561	1	102072	358274	35.30	0.88	3.51	0.94	126471	3153		
Kuliberg.	Sum:	215052	0	0	0	ERR	ERR	ERR	0.00	0	0		

Andørja
Andørja Ore Zone 6
Cut off 20 % Magnetite
DILUTED TO 3 M LENGTH

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Composites Elevation Top	Bottom
Kuliberg.	F	13467	0	0	0	9.70	0.58	2.99	9.20	0	0	17.94	8.7
Kuliberg.	H	20131	0	0	0	9.55	0.48	2.99	3.00	0	0	129.08	127.0
Kuliberg.	J	14628	1	53100	177884	27.60	1.12	3.35	3.63	49096	1992	87.10	83.4
Kuliberg.	K	17314	1	72719	241426	26.00	0.51	3.32	4.20	62771	1231	57.48	53.2
Kuliberg.	L	15716	1	212009	686909	22.10	0.94	3.24	13.49	151807	6457	18.84	5.3
Kuliberg.	M	18454	1	59791	211062	36.70	1.30	3.53	3.24	77460	2744	-6.26	-9.5
Kuliberg.	T	13891	1	105433	344765	23.30	1.18	3.27	7.59	80330	4068	22.10	14.5
Kuliberg.	U	19899	1	264657	905126	31.20	1.25	3.42	13.30	282399	11314	-1.00	-14.3
Kuliberg.	V	24583	1	112098	395708	36.60	1.38	3.53	4.56	144829	5461	-26.10	-30.6
Kuliberg.	Z	13895	0	0	0	15.23	0.72	3.10	3.00	0	0	13.84	11.0
Kuliberg.	29	16000	1	51840	166925	21.20	0.86	3.22	3.24	35388	1436	28.97	25.7
Kuliberg.	AA	19259	1	89747	295267	24.40	1.05	3.29	4.66	72045	3100	-39.79	-44.4
Kuliberg.	AE	14486	0	0	0	17.30	0.81	3.15	6.28	0	0	-15.00	-21.2
Kuliberg.	OE	17947	1	107682	361812	29.03	1.37	3.36	6.00	105034	4957	-43.11	-49.1
Lia	19	32400	1	158760	509620	21.02	0.84	3.21	4.90	107122	4281	119.10	114.2
Lia	20	45948	0	0	0	7.94	0.48	2.96	3.92	0	0	104.57	100.6
Lia	21	2248	0	0	0	11.99	0.53	3.03	3.00	0	0	74.39	72.3
Total	Sum:	320266	11	1287835	4296503	27.19	1.09	3.34	4.02	1168281	47041		
Lia	Sum:	80596	1	158760	509620	21.02	0.84	3.21	1.97	107122	4281		
Kuliberg	Sum:	239670	10	1129075	3786883	28.02	1.13	3.35	4.71	1061159	42760		

Gropa	5D	6498	0	0	0	20.80	0.92	3.22	5.80	0	0	324.70	318.90	
Gropa	5E	2760	0	0	0	20.10	0.66	3.20	5.15	0	0	319.53	314.38	
Gropa	5F	2877	0	0	0	15.18	0.86	3.10	6.40	0	0	313.95	307.55	
Gropa	5G	2035	0	0	0	16.02	0.83	3.11	3.00	0	0	304.00	301.40	
Gropa	5H	4414	0	0	0	3.92	0.19	2.87	3.00	0	0	309.27	308.87	
Gropa	6D	1643	0	0	0	33.29	1.57	3.45	3.00	0	0	349.80	347.05	
Gropa	6F	2886	0	0	0	11.23	0.52	3.01	3.00	0	0	340.15	338.60	
Gropa	7F	3953	0	0	0	11.50	0.68	3.03	4.12	0	0	350.40	346.28	
Gropa	7H	7234	0	0	0	24.34	0.95	3.25	3.08	0	0	349.30	346.22	
Gropa	123	10521	0	0	0	10.72	0.44	3.01	3.00	0	0	355.59	352.70	
Gropa	124	9118	0	0	0	18.50	0.72	3.17	3.38	0	0	337.83	334.45	
Gropa	125	5093	0	0	0	17.30	0.74	3.15	3.70	0	0	327.95	324.25	
Gropa	126	4180	0	0	0	23.80	0.82	3.28	4.00	0	0	314.50	310.50	

Kuliberg.	A	9606	0	0	0	15.60	1.34	3.11	5.59	0	0	-57.89	-63.48
Kuliberg.	D	16049	0	0	0	8.98	0.41	2.90	5.93	0	0	-24.69	-30.62
Kuliberg.	F	13467	0	0	0	12.60	0.65	3.05	6.86	0	0	-72.50	-79.36
Kuliberg.	H	21458	0	0	0	21.70	0.75	3.23	3.62	0	0	41.30	37.68
Kuliberg.	I	13400	0	0	0	16.20	0.73	3.12	7.18	0	0	-3.44	-10.62
Kuliberg.	J	14628	0	0	0	13.50	0.73	3.07	5.31	0	0	-35.62	-40.93
Kuliberg.	K	17314	0	0	0	12.70	0.76	3.05	3.10	0	0	-74.60	-77.70
Kuliberg.	L	15716	0	0	0	5.98	0.28	2.91	3.00	0	0	-98.64	-99.68
Kuliberg.	M	18454	0	0	0	15.25	0.86	3.10	3.33	0	0	-121.33	-124.66
Kuliberg.	N	9595	0	0	0	18.80	0.75	3.18	5.78	0	0	-4.83	-10.61
Kuliberg.	R	20210	0	0	0	20.40	0.81	3.21	5.16	0	0	-12.57	-17.73
Kuliberg.	S	16244	0	0	0	15.20	0.70	3.10	5.96	0	0	-72.57	-78.53
Kuliberg.	T	13891	0	0	0	13.20	0.78	3.06	6.00	0	0	-101.23	-107.23
Kuliberg.	U	19899	0	0	0	12.05	0.55	3.04	3.00	0	0	-123.26	-125.71
Kuliberg.	V	24583	0	0	0	6.78	0.33	2.93	3.00	0	0	-146.65	-147.93
Kuliberg.	Y	27241	0	0	0	21.00	0.83	3.22	4.19	0	0	-92.10	-96.29
Kuliberg.	Z	13895	0	0	0	11.38	0.55	3.02	3.00	0	0	-123.70	-125.67
Kuliberg.	AA	19259	1	301981	999558	26.93	1.10	3.31	15.68	269181	10995	-129.71	-130.90
Kuliberg.	AE	14486	0	0	0	12.53	0.52	3.01	3.00	0	0	-138.00	-140.73
Kuliberg.	OE	17947	0	0	0	4.50	0.25	2.88	3.00	0	0	-157.36	-158.62
Kuliberg.	102	2785	0	0	0	17.33	0.76	3.13	8.50	0	0	26.30	17.80
Kuliberg.	103	10191	0	0	0	19.50	0.84	3.19	7.90	0	0	75.00	67.10
Kuliberg.	112	8793	0	0	0	13.88	0.67	3.06	6.40	0	0	-24.35	-30.75
Kuliberg.	114	3150	0	0	0	13.20	0.66	3.06	8.12	0	0	-11.54	-19.66
Kuliberg.	115	3859	0	0	0	22.80	0.67	3.26	5.61	0	0	-5.23	-10.84
Kuliberg.	116	7529	0	0	0	16.00	0.64	3.12	7.53	0	0	23.85	16.32
Kuliberg.	117	2359	0	0	0	14.10	0.81	3.08	11.08	0	0	39.86	28.78
Kuliberg.	118	5210	0	0	0	16.10	0.89	3.12	10.60	0	0	49.00	38.40
Kuliberg.	119	5076	0	0	0	19.70	0.70	3.19	10.78	0	0	66.00	55.22
Kuliberg.	120	1130	0	0	0	15.30	0.63	3.11	7.55	0	0	18.63	11.08
Kuliberg.	121	3116	0	0	0	12.80	0.60	3.06	8.19	0	0	11.79	3.60
Kuliberg.	122	3424	0	0	0	13.20	0.73	3.06	8.08	0	0	5.28	-2.80
Lia	8	19412	1	100942	351280	33.90	0.68	3.48	5.20	119084	2389	262.00	256.80
Lia	Q	17766	0	0	0	24.10	0.97	3.28	5.01	0	0	25.63	20.62
Lia	12	38633	0	0	0	17.40	0.95	3.15	3.00	0	0	232.70	229.70
Lia	15	26447	0	0	0	12.20	0.56	3.04	7.80	0	0	103.50	95.70
Lia	16	38365	0	0	0	20.54	0.78	3.19	6.80	0	0	178.80	172.00

Andørja
Ore Zone 3 + Kuliberget+Gropa
Cut off 25 % Magnetite
Minimum 3 m length

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Elevation Composites Top	Bottom
Gropa	4	5451	1	119109	395441	27.06	1.31	3.32	21.85	107006	5180	335.85	314.
Gropa	9	7630	1	83166	275279	28.06	1.07	3.31	10.90	77243	2945	316.70	305.
Gropa	10	8644	1	50997	168801	27.79	1.06	3.31	5.90	46910	1789	311.50	305.
Gropa	11	9148	1	187528	613216	25.45	1.24	3.27	20.50	156063	7604	296.90	276.
Gropa	1C	9000	1	172626	573118	28.47	1.02	3.32	19.18	163167	5846	318.86	299.
Gropa	1D	6401	0	0	0	23.19	0.81	3.16	3.00	0	0	310.48	308.
Gropa	1F	11043	1	122136	410376	27.80	0.99	3.36	11.06	114084	4063	318.90	307.
Gropa	1I	4815	1	60912	202838	26.70	1.04	3.33	12.65	54158	2110	311.35	298.
Gropa	2E	3009	1	46996	162136	32.70	1.16	3.45	15.62	53018	1881	312.45	296.
Gropa	2F	4075	1	22207	75724	30.70	1.19	3.41	5.45	23247	901	326.50	321.
Gropa	2I	4071	1	41201	138434	28.00	1.10	3.36	10.12	38761	1523	330.06	319.
Gropa	3A	206	0	0	0	23.56	1.16	3.17	3.00	0	0	365.18	362.
Gropa	3B	5877	1	100208	336699	28.67	1.24	3.36	17.05	96532	4175	342.55	325.
Gropa	3C	4236	1	95691	330135	32.86	1.31	3.45	22.59	108482	4325	344.79	322.
Gropa	3D	4118	1	110609	380497	32.56	1.30	3.44	26.86	123890	4946	341.58	314.
Gropa	3E	3113	1	70176	242107	34.24	1.27	3.45	22.54	82898	3075	333.12	310.
Gropa	3H	4324	1	51672	177751	32.00	1.29	3.44	11.95	56880	2293	335.95	324.
Gropa	3I	5995	1	149863	512530	32.57	1.15	3.42	25.00	166931	5894	338.00	313.
Gropa	4B	5028	1	55156	184773	27.40	1.13	3.35	10.97	50628	2088	345.12	334.
Gropa	4D	3577	1	51326	182719	38.20	1.52	3.56	14.35	69799	2777	345.40	331.
Gropa	4E	3099	1	68944	237167	32.88	1.31	3.44	22.25	77980	3107	348.20	325.
Gropa	4F	3605	1	77618	263124	30.04	1.14	3.39	21.53	79043	3000	341.70	320.
Gropa	4G	4163	1	119214	406520	31.64	1.29	3.41	28.64	128623	5244	343.10	314.
Gropa	4I	13656	1	104468	387578	45.60	1.53	3.71	7.65	176735	5930	340.00	332.
Gropa	5D	4807	1	138676	470112	30.40	1.13	3.39	28.85	142914	5312	369.00	340.
Gropa	5E	2755	1	25898	91161	36.00	1.03	3.52	9.40	32818	939	367.00	357.
Gropa	5F	2877	1	61141	210323	32.58	1.54	3.44	21.25	68523	3239	365.00	343.
Gropa	5G	2035	1	36878	127597	33.10	1.22	3.46	18.12	42235	1557	355.32	337.
Gropa	5H	4415	1	37170	134556	41.40	1.51	3.62	8.42	55706	2032	337.07	328.
Gropa	6D	1219	0	0	0	0.00	0.00	2.80	3.00	0	0	364.84	349.

Gropa	6E	2560	1	11903	41899	35.80	1.14	3.52	4.65	15000	478	370.50	365.
Gropa	6F	2886	1	33800	113229	28.96	0.87	3.35	11.71	32791	985	356.95	345.
Gropa	6G	3379	1	96023	325517	30.42	0.99	3.39	28.42	99022	3223	369.00	340.
Gropa	7F	1797	1	5390	16602	19.65	0.77	3.08	3.00	6956	274	369.50	368.
Gropa	7H	3167	1	9501	30822	31.74	0.94	3.24	3.00	11404	336	367.00	365.
Gropa	110	9106	1	40523	136966	29.20	1.31	3.38	4.45	39994	1794	322.55	318.
Gropa	123	4281	1	25685	93495	42.20	1.24	3.64	6.00	39455	1159	376.00	370.
Gropa	124	8033	1	57197	203050	37.60	1.26	3.55	7.12	76347	2558	365.15	358.
Gropa	125	5093	1	78375	269610	32.74	1.01	3.44	15.39	88270	2723	356.94	341.
Gropa	126	4180	1	133828	452337	30.38	0.90	3.38	32.02	137420	4071	360.00	327.
Gropa	5/6D	1481	1	34446	113326	26.69	0.90	3.29	23.26	30247	1020	371.00	347.
Kuliberg.	A	9626	1	87598	311850	38.10	1.25	3.56	9.10	118815	3898	-34.90	-44.
Kuliberg.	D	16049	1	346819	1165311	28.36	1.32	3.36	21.61	330482	15382	7.16	-14.
Kuliberg.	F	13467	1	260990	895197	31.30	1.25	3.43	19.38	280197	11190	-50.92	-70.
Kuliberg.	G	10929	1	36721	124118	28.80	1.20	3.38	3.36	35746	1489	-83.70	-87.
Kuliberg.	H	23342	0	0	0	20.70	1.09	3.21	9.83	0	0	58.53	48.
Kuliberg.	I	13400	1	167500	581225	33.70	1.43	3.47	12.50	195873	8312	12.43	-0.
Kuliberg.	J	14628	1	256283	863672	28.60	1.54	3.37	17.52	247010	13301	-10.43	-27.
Kuliberg.	K	17314	1	215732	742120	32.00	1.40	3.44	12.46	237478	10390	-56.54	-69.
Kuliberg.	L	15716	1	377655	1287805	30.30	1.16	3.41	24.03	390205	14939	-66.24	-90.
Kuliberg.	M	18454	0	0	0	20.50	1.07	3.21	12.32	0	0	-99.06	-111.
Kuliberg.	N	9595	1	89902	308365	31.60	1.31	3.43	9.37	97443	4040	12.29	2.
Kuliberg.	R	20210	1	131769	437474	26.00	1.15	3.32	6.52	113743	5031	-0.13	-6.
Kuliberg.	S	16244	1	350058	1218203	33.80	1.47	3.48	21.55	411752	17908	-45.00	-66.
Kuliberg.	T	13891	1	276153	927874	27.80	1.36	3.36	19.88	257949	12619	-79.50	-99.
Kuliberg.	U	19899	1	390418	1323518	29.50	1.19	3.39	19.62	390438	15750	-102.78	-122.
Kuliberg.	V	24583	1	227639	780800	31.40	1.09	3.43	9.26	245171	8511	-131.52	-140.
Kuliberg.	Y	27241	1	502052	1732078	32.58	1.37	3.45	18.43	564311	23729	-51.95	-70.
Kuliberg.	Z	13895	1	371969	1287013	32.72	1.48	3.46	26.77	421111	19048	-80.53	-107.
Kuliberg.	27	12060	1	93344	322038	32.40	1.21	3.45	7.74	104340	3897	58.08	50.
Kuliberg.	28	13170	1	288423	986407	31.20	1.25	3.42	21.90	307759	12330	-19.00	-40.
Kuliberg.	29	16000	1	369760	1260882	30.60	1.32	3.41	23.11	385830	16644	-60.06	-83.
Kuliberg.	AA	19259	1	152339	517952	30.35	1.28	3.40	7.91	157198	6630	-120.29	-128.
Kuliberg.	AE	14486	1	328108	1109005	28.95	1.23	3.38	22.65	321057	13641	-109.35	-132.
Kuliberg.	OE	17947	1	281229	933682	28.40	1.35	3.32	15.67	265166	12605	-137.28	-152.
Kuliberg.	102	1509	1	16073	55291	32.10	1.19	3.44	10.65	17748	658	43.00	32.
Kuliberg.	112	8882	1	171062	585030	31.20	1.20	3.42	19.26	182530	7020	-1.24	-20.

Kuliberg.	113	2867	1	54333	186364	31.40	1.51	3.43	18.95	58518	2814	2.93	-16.
Kuliberg.	114	3170	1	55132	189652	32.59	1.54	3.44	17.39	61808	2921	11.25	-6.
Kuliberg.	115	3402	1	67758	228344	28.30	1.20	3.37	19.92	64621	2740	20.00	0.
Kuliberg.	116	7529	1	76190	262095	33.19	1.57	3.44	10.12	86989	4115	39.68	29.
Kuliberg.	117	1670	1	14865	50689	30.70	1.48	3.41	8.90	15561	750	52.00	43.
Kuliberg.	118	11239	1	88900	305818	31.80	1.52	3.44	7.91	97250	4648	59.00	51.
Kuliberg.	120	1129	1	15550	52872	30.10	1.08	3.40	13.77	15914	571	38.60	24.
Kuliberg.	121	2468	1	38741	133270	31.80	1.10	3.44	15.70	42380	1466	32.00	16.
Kuliberg.	122	2742	1	53870	179389	26.30	0.59	3.33	19.65	47179	1058	27.00	7.
Lia	8	19105	1	166214	561802	29.24	1.44	3.38	8.70	164271	8090	297.50	288.
Lia	Q	17766	0	0	0	24.10	0.97	3.28	5.01	0	0	25.63	20.
Lia	12	38612	1	278006	922981	26.10	1.09	3.32	7.20	240898	10060	263.20	256.
Lia	15	26447	1	116367	387501	28.08	1.35	3.33	4.40	108810	5231	140.20	135.
Lia	16	38365	1	268555	918458	31.47	1.31	3.42	7.00	289039	12032	197.30	190.
Lia	17	27965	1	191560	634064	27.51	1.07	3.31	6.85	174431	6784	146.85	140.
Lia	18	33778	1	135112	447221	26.86	1.16	3.31	4.00	120123	5188	148.10	144.
Lia	19	32400	0	0	0	20.30	0.83	3.21	5.60	0	0	54.30	48.
Lia	20	45948	0	0	0	21.72	1.12	3.24	9.30	0	0	39.55	30.
Lia	21	2248	0	0	0	24.30	1.04	3.29	6.76	0	0	-11.08	-17.
Lia	23	31293	1	217799	740518	30.00	1.05	3.40	6.96	222155	7775	255.49	248.
Lia	24	36091	1	273931	920407	28.00	1.12	3.36	7.59	257714	10309	193.14	185.
Lia	25	36858	1	363051	1205330	27.08	1.10	3.32	9.85	326403	13259	124.60	114.
Lia	26	22164	1	150050	507170	28.90	1.11	3.38	6.77	146572	5630	72.96	66.
Lia	107	17752	1	73493	250612	30.70	1.28	3.41	4.14	76938	3208	230.74	226.
Lia	111	7003	1	39566	131360	26.78	1.10	3.32	5.65	35178	1445	264.90	259.
	Sum:	1070159	83	11316898	38460393	30.43	1.25	3.40	10.57	11703290	481449		
Lia	Sum:	433795	12	2273705	7627425	28.35	1.17	3.35	5.24	2162534	89011		
Kuliberg.	Sum:	438011	33	6254939	21345404	30.78	1.31	3.41	14.28	6569575	280043		
Gropa	Sum:	198352	38	2788254	9487564	31.32	1.18	3.40	14.06	2971182	112396		

Andørja Ore Zone above Gropa/3/Kuliberget
Cut off 25 % Magnetite
DILUTED TO 3 M LENGTH

Area	Hole	Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Magn	P	Composites Elevation Top	Bottom
Gropa	9	7829	0	0	0	21.14	0.71	3.17	3.55	0	0	337.10	333.55
Gropa	10	8644	1	39330	132149	28.00	1.02	3.36	4.55	37002	1348	339.35	334.80
Gropa	1C	9000	1	35550	119448	28.00	1.17	3.36	3.95	33445	1398	337.85	333.90
Gropa	1D	6401	1	32773	113065	32.40	1.24	3.45	5.12	36633	1402	331.92	326.80
Gropa	1F	11235	1	46064	155695	28.90	1.14	3.38	4.10	44996	1775	342.10	338.00
Gropa	1I	4815	1	25760	85782	26.70	1.26	3.33	5.35	22904	1081	333.20	327.85
Gropa	2E	3009	0	0	0	23.20	0.96	3.26	5.63	0	0	344.75	339.12
Gropa	2F	5724	0	0	0	9.19	0.70	2.96	7.05	0	0	356.55	349.50
Gropa	2I	4071	1	10585	38422	41.60	1.37	3.63	2.60	15984	526	356.00	353.40
Gropa	3B	5877	0	0	0	20.57	0.87	3.20	3.00	0	0	358.13	355.62
Gropa	3D	5303	1	16545	55427	27.30	1.09	3.35	3.12	15132	604	358.98	355.86
Gropa	3E	3113	1	9340	31351	28.30	1.04	3.36	3.00	9311	342	355.07	352.24
Gropa	3H	6691	1	34459	115436	27.50	1.11	3.35	5.15	31745	1281	360.75	355.60
Gropa	3I	5995	1	17985	63319	38.28	1.28	3.52	3.00	29760	994	362.85	360.55
Gropa	4B	5113	0	0	0	15.91	0.82	3.11	3.00	0	0	362.50	360.40
Gropa	4E	3872	0	0	0	18.20	0.66	3.16	3.45	0	0	372.00	368.55
Gropa	4F	3606	0	0	0	17.10	0.92	3.14	3.30	0	0	365.50	362.20
Gropa	4G	5207	0	0	0	6.70	0.65	2.93	7.23	0	0	359.60	352.37
Kuliberg.	A	9626	0	0	0	20.05	0.40	3.17	3.00	0	0	-18.08	-19.80
Kuliberg.	F	13467	1	54676	182071	26.70	1.22	3.33	4.06	48613	2221	-30.14	-34.20
Kuliberg.	J	14628	0	0	0	8.50	0.79	2.97	3.46	0	0	1.31	-2.15
Kuliberg.	K	17314	1	81030	279552	32.30	1.25	3.45	4.68	90295	3494	-30.10	-34.78
Kuliberg.	L	15716	0	0	0	14.40	0.61	3.06	3.00	0	0	-48.28	-49.53
Kuliberg.	M	18454	0	0	0	17.32	0.85	3.12	3.00	0	0	-70.00	-71.80
Kuliberg.	T	13891	0	0	0	17.22	0.82	3.11	3.00	0	0	-57.87	-59.32
Kuliberg.	U	19899	0	0	0	23.20	0.95	3.26	3.08	0	0	-69.73	-72.81
Kuliberg.	V	24583	1	89728	301486	28.20	1.17	3.36	3.65	85019	3527	-102.38	-106.03
Kuliberg.	Y	27241	1	126943	427798	28.60	1.24	3.37	4.66	122350	5305	-25.65	-30.31
Kuliberg.	Z	13895	1	91707	306301	27.20	1.26	3.34	6.60	83314	3859	-57.90	-64.50
Kuliberg.	27	12060	0	0	0	16.71	0.63	3.12	3.00	0	0	70.16	68.25
Kuliberg.	29	16000	1	88480	299947	29.70	1.22	3.39	5.53	89084	3659	-37.50	-43.03
Kuliberg.	AA	19259	0	0	0	8.15	0.44	2.95	3.00	0	0	-92.40	-93.28

Kuliberg.	AE	14486	0	0	0	17.97	0.73	3.16	3.00	0	0	-73.02	-75.87
Kuliberg.	OE	17947	1	53841	183269	30.05	1.45	3.40	3.00	55531	2676	-112.48	-115.45
Lia	8	17488	0	0	0	24.20	0.88	3.28	5.55	0	0	316.55	311.00
Lia	15	26447	1	79341	276107	34.20	1.11	3.48	3.00	94428	3065	152.50	149.50
Lia	17	27965	1	134232	442966	25.91	1.12	3.30	4.80	114772	4961	158.10	153.30
Lia	18	33778	1	118223	407869	32.30	1.23	3.45	3.50	131742	5017	187.90	184.40
Lia	19	32400	1	174960	577368	27.13	1.01	3.30	5.40	156640	5831	77.90	72.50
Lia	21	2248	0	0	0	15.81	0.75	3.10	3.00	0	0	31.23	29.45
Lia	23	29830	0	0	0	6.70	0.53	2.93	4.50	0	0	286.73	282.23
Lia	25	26096	1	174060	586583	28.40	1.06	3.37	6.67	166590	6218	157.24	150.57
Lia	26	22164	1	100403	338358	28.30	1.02	3.37	4.53	95755	3451	83.41	78.88
Total	Sum:	592387	23	1636014	5519771	29.19	1.16	3.37	2.76	1611045	64036		
Lia	Sum:	218416	6	781219	2629251	28.90	1.09	3.37	3.58	759928	28543		
Kuliberg.	Sum:	268466	7	586405	1980425	28.99	1.25	3.38	2.18	574206	24742		
Gropa	Sum:	105504	10	268390	910095	30.43	1.18	3.39	2.54	276911	10751		

Andørja Ore Zone 4
Cut off 25 % Magnetite
DILUTED TO 3 M

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Magn	P	Composites Elevation Top	Bottom
Kuliberg.	F	13467	0	0	0	13.50	0.69	3.07	8.93	0	0	5.20	-3.73
Kuliberg.	G	10929	0	0	0	20.10	0.86	3.20	11.51	0	0	-16.94	-28.45
Kuliberg.	H	20131	0	0	0	22.20	0.95	3.24	8.40	0	0	118.25	109.85
Kuliberg.	I	12834	0	0	0	24.80	1.24	3.30	6.93	0	0	89.34	82.41
Kuliberg.	J	14628	0	0	0	19.30	0.78	3.19	9.26	0	0	56.51	47.25
Kuliberg.	K	17314	0	0	0	19.90	0.80	3.20	3.00	0	0	15.90	13.00
Kuliberg.	L	15716	1	47148	155211	26.45	1.05	3.29	3.00	56186	2235	-14.80	-16.85
Kuliberg.	M	18454	1	87841	298660	30.00	1.24	3.40	4.76	89598	3703	-31.73	-36.49
Kuliberg.	N	9595	0	0	0	20.70	0.90	3.21	3.68	0	0	82.40	78.72
Kuliberg.	R	20210	0	0	0	20.60	0.80	3.21	7.09	0	0	76.23	69.14
Kuliberg.	S	16244	0	0	0	24.60	0.95	3.29	4.73	0	0	27.66	22.93
Kuliberg.	T	13891	1	104183	345886	26.00	1.29	3.32	7.50	89930	4462	-6.30	-13.80
Kuliberg.	U	19899	1	171131	580135	29.81	1.23	3.39	8.60	172938	7136	-35.02	-43.62
Kuliberg.	V	24583	1	104724	361296	32.40	1.19	3.45	4.26	117060	4299	-63.33	-67.59
Kuliberg.	Y	27241	0	0	0	23.71	0.95	3.28	3.00	0	0	20.98	18.00
Kuliberg.	Z	13895	1	50161	174560	36.72	1.08	3.48	3.61	64098	1885	-4.47	-8.08
Kuliberg.	28	13170	0	0	0	17.30	0.79	3.15	7.95	0	0	50.38	42.43
Kuliberg.	29	16000	1	64000	224640	35.60	1.13	3.51	4.00	79972	2538	6.00	2.00
Kuliberg.	AA	19259	0	0	0	22.00	0.82	3.24	5.90	0	0	-64.10	-70.00
Kuliberg.	AE	14486	1	53019	177083	27.20	1.11	3.34	3.66	48166	1966	-37.22	-40.88
Kuliberg.	OE	17947	0	0	0	22.92	1.17	3.26	12.26	0	0	-70.16	-82.42
Lia	Q	17766	0	0	0	21.90	0.85	3.24	9.10	0	0	84.10	75.00
Lia	19	32400	1	106920	360320	28.40	0.91	3.37	3.30	102331	3279	88.95	85.65
Lia	20	45948	0	0	0	20.12	0.70	3.19	3.00	0	0	90.95	88.65
Lia	21	2248	0	0	0	22.20	0.92	3.24	8.09	0	0	58.55	50.46
Total	Sum:	448255	9	789126	2677792	30.63	1.18	3.39	1.76	820281	31504		
Lia	Sum:	98362	1	106920	360320	28.40	0.91	3.37	1.09	102331	3279		
Kuliberg.Sum:		349893	8	682206	2317471	30.98	1.22	3.40	1.95	717950	28225		

Andørja
Andørja Ore Zone 6
Cut off 25 % Magnetite
DILUTED TO 3 M LENGTH

		Area	1/0	Volume	Tonnes	% Magn	%P	Spg	Thick	Tons Magn	Tons P	Composites Elevation Top	Bottom
Kuliberg.	F	13467	0	0	0	9.70	0.58	2.99	9.20	0	0	17.94	8.7
Kuliberg.	H	20131	0	0	0	9.55	0.48	2.99	3.00	0	0	129.08	127.0
Kuliberg.	J	14628	1	53100	177884	27.60	1.12	3.35	3.63	49096	1992	87.10	83.4
Kuliberg.	K	17314	1	72719	241426	26.00	0.51	3.32	4.20	62771	1231	57.48	53.2
Kuliberg.	L	15716	0	0	0	22.10	0.94	3.24	13.49	0	0	18.84	5.3
Kuliberg.	M	18454	1	59791	211062	36.70	1.30	3.53	3.24	77460	2744	-6.26	-9.5
Kuliberg.	T	13891	0	0	0	23.30	1.18	3.27	7.59	0	0	22.10	14.5
Kuliberg.	U	19899	1	264657	905126	31.20	1.25	3.42	13.30	282399	11314	-1.00	-14.3
Kuliberg.	V	24583	1	112098	395708	36.60	1.38	3.53	4.56	144829	5461	-26.10	-30.6
Kuliberg.	Z	13895	0	0	0	15.23	0.72	3.10	3.00	0	0	13.84	11.0
Kuliberg.	29	16000	0	0	0	21.20	0.86	3.22	3.24	0	0	28.97	25.7
Kuliberg.	AA	19259	0	0	0	24.40	1.05	3.29	4.66	0	0	-39.79	-44.4
Kuliberg.	AE	14486	0	0	0	17.30	0.81	3.15	6.28	0	0	-15.00	-21.2
Kuliberg.	OE	17947	1	107682	361812	29.03	1.37	3.36	6.00	105034	4957	-43.11	-49.1
Lia	19	32400	0	0	0	21.02	0.84	3.21	4.90	0	0	119.10	114.2
Lia	20	45948	0	0	0	7.94	0.48	2.96	3.92	0	0	104.57	100.6
Lia	21	2248	0	0	0	11.99	0.53	3.03	3.00	0	0	74.39	72.3
Total	Sum:	320266	6	670047	2293017	31.47	1.21	3.42	2.09	721589	27699		
Lia	Sum:	80596	0	0	0	ERR	ERR	ERR	0.00	0	0		
Kuliberg	Sum:	239670	6	670047	2293017	31.47	1.21	3.42	2.80	721589	27699		

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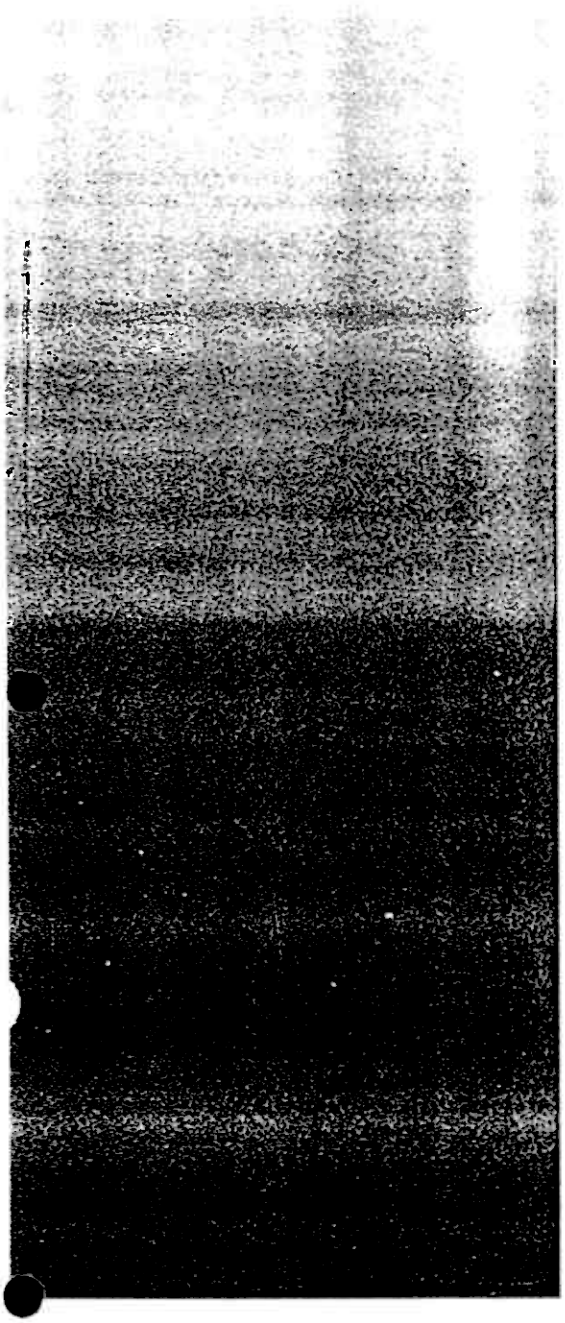

Rock Mechanics Investigations at the Andørja Iron Ore Deposit

1991-04-08

SINTEF

Rock and Mineral Engineering

RAPPORT

RAPPORT

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Abstract

This report present results from in-situ rock stress measurements, laboratory material property tests and Boundary Element analysis at the Andørja Iron Ore Deposit.

Depending on the selected mining method the span of the stopes must be within 15 - 20 m and a pillar width of 12 - 15 m.

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Group 1	Rock and Mineral Eng.	Bergteknikk
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Div. Director

CONTENT

1 GENERAL

This report describes results from in-situ rock stress measurements, laboratory material property tests and Boundary Element (BEM) analysis at the Andørja Iron Ore Deposit. The work has been carried out by the staff of SINTEF Division of Rock and Mineral Engineering. The main objective with the investigation is to give recommendations with regard to stope and pillar dimensions.

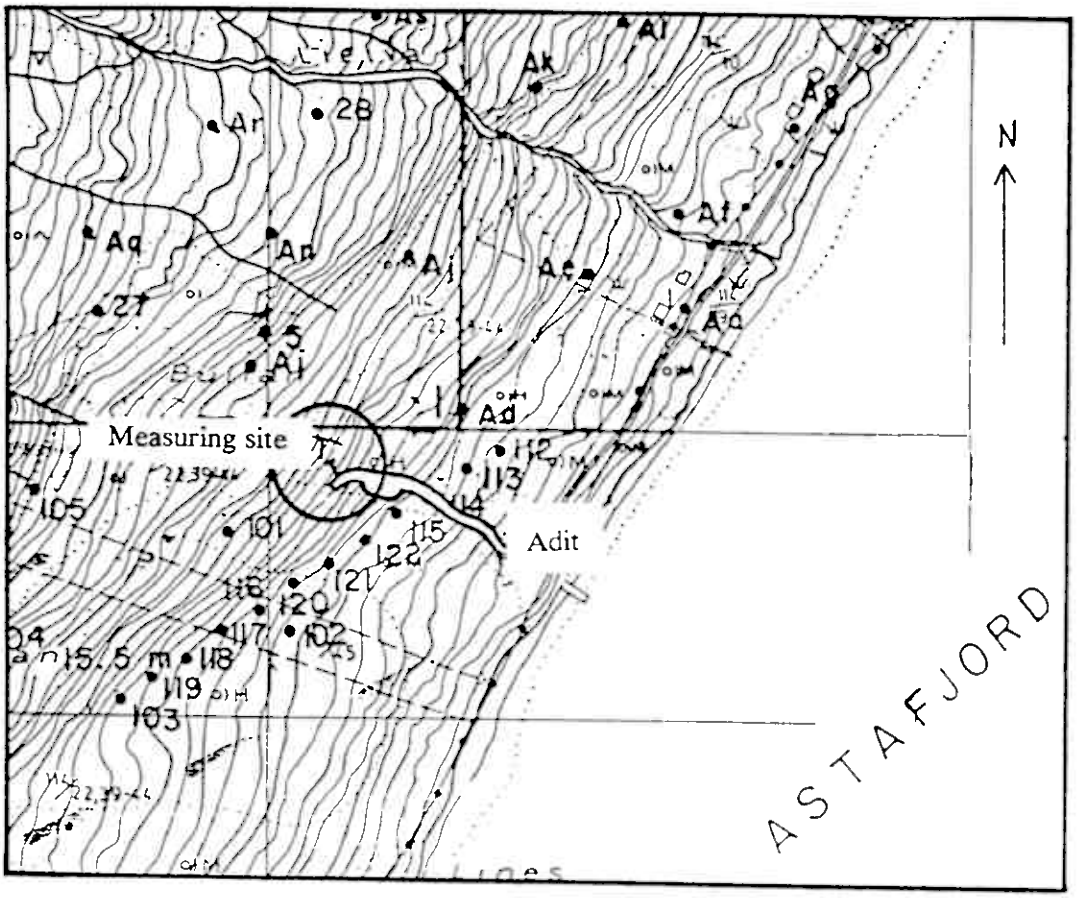
The investigation programme includes:

* Site visit in the existing investigation adit
* Triaxial in-situ rock stress measurements
* Laboratory tests to determine rock parameters
* Boundary element (BEM) modelling to evaluate stability conditions and dimensions of stopes and pillars
* Finale evaluation and report

2 IN SITU ROCK STRESS MEASUREMENTS

2.1 Measuring site

During the inspection in connection with the starting up of the stress measurements, the test site was selected at the face of the investigation adit. The measuring method is overcoring of a triaxial straingauge cell. The principle of the method is given in appendix 1. The measuring hole is drilled in the hanging wall of the Kuliberget Ore Zone. The location of the site is given in figure 1. The direction of the hole is 324°/-4° (azimuth/dip). The rock overburden at the measuring site is approximately 85 m. Six successful single measurements were carried out at hole depth between 4.5 - 8.75 m. Because of a heavy jointed water bearing zone between hole depth 5.0 m and 6.5 m the measurement at 4.5 m was rejected.



Location of measuring site at Kuliberget

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Figure 1.

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2.2 Strain readings

TABLE 1 Strain readings (mean values from measurement no 2 - 5):

Φ = 0°			Φ = 90°			Φ = 225°		
ε_a	ε_Φ	ε_{45}	ε_a	ε_Φ	ε_{45}	ε_a	ε_Φ	ε_{45}
64	170	142	57	128	67	51	115	60

Strain readings from single measurements are given in appendix 2. Because of the heavy jointed zone the measurement at 4.5 m depth is rejected.

2.3 Laboratory material tests

To obtain material properties of the hanging wall and the orebody, laboratory tests have been carried out. Specimens from the hanging wall mica-schist are obtained from the measuring hole. Magnetite specimens are drilled from blocks collected in the investigation adit. Specimens with diameter 62 and 50 mm (mica-schist and magnetite) and a length to diameter ratio of 2.5 were prepared. The results are summarized in Table 2, while the complete results are presented in appendix 3.

TABLE 2 Laboratory tests of material properties (mean values)

	Mica-schist	Magnetite	
Youngs modulus E	40.2	152.6	GPa
Poissons ratio ν	0.191	0.404	
Uniaxial compressive strength σ_c	79.0	313.0	MPa
Angle of failure	14	*	(°)
Tensile strength σ_t (Point load index)	10.4	*	MPa
Density ρ	2942	3758	Kg/m³
Velocity	4944	5916	m/s

2.4 Calculated stresses

The stress calculations are based upon mean values of measured strains and laboratory determined elastic parameters.

TABLE 3 Calculated stresses

Principal stresses (MPa)	Φ(°)	Θ(°)
σ_1 = 4.4	293	55
σ_2 = 3.3	155	43
σ_3 = 2.9	39	68
Stress components according to borehole		
σ_x = 3.9 σ_y = 3.1 σ_z = 3.6		
τ_{xy} = 0.4 τ_{xz} = 0.4 τ_{yz} = 0.4		

(x oriented along borehole, Φ = orientation to N and Θ = angle from vertical axis, see figure 2)

The stress directions are presented in figure 2.
From table 3 and figure 2 it will be seen that the

Major principal stress σ_1 = 4.4 MPa
with azimuth 293° and dip (90° - 55°) = 35°, i.e. acting parallel to the mountain slope.

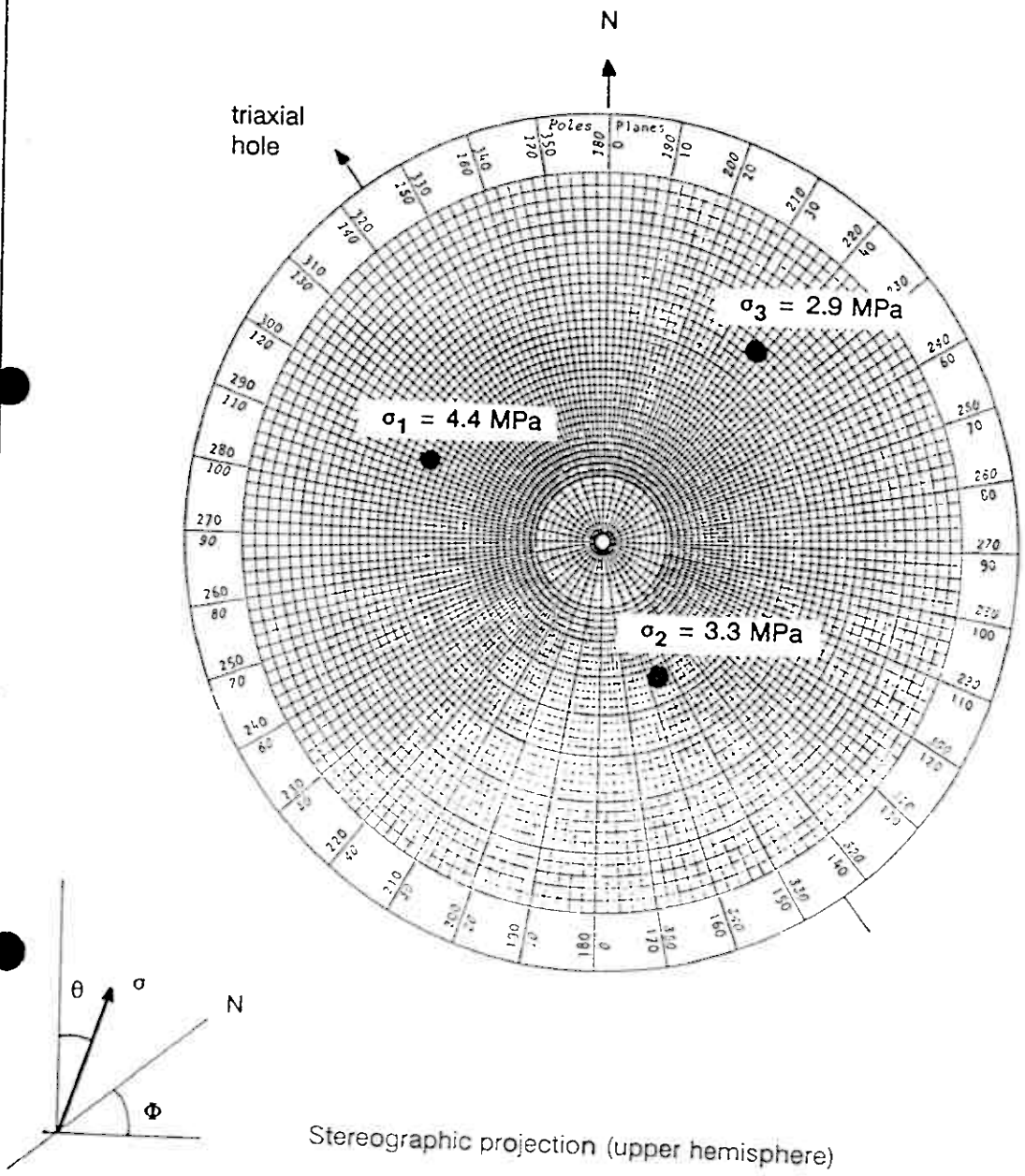
Intermediate principal stress σ_2 = 3.3 MPa
with azimuth 155° and dip (90° - 43°) = 47°

Minor principal stress σ_1 = 2.9 MPa
with azimuth 39° and dip (90° - 68°) = 32°

i.e. σ_2 and σ_3 are close in magnitude.

The overburden at the test site is approx. 85 m. With an average density of ρ = 2900 kg/m³ the theoretical vertical stress will be

$$\sigma_v = \rho \cdot g \cdot h = 2.5 \text{ MPa}$$



Stereographic projection (upper hemisphere)

In-situ stresses at Kuliberget	PROJECT
SINTEF AVDELING FOR BERGTEKNIKK DIVISION OF ROCK AND MINERAL ENGINEERING	DATE Figure 2

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and with Poisson's ratio of $\nu = 0.19$ the theoretical gravitational horizontal stress will be

$$\sigma_h = \frac{\nu}{1-\nu} \cdot \sigma_v = 0.6 \ MPa$$

The measured vertical stress is in the same order of magnitude as the theoretical vertical stress. The magnitude of the horizontal stress indicates the existence of geologically induced stresses superimposed on the gravitational stress field.

2.5 RQD-test

The RQD is defined as the percentage of core recovered in intact pieces of 100 mm or more in length in the total length of a borehole. Hence:

$$RQD\ (\%) = 100 \cdot \frac{Length\ of\ pieces\ of\ core > 100mm}{Length\ of\ borehole}$$

Table 4 gives the relationship between the numerical value of RQD and the engineering quality of rock.

TABLE 4 RQD - values

RQD	Rock Quality
< 25%	Very poor
25 - 50 %	Poor
50 - 75 %	Fair
75 - 90 %	Good
90 - 100 %	Very good

RQD - tests have been carried out on cores from 4 old boreholes. The cores have been provided by the Central Core File of the Norwegian Geological Survey. Appendix 4 shows the positions of the boreholes A21, A27, A28 and A29. The tests have been carried out on approx. 20 m core length above the ore zone. Additional RQD - tests were done on the cores from the stress measurement hole. RQD values for the different holes are given in table 5.

TABLE 5 RQD at Kuliberget

Bore-hole number	Length from - to m	Length examined m	$\sum$ length of core pieces m	RQD %
A 27	121.2 - 140.6	19.4	3.46	18
A 28	165.4 - 185.8	20.4	14.6	72
A 29	178.7 - 195.0	16.3	10.9	67
A 21	252.9 - 274.5	21.6	12.2	56
Triax. hole	0 - 9.5	9.5	6.9	73

Four of the five holes shows values in the "fair" class, while one shows value "very poor".

3. BOUNDARY ELEMENT MODELLING (BEM)

3.1 General

The main objectives of this analysis is to find dimensions of stopes and pillars, and for this purpose numerical modelling is used. The program, BESOL, is a system of two dimensional computer programs designed to analyze rock mechanics problems in mining. The programs can be used to compute the stresses, strains and displacements around excavations of any shape in a variety of geological settings. Output from the BESOL models gives stresses and strains on defined boundary elements of excavations and also on field points in the area around.

3.2 The Kuliberget Model

The boundary element model is based on profile 23, see figure 3. This profile is parallel to the strike of the Kuliberget Ore Zone. The suggested mining method, a V.C.R. version, will give a stope direction normal with the dip. A model will give indications of practical stable stope and pillar widths. A decisive prerequisite is that the roofs of the stopes are not subjected to tensile stresses. A suitable constraint of the roof rock may prevent major cave ins, avoiding heavy waste dilution.
The main input in the model is the in-situ stress conditions, the material parameters and the geometry of the excavations. The geometry of the excavations is in accordance with the sketches of the suggested mining method provided by Mr. Søyland.

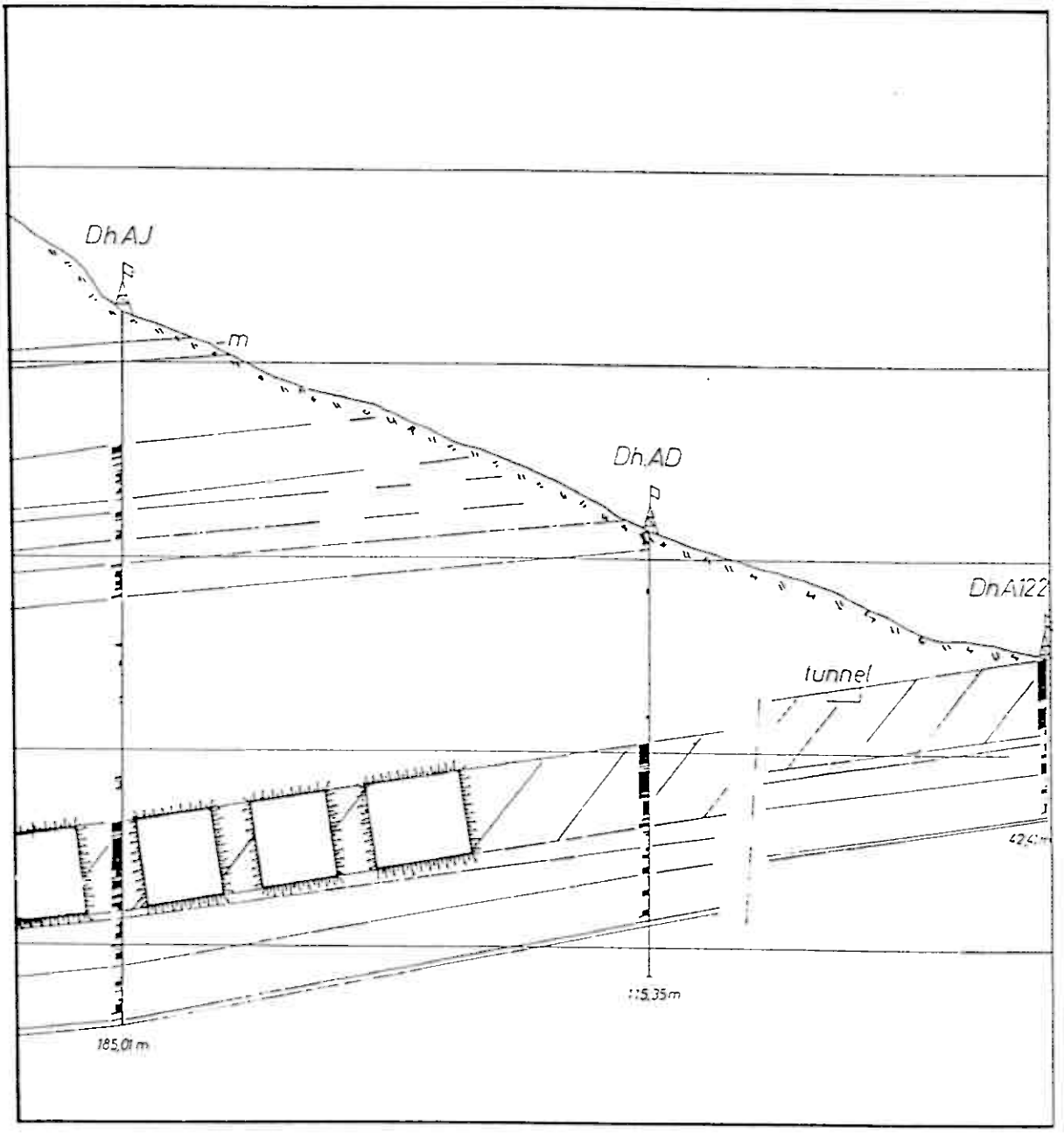
Based on the in-situ stress measurements the following horizontal- and vertical stresses are assumed:

$$\sigma_x = 3.9 - 0.0067 \cdot z$$
$$\sigma_z = 0 - 0.0029 \cdot z \qquad \text{where z is depth below surface}$$

The model is based on 4 excavations where different stope- and pillar widths may be simulated. The model is run in 4 mining steps were the stope width is increased from 10 to 25 m, and the pillar width is decreased from 20 to 10 m.

3.3 Results

The results from BEM-modelling is given in figure 4 and appendix 5.
Appendix 5 gives the principal stress plots, and figure 4 gives the stress magnitude of the tangential stresses in the roof of the different excavations for mining step 1 - 4. Figure 4 indicates that if the stope width exceeds 20 m, the tangential stresses are near or below zero. This means that the constraint in the roof of the stopes becomes very poor. It will be seen in the diagram that the tangential stresses increase near the corners. This is due to the small radius of curvature of corner between pillar and roof in the model. This effect will probably be less pronounced in the rock mass.



Andørja profile 23

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Figure 3.

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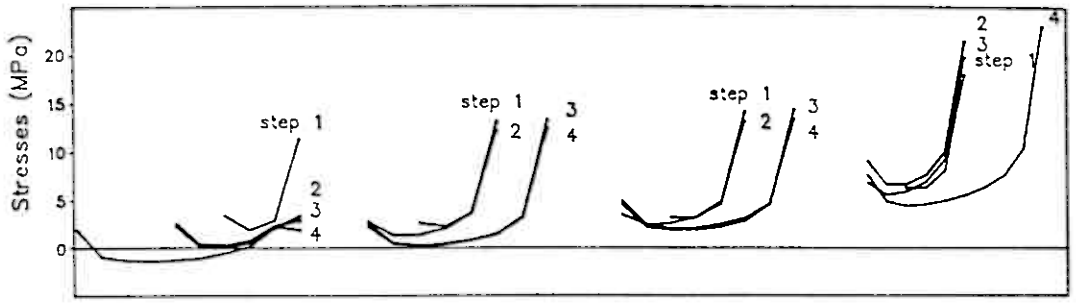
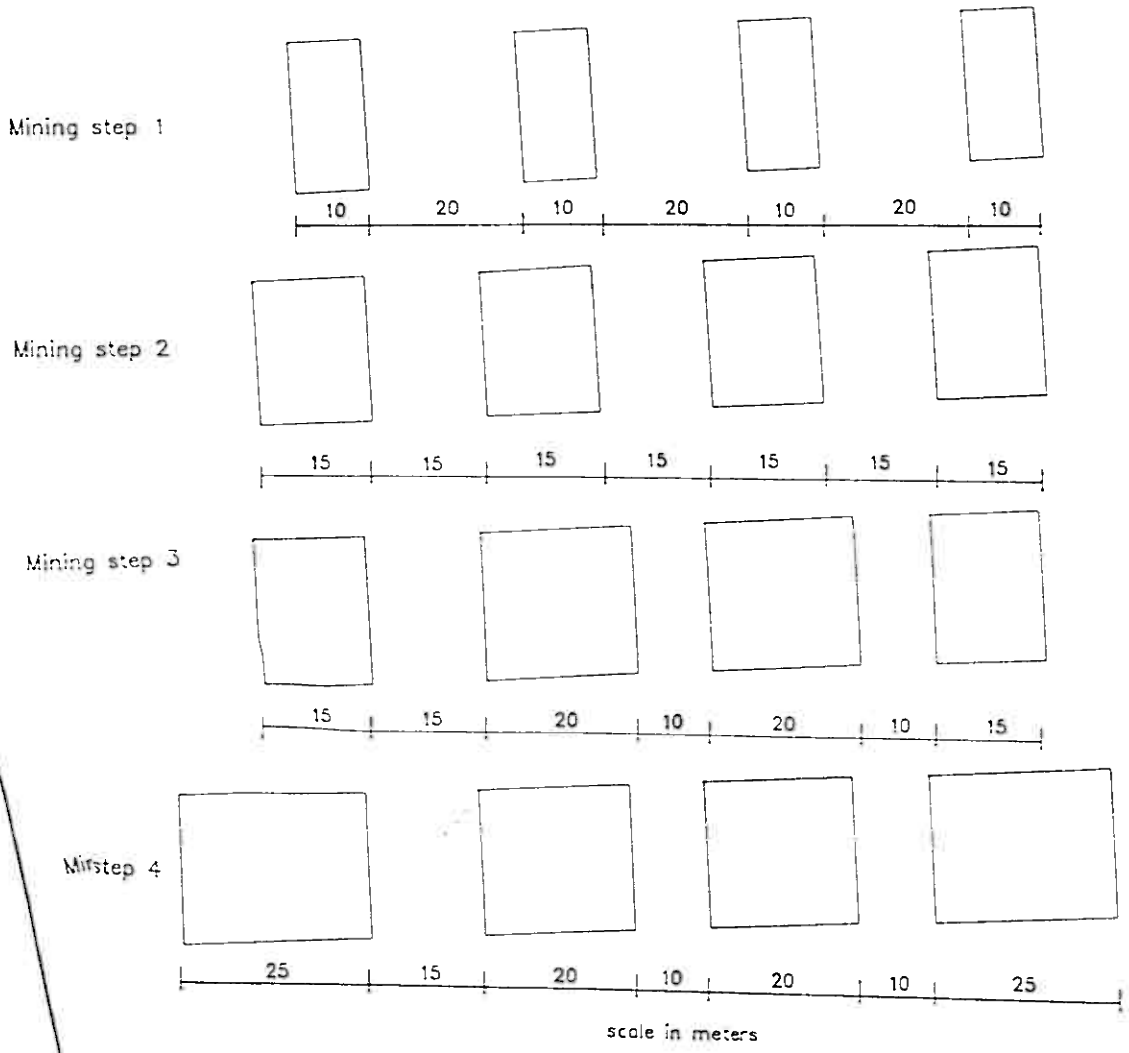
Tangential stresses in roof of excavations
Kuliberget underground mine, Andørja





Tangential stresses in roof of excavations	PROJECT
AVDELING FOR BERGTEKNIKK DIVISION OF ROCK AND MINERAL ENGINEERING	DATE Figure 4.

ADR 5

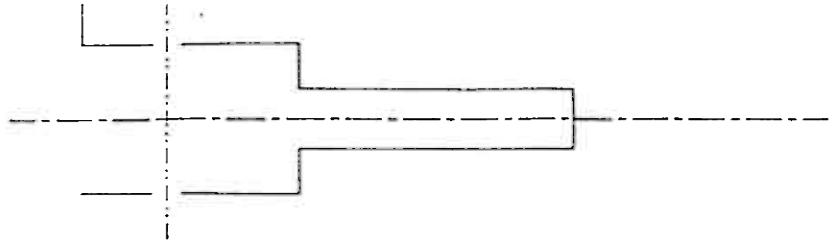
For the evaluation of the results, the mean stress level in the roof is used. From the principal stress plots (appendix 5) it will be seen that the pillar stress will not exceed 15 MPa even with a pillar width of 10 m. Provided that the effective width of the pillars is minimum 10 m, it is therefore assumed that the pillar stress is not critical.

4 DISCUSSION/CONCLUSIONS

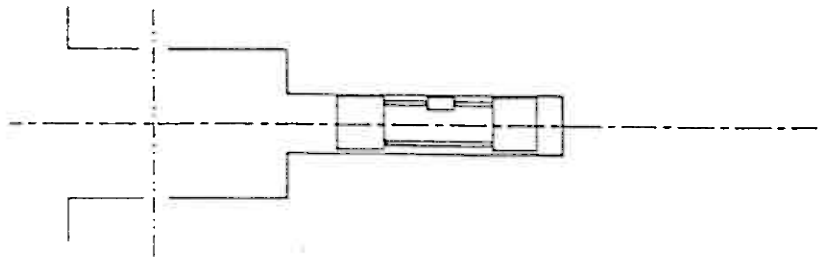
From the model studies it follows that tensile stresses may occur in the roofs of stopes when the span exceeds 20 m. Taking a certain safety factor into consideration the span should therefore not exceed 15 m. If the experience obtained during the first period of mining is positive with regard to waste dilution from the hanging wall, the span may be increased in the case of V.C.R. (but not above 20 m). If conventional room-and-pillar mining is adopted, the hanging wall must be systematically supported by rock bolting. A span of 15 m will in this case require quite heavy support, and must be regarded as absolute maximum.
The length of the stopes along the dip may be adjusted according to the practical mining situation, as the length is not affecting the stress conditions significantly.

The effective width of the pillars should not be less than half of the ore thickness i. e. approximately 10 m. With conventional room-and-pillar mining when smooth blasting may be adopted against the final pillar walls, a practical pillar width of 12 m may be adopted. With V.C.R. using fan drilling with the ends of the holes perpendicular to the pillar walls, a much higher degree of blast damage may be expected. In this case the pillar width should be 15 m.

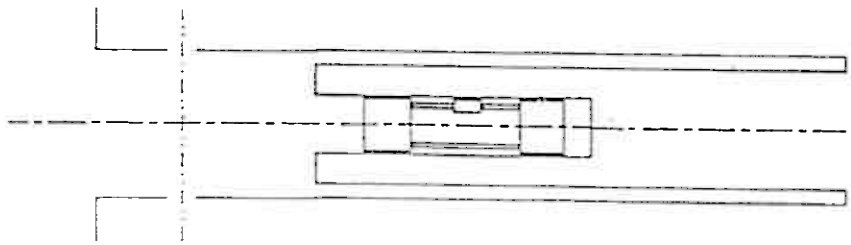
TRIAXIAL STRESS MEASUREMENTS



A diamond drill hole (76 mm Ø) is drilled to wanted depth. A concentric hole with smaller dameter (36 mm Ø) is drilled approximately 30 cm further.



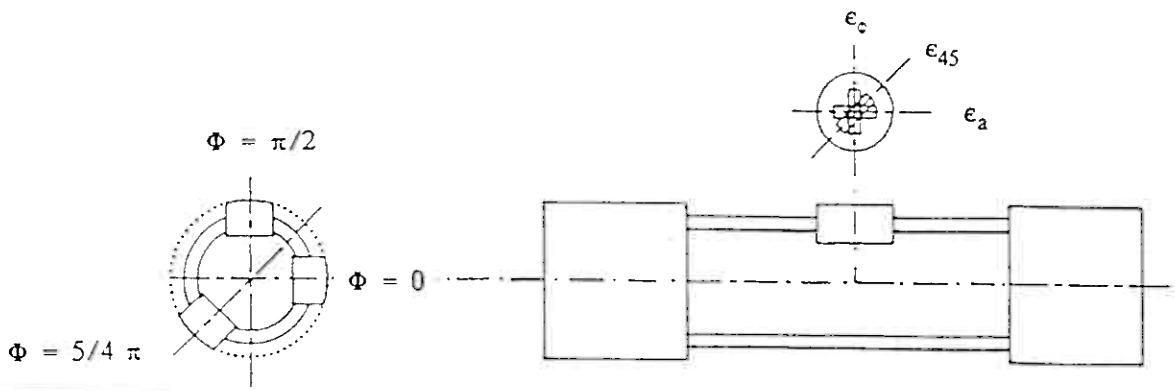
A measuring cell containing three strain rosettes is inserted, and the rosettes are glued to the walls of the small hole.



The small hole is overcored by the large diameter bit, thus stress relieving the core. The corresponding strains are recorded by the rosettes. When the elastic constants are krown, the triaxial state of stress can be computed.

MEASURING CELL

Strain rosette



Principle for rock stress measurements	PROJECT
	DATE
SINTEF AVDELING FOR BERGTEKNIKK DIVISION OF ROCK AND MINERAL ENGINEERING	FIG

ADR 5000/87

Appendix 2 Measured strain (μS)

Hole-depth m	Φ = 0°			Φ = 90°			Φ = 225°		
	ϵ_a	ϵ_Φ	ϵ_{45}	ϵ_a	ϵ_Φ	ϵ_{45}	ϵ_a	ϵ_Φ	ϵ_{45}
4.5	55	50	130	25	20	30	0	45	45
6.5	105	40	80	110	95	70	45	55	30
6.75	50	255	105	45	165	20	45	135	100
7.25	25	90	105	10	125	40	25	35	15
7.75	40	245	180	50	155	50	60	40	75
8.75	100	220	240	70	100	155	80	310	80

APPENDIX 3

Mechanical properties of rock

THE FOUNDATION FOR SCIENTIFIC AND INDUSTRIAL RESEARCH AT THE NORWEGIAN INSTITUTE OF TECHNOLOGY

SINTEF
Rock and Mineral Engineering

Project no.: 365092.00
File no.: 91022
Our reference: HL

SINTEF ROCK AND MINERAL ENGINEERING
N-7034 TRONDHEIM

Telephone: + 47-7-59 30 00
Direct line: + 47-7-59 31 76
Telex: 55 620 sintf n
Fax: + 47-7-59 48 89

TEST REPORT

TESTING OF: Rock mechanical properties and mineral composition of drill cores from Andorja

CLIENT: Falkhammar - Ibestad Magnetitt A.S
A.Tverreggensv. 10,
7037 Trondheim

AGREEMENT DATE: 1991-02-20 YOUR REF: J.Soyland

SCOPE OF WORK: Youngs modulus, poissons ratio, uniaxial compressive strength (UCS), angle of failure, tensile strength, density, compression wave velocity, mineral composition (XRD)

SEMI-QUANTITATIVE XRD: Mica-schist

Quartz	8 %
Plagioclase	65 "
Mica (biotite)	27 "

Trondheim, 19. mars 1991

Hans K. Lund
Hans Lund
Engineer

Tor Harald Hanssen
Head of laboratory

ROCK MECHANICAL PROPERTIES

Mica-schist
Parallell

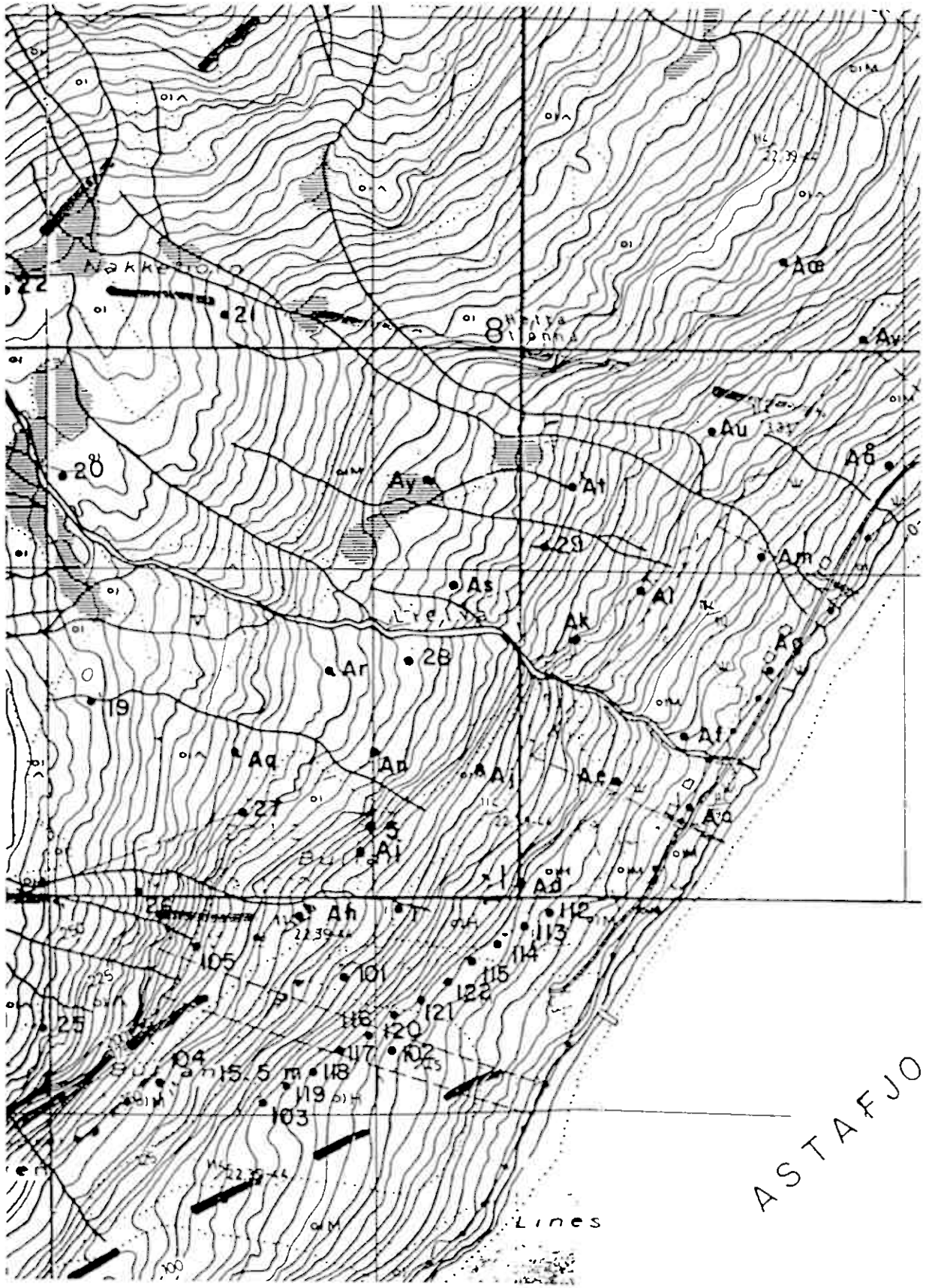
Specimen	Youngs modulus Gpa	Poissons ratio	UCS Mpa	Angle of failure ( )	Tensile strength Mpa	Density Kg/m3	Velocity m/s
1	60.2	0.168	79.95	23		3223	5373
2	63.3	0.166	71.43	11		3273	5343
3	53.0	0.231	72.74	9		3015	5489
4	26.8	0.220	38.66	25		2986	4533
1.4	26.0	0.195	73.40	9		2768	4690
1.5	28.6	0.242	84.54	3		2772	4736
1.6	32.1	0.145	89.78	14		2742	4674
1.7	31.3	0.159	121.23	14		2757	4715
mean	40.2	0.191	78.97	14		2942	4944
1.1					12.60		
1.3					9.43		
1.4					9.28		
1.5					10.27		
1.6					9.60		
1.7					10.98		
1.8					11.22		
1.9					9.50		

Magnetite
Normal

Specimen	Youngs modulus Gpa	Poissons ratio	UCS Mpa	Angle of failure ( )	Density Kg/m3	Velocity m/s
1	153.1	0.451	305.04		3724	5860
2	142.5	0.377	248.85		3770	5921
3	163.1	0.464	214.73		3750	6047
4	155.0	0.394	299.02		3771	5840
5	149.4	0.334	497.70		3777	5914
mean	152.6	0.404	313.0		3758	5916

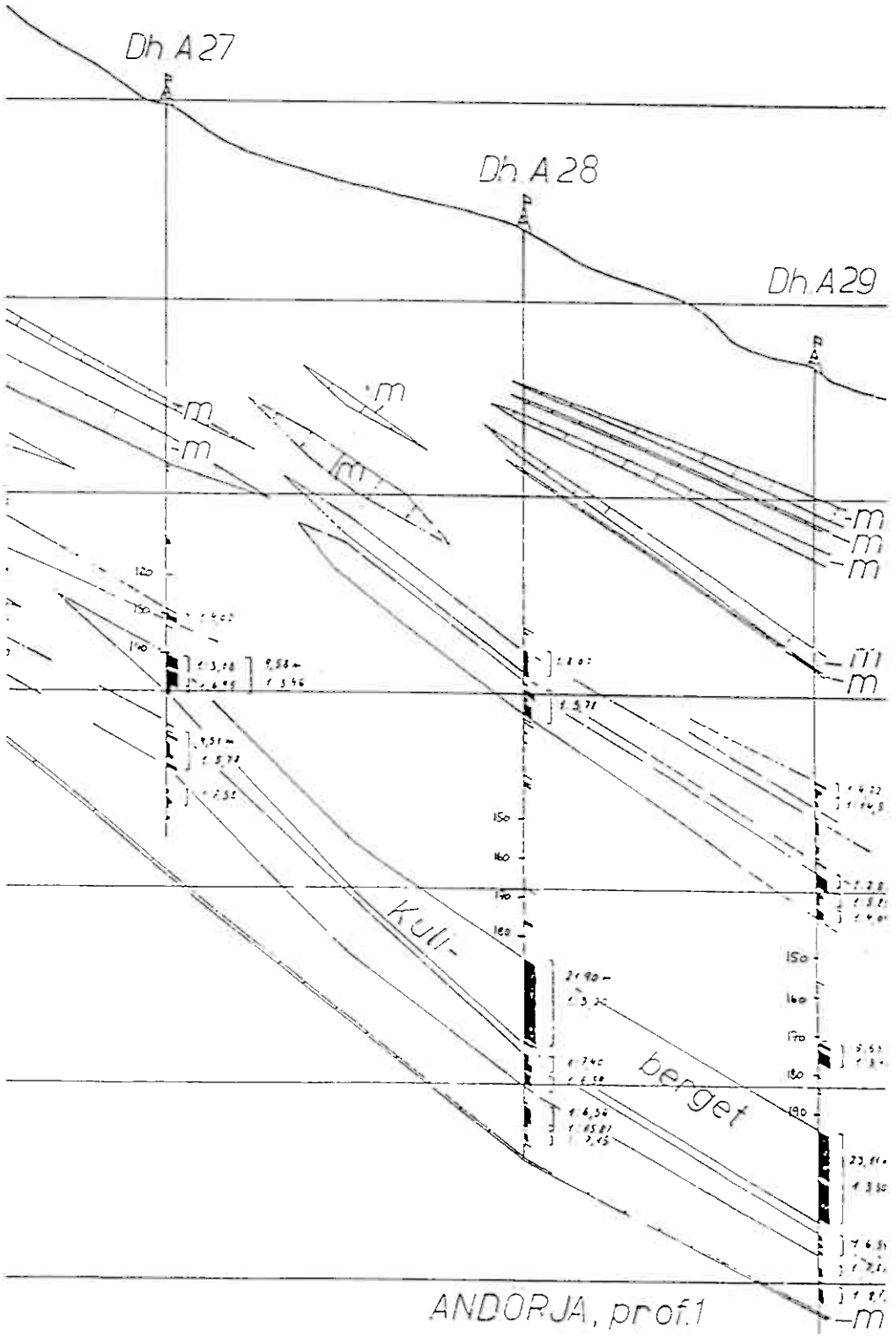
APPENDIX 4

Profiles for the Kuliberget Model



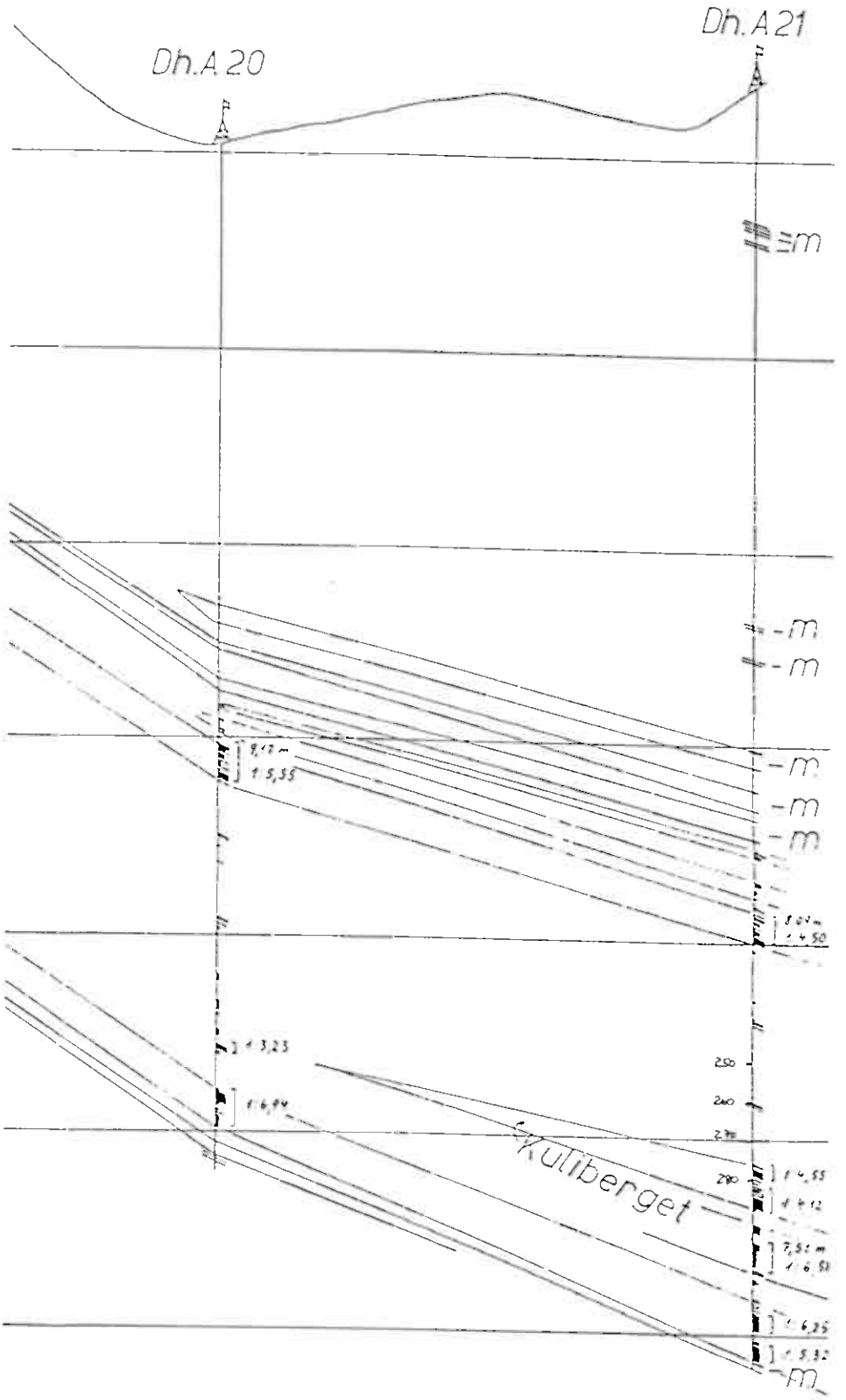
	PROJECT
	DATE
SINTEF **AVDELING FOR BERGTEKNIKK** DIVISION OF ROCK AND MINERAL ENGINEERING	FIG.

ADR 5000.87



	PROJECT
	DATE
SINTEF **AVDELING FOR BERGTEKNIKK** DIVISION OF ROCK AND MINERAL ENGINEERING	FIG.

ADR 5000/87



	PROJECT
	DATE
SINTEF **AVDELING FOR BERGTEKNIKK** DIVISION OF ROCK AND MINERAL ENGINEERING	FIG.

ADR 5000/87

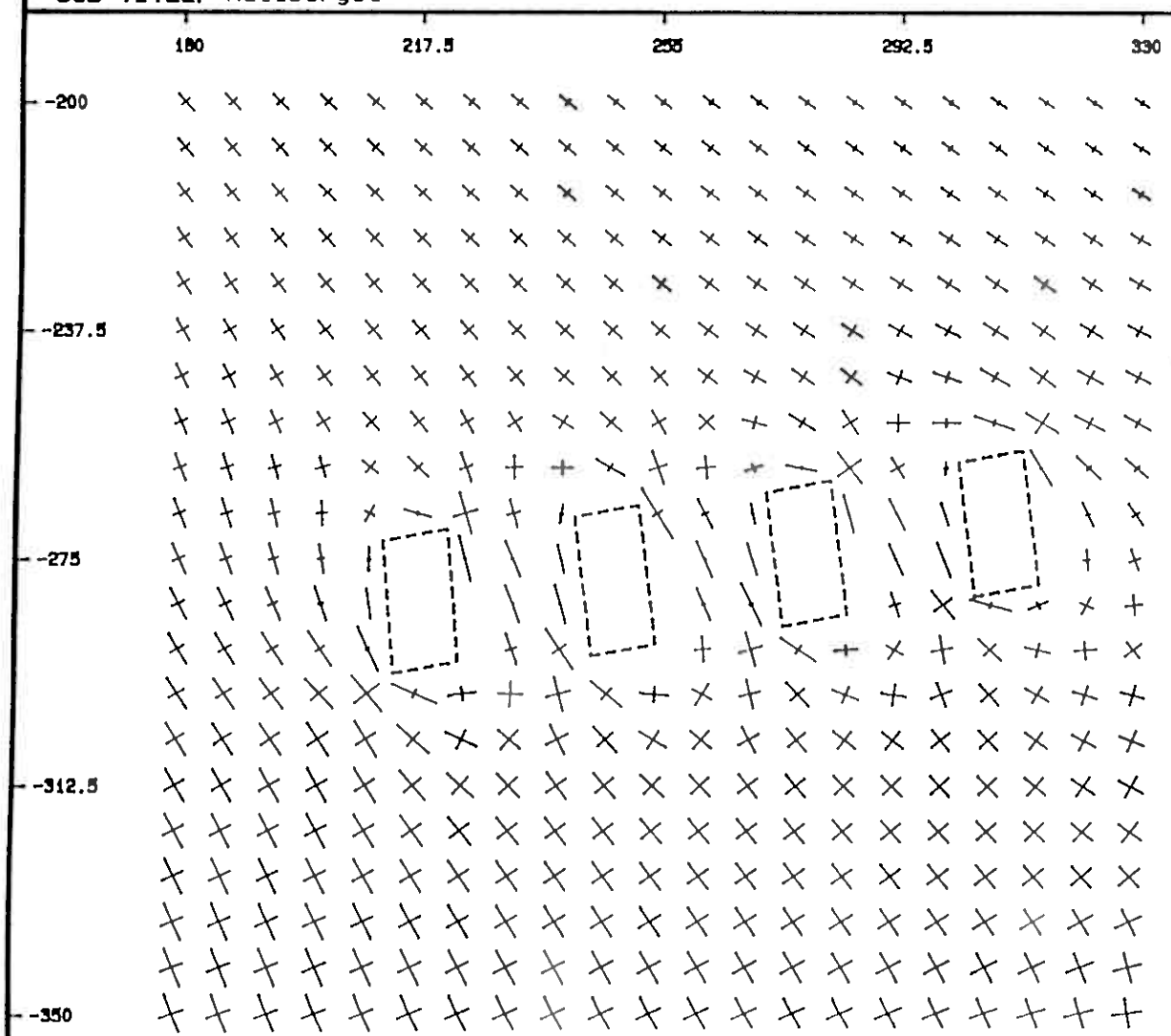
APPENDIX 5

Principal stress plots for the Kuliberget Model

BESOL/P5002 PRINCIPAL STRESS PLOTS

SINTEF

JOB TITLE: Kullberget



STEP NUMBER 1

WINDOW NUMBER 1

LEGEND

STRESSES:

——— Compression

——— Tension

GEOMETRY:

---- DD elements, KODE = 1-4 7, 8

---- DD elements, KODE = 6

---- DD elements, KODE = 9-12

---- FS elements, KODE = 1-4

SCALE:
(Maximum vector length)

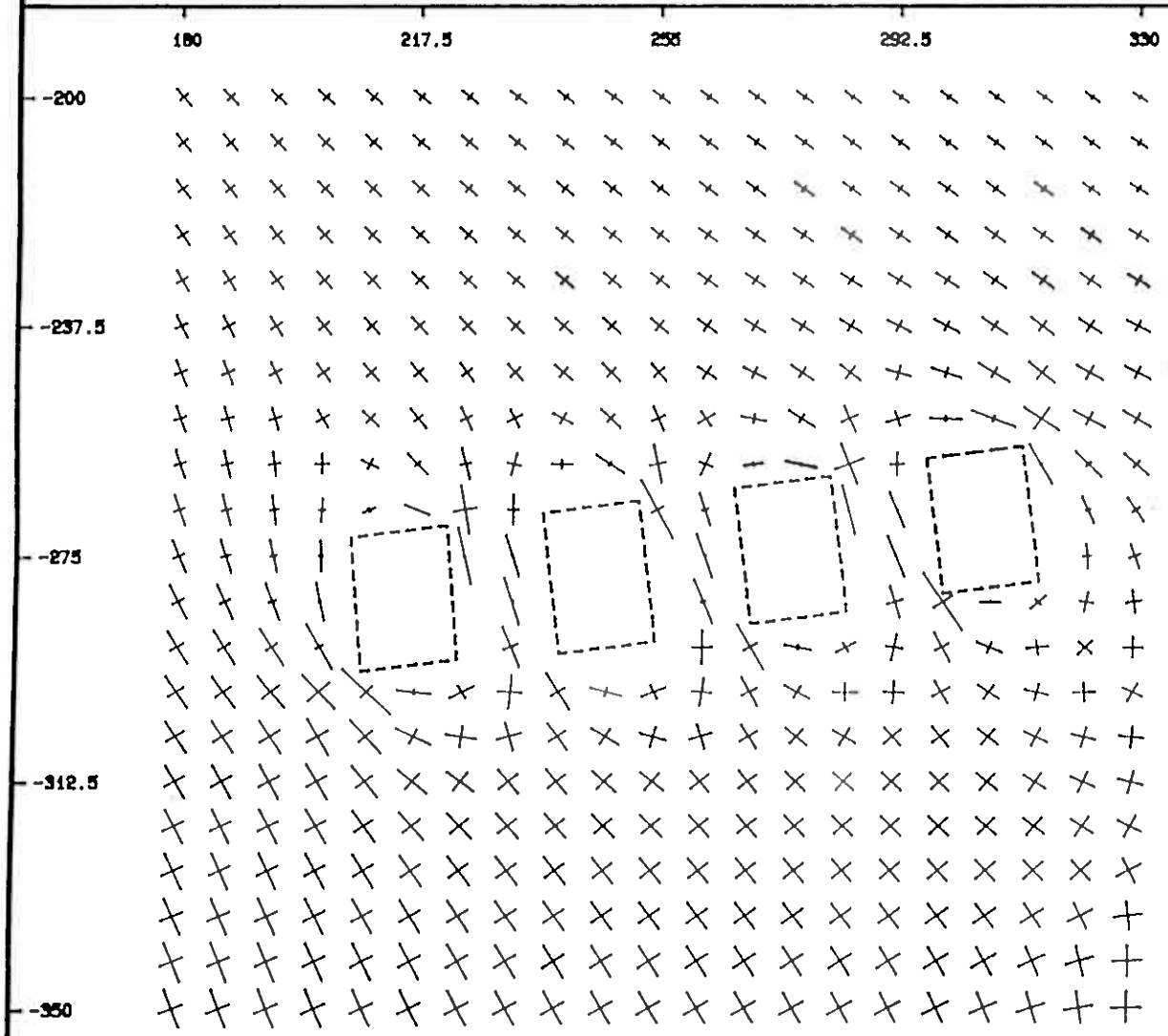
0 12

CROUCH RESEARCH, INC.

BESOL/P5002 PRINCIPAL STRESS PLOTS

SINTEF

JOB TITLE: Kuliberget



STEP NUMBER 2

WINDOW NUMBER 1

LEGEND

STRESSES:

——— Compression

——— Tension

GEOMETRY:

---- DD elements, KODE = 1-4, 7, 8

---- DD elements, KODE = 6

---- DD elements, KODE = 9-12

---- FS elements, KODE = 1-4

SCALE:
(Maximum vector length)

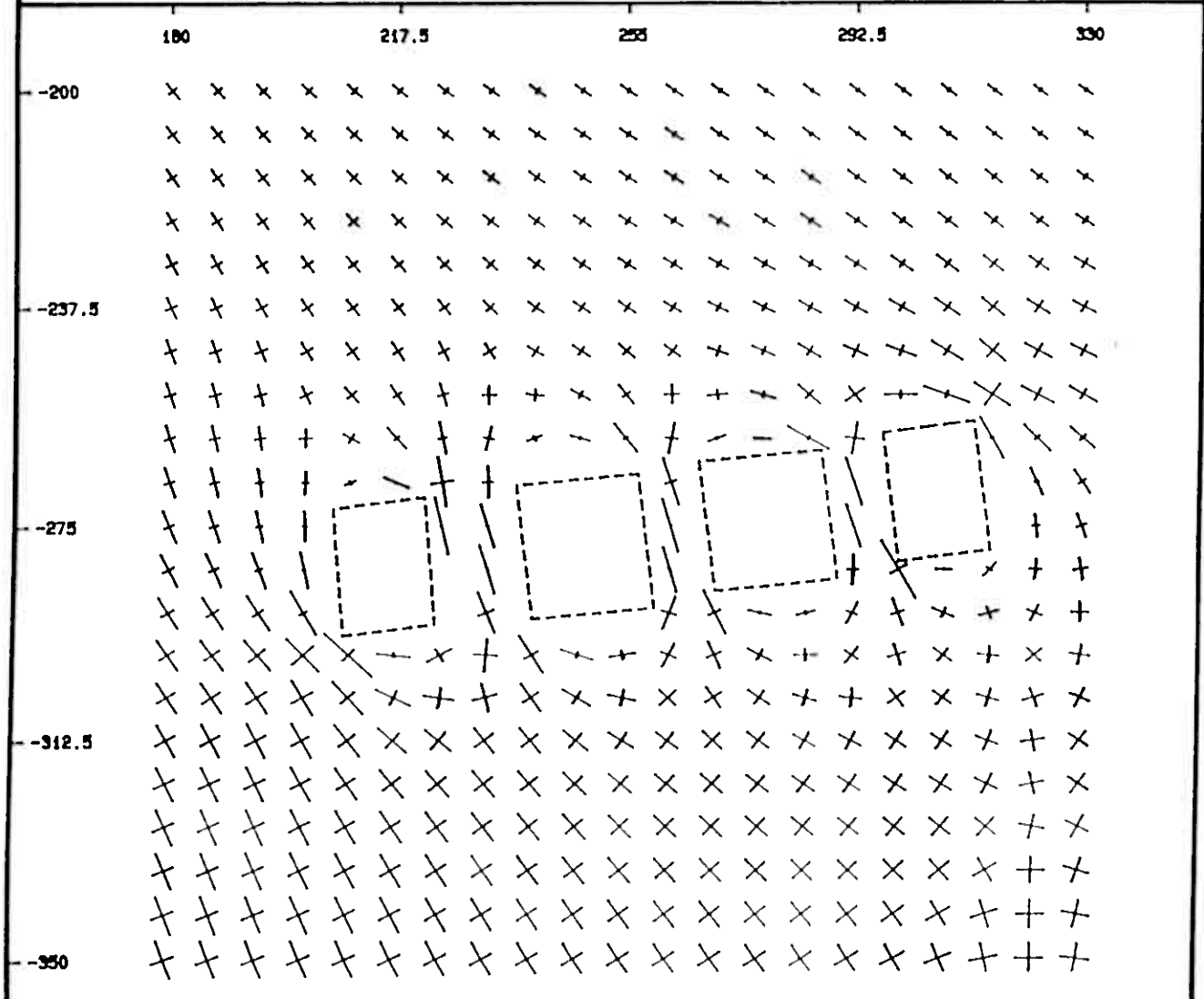
0 14

CROUCH RESEARCH, INC.

BESOL/P5002 PRINCIPAL STRESS PLOTS

SINTEF

JOB TITLE: Kuliberget



STEP NUMBER 3

WINDOW NUMBER 1

LEGEND

STRESSES:

—— Compression

—— Tension

GEOMETRY:

---- DD elements, KODE = 1-4
7, 8

---- DD elements, KODE = 6

---- DD elements, KODE = 9-12

---- FS elements, KODE = 1-4

SCALE:
(Maximum vector length)

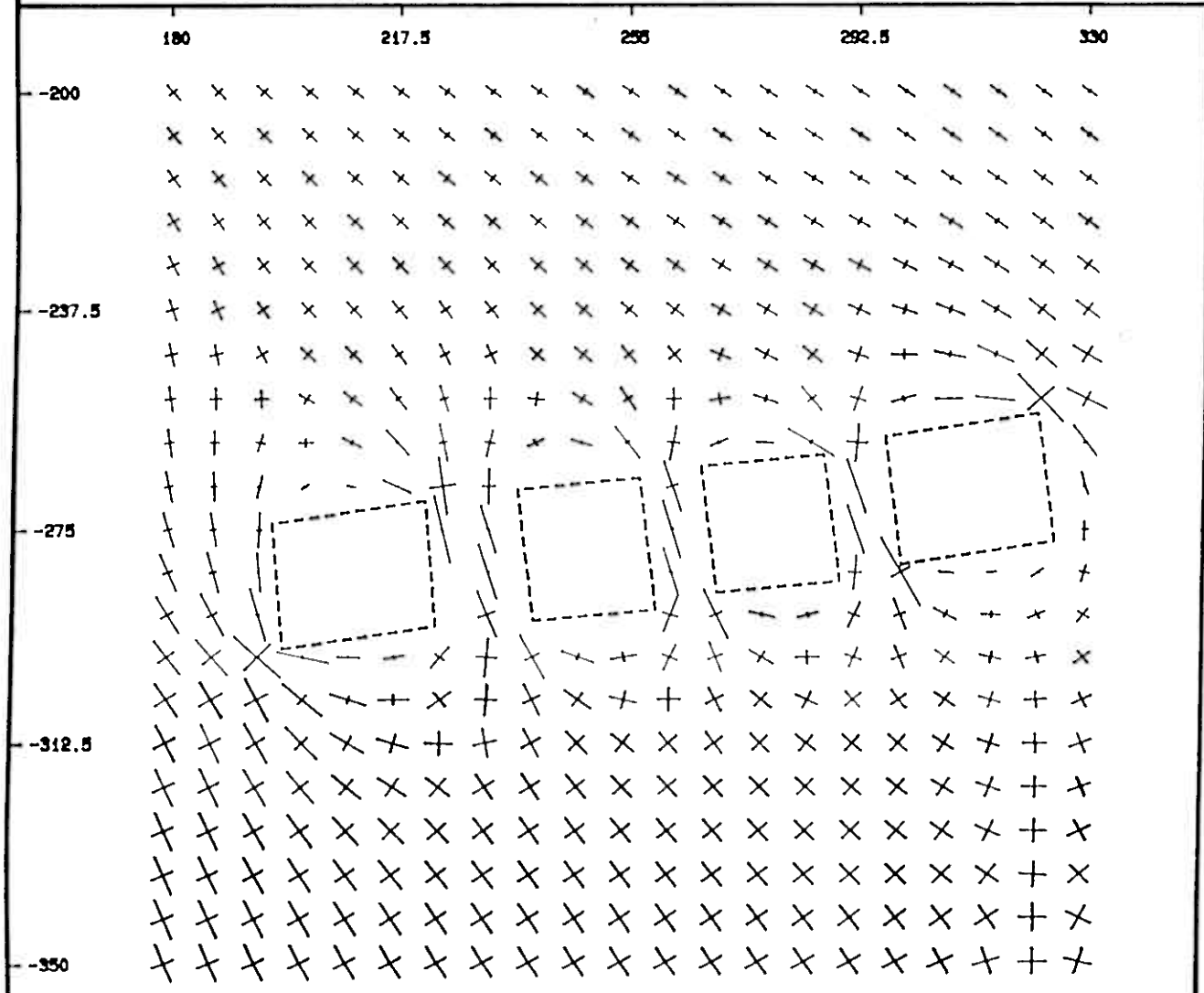
0 14

CROUCH RESEARCH, INC.

BESOL/P5002 PRINCIPAL STRESS PLOTS

SINTEF

JOB TITLE: Kullberget



STEP NUMBER 4

WINDOW NUMBER 1

LEGEND

STRESSES:

—— **Compression**

—— Tension

GEOMETRY:

---- DD elements, KODE = 1-4 7, 8

---- DD elements, KODE = 6

---- DD elements, KODE = 9-12

---- FS elements, KODE = 1-4

SCALE:
(Maximum vector length)

0 17

CROUCH RESEARCH, INC.

APPENDIX B

DESIGN CRITERIA & PROCESS DETAILS

FALKHAMMER - IBESTAD MAGNETITE A.S.

ANDORJA MAGNETITE PROJECT

APPENDIX B

DESIGN CRITERIA AND CALCULATIONS

PARAMETER	UNITS	DATA
Overall Production Criteria		
Annual processing rate (ore)	t/a	1,360,000
Annual production rate Magnetite concentrate	t/a	325,000
Annual production rate Superconcentrate	t/a	75,000
Annual production rate Pigment	t/a	540
Annual production rate Apatite concentrate	t/a	81,600
Average processing rate	t/d	3,886
Say	t/d	4,000
Plant availability (primary crusher)	%	80.0
Plant availability (SAG mill)	%	87.5
Plant availability (plant)	%	92.0
Processing days per year	d/a	350
Processing hours per day	h/d	24
Processing hours per shift	h/shift	8

PARAMETER	UNITS	DATA
********* ********* *********	*****	**********

Annual Magnetite balance
(All grades in Fe3O4)

	Tonnes	Grade	Content	Recovery
Feed	1,360,000	28.0	380,800	100.00
Magnetite concentrate	325,000	92.4	300,300	78.86
Superconcentrate	75,000	98.8	74,100	19.46
Pigment	540	98.8	534	0.14
Tailings\Other	959,460	0.61	5,866	1.54
	Magnetite recovery			98.46

Annual Apatite balance
(All grades in P2O5)

	Tonnes	Grade	Content	Recovery
Feed	1,360,000	8.0	108,800	100.00
Apatite concentrate	81,600	39.7	32,395	29.78
Other	1,278,400	3.2	40,653	37.37
	Apatite recovery			67.14

PARAMETER		UNITS	DATA
Site data			
Location	Andorja Island Norway 68.8 N lat., 17.4 E long.		
Access	Highway E6 to Harstad, then ferry to Rolla, then highway 848 to Hamnvik and ferry to Andorja.		
Elevation		m AMSL	40
Minimum ambient temperature		deg. C	(10)
Maximum ambient temperature		deg. C	30
Ore characteristics			
Absolute density		t/m^3	3.4
Recoverable magnetite		%	28.00
Moisture		%	4.00
Mineralogy of ore			
Iron		%	32
Phosphorous		%	1.3
Sulphur		%	0.46
Primary Crushing			
Truck dump hopper capacity		t	100
Average processing rate		t/d	4,000
Plant availability (crusher)		%	80
Design daily tonnage		t/d	5,000
Design processing rate		t/h	208
Processing days per week		d/w	7
Product size	% passing 200 mm		100
Grinding			
Average processing rate		t/d	4,000
Plant availability (crusher)		%	87.5

PARAMETER	UNITS	DATA
Design daily tonnage	t/d	4,571
Design processing rate	t/h	190
Processing days per week	d/w	7
Product size	% passing 0.090 mm	90
Primary mill	SAG mill	
Primary mill power	hp	5,056
Primary mill drive power losses	%	10
Primary mill power applied	kWh/t	18.00
Primary mill installed power	hp	7,000
Primary cyclone conc.ratio	feed/conc.	3.3
Cyc. o/f screen conc.ratio	feed/conc.	1.1
Superslig production		
Secondary cyclone conc. ratio	feed/conc.	1.0
Primary spiral conc. ratio	feed/conc.	2.2
Secondary spiral conc. ratio	feed/conc.	1.4
Tertiary spiral conc. ratio	feed/conc.	1.1
Shaking table conc. ratio	feed/conc.	1.2
Superslig mag.sep. conc. ratio	feed/conc.	1.0
Mill type	Ball mill	
Ball mill power	hp	52
Ball mill drive power losses	%	10
Ball mill power applied	kWh/t	3.00
Ball mill installed power	hp	125
Phosphate flotation		
Residence time	mins	30

PARAMETER	UNITS	DATA
Concentration ratio	feed/conc.	0.1
Silicate flotation		
Residence time	mins	30
Concentration ratio	feed/conc.	0.1
Flot. tails mag.sep.conc.ratio	feed/conc.	1.0
Magnetite concentrate		
Mill type	Ball mill	
Ball mill power	hp	388
Ball mill drive power losses	%	10
Ball mill power applied	kWh/t	6.30
Ball mill installed power	hp	400
Magnetite conc. mag.sep.conc.ratio		1.1
Magnetite conc. thickener duty	t/d/m^2	4.1
Mag'tite/S'slig conc. filter duty	t/h/m^2	2.0
Filter type	disc	
Pigment		
Pigment mill type	Tower	
Tower mill power	hp	102
Tower mill drive power losses	%	2
Tower mill power applied	kWh/t	1160
Tower mill installed power	hp	100
Pigment filter duty	t/d/m^2	6.0
Filter type	plate & frame	
Sulphide flotation		
Conditioner residence time	mins	30
Flotation residence time	mins	30

PARAMETER	UNITS	DATA
Flotation concentration ratio	feed/conc.	29.7
Apatite flotation		
Conditioner residence time	mins	30
Rougher residence time	mins	15
Rougher concentration ratio	feed/conc.	5.9
Scavenger residence time	mins	15
Scavenger concentration ratio	feed/conc.	10.7
First cleaner residence time	mins	15
First cleaner concentration ratio	feed/conc.	1.1
Second cleaner residence time	mins	15
Second cleaner concentration ratio	feed/conc.	0.3
Apatite thickener duty	t/d/m^2	6.0
Thickener type	conventional	
Apatite filter duty	t/h/m^2	1.2
Filter type	horizontal belt	

Reagents

Frother

Type	Dow 250
Source	Truck load 210 L drums
Preparation	None
System	Barrel pump to holding tank pumps on loop to addn. points metered through rotameters.

Apatite Collector

Reagent	Berol ATRAC 857
Source	Semi bulk tanks 1000 kg

PARAMETER	UNITS	DATA
Preparation	None	
System	Barrel pump to holding tank pumps on loop to addn. points metered through rotameters.	
Xanthate Collector		
Reagent	Potassium Amyl Xanthate	
Source	Truck load 210 L drums	
Preparation	None (Dilution avai None	
System	Barrel pump to holding tank pumps on loop to addn. points metered through rotameters.	
Iron Depressant		
Reagent	Dextrin	
Source	Truck load - bulk	
Preparation	Dilute and cook + NaOH	
System	Metered dry via auger to mix/cook tank pumps on loop to addn. points metered through rotameters.	
Collector		
Reagent	Amine	
Source	Truck load 210 L drums	
Preparation	None (Dilution available)	
System	Barrel pump to holding tank pumps on loop to addn. points metered through rotameters.	
Flocculant		
Reagent	Percol E10	
Source	Truck load 20kg bags	
Preparation	Dilute to 0.5% solids + aging	
System	Auger/blower to mix tank transfer to dosing tank	

PARAMETER	UNITS	DATA
		pumps on loop to addn. points metered through rotameters.
Sodium hydroxide		
Type		50% Concentration
Source		Truck load 210 L drums
Preparation		None (Dilution avai None
System		Barrel pump to holding tank pumps on loop to addn. points metered through rotameters.
Steel balls		
Type		25mm (1")
Source		Truck load (30t)
Preparation		None
Type		100mm (4")
Source		Truck load (30t)
Preparation		None

PARAMETER	UNITS	DATA

ABBREVIATIONS AND REVISIONS

Abbreviations

a	annum (year)
AMSL	Above mean sea level
d	day (24 hours)
deg. C	degrees Celsius
h	hour
hp	horsepower
kg	kilogram
kW	kilowatt
kWh	kilowatt hour
L	litre
m	metre
min	minute
mm	millimetre
m^2	square metre
m^3	cubic metre
s	second
t	tonne

Revisions

Rev. No.	Date	For
A	14th June 1991	Comment and approval

ANDORJA PROJECT 19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
ANDORJA PROJECT					19-Jun-91 09:15 AM	
EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2						
AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 220 - CONVEYORS						
**********						
Belt conveyor No.1 900 W	1	20	20	15	0.8	11.9
Belt conveyor No.2 900 W	1	40	40	30	0.8	23.9
Belt conveyor No.3 900 W	1	15	15	11	0.8	9.0
Belt conveyor No.4 600 W	1	10	10	7	0.8	6.0

ANDORJA PROJECT

19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 230 - CRUSHING						
**********						
100 t dump hopper	1	-	-	-	-	-
Hydrostroke feeder 1200 W	1	10	10	7	0.6	4.5
Jaw crusher 1050 x 1200 (200 CSS)	1	150	150	112	0.6	67.1
Vibrating feeder 1200 W x 1500 L	2	3	6	4	0.8	3.6
Cone crusher 912 Dia	1	100	100	75	0.8	59.7
Stockpile area sump pump 100 Dia	1	5	5	4	0.8	3.0

ANDORJA PROJECT

19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 241 - GRINDING						
**********						
SAG mill 8230 Dia x 5486 L	1	5,000	5,000	3,730	0.8	2984.0
Screen 1830 W x 3050 L	1	10	10	7	0.8	6.0
Pumpbox 2 comp 2500 x 2500 x 2500 H	1	-	-	-	-	-
SAG mill pumps 300 x 250 x 625	2	75	150	112	0.4	44.8
Cyclopac 8 x 375 Dia	1	-	-	-	-	-
Screen 1220 W x 3050 L	1	5	5	4	0.8	3.0
Mag.sep 916 Dia x 3000 W	5	10	50	37	0.8	29.8
Demag coil	1	-	-	-	-	-
Magnetics pumpbox 1200 Dia x 1200 H	1	-	-	-	-	-
Surge tank feed pumps 125 x 125 x 300	2	20	40	30	0.4	11.9
Surge tank 9000 Dia x 9000 H	1	-	-	-	-	-
Surge tank agitator	1	50	50	37	0.8	29.8
Surge tank pumps 125 x 125 x 300	2	20	40	30	0.4	11.9
Non-magnetics pumpbox 1200 Dia x 1200 H	1	-	-	-	-	-
Non-magnetics pumps 250 x 200 x 525	2	40	80	60	0.8	47.7
Grinding Area sump pump 100 Dia	1	5	5	4	0.8	3.0
Grinding Area O/H crane (vert.)	1	3	3	2	0.1	0.2
Grinding Area O/H crane (horiz.)	1	3	3	2	0.1	0.2
Grinding Area O/H crane (travel.)	1	3	3	2	0.1	0.2

GE 2

NO. EMS LLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
2	-	-	-	-	-
8	-	-	-	-	-
1	-	-	-	-	-
2	10	20	15	0.8	11.9
7	-	-	-	-	-
1	-	-	-	-	-
2	10	20	15	0.8	11.9
5	-	-	-	-	-
1	-	-	-	-	-
2	10	20	15	0.8	11.9
4	8	30	22	0.8	17.9
1	-	-	-	-	-
2	8	15	11	0.4	4.5
[redacted]	3	3	2	0.8	1.8
1	125	125	93	0.8	74.6
1	-	-	-	-	-
1	25	50	37	0.4	14.9
2	-	-	-	-	-
1	5	30	22	0.8	17.9
6	5	30	22	0.8	17.9
6	5	5	4	0.8	3.0
1	3	6	4	0.8	3.6
2	-	-	-	-	-
1	30	30	22	0.8	17.9
1	10	10	7	0.4	3.0
1	-	-	-	-	-
1	5	5	4	0.8	3.0
1	3	3	2	0.8	1.8
1	100	100	75	0.8	59.7
1	2	2	1	0.1	0.1
1	1	1	0	0.1	0.0
1	5	5	4	0.1	0.4
1					

[redacted]

ANDORJA PROJECT

19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 244 - APATITE CONCENTRATION						
**********						
Sulphide conditioner tank 6000 Dia x 6000	1	-	-	-	-	-
Sulphide conditioner tank agitator	1	20	20	15	0.8	11.9
Sulphide rougher float cells 500 ft3	6	40	240	179	0.8	143.2
Sulphide rougher froth pump and box	1	8	8	6	0.8	4.5
Apatite conditioner tank 6000 Dia x 6000 H	1	-	-	-	-	-
Apatite conditioner tank agitator	1	20	20	15	0.8	11.9
Apatite rougher float cells 500 ft3	6	40	240	179	0.8	143.2
Apatite rougher froth pump and box	1	8	8	6	0.8	4.5
Apatite scav froth pump and box	1	5	5	4	0.8	3.0
Apatite cleaner float cells 300 ft3	6	30	180	134	0.8	107.4
Apatite cleaner froth pump and box	1	8	8	6	0.8	4.5
Apatite second cleaner froth pump and box	1	5	5	4	0.8	3.0
Apatite cleaner tails pumpbox	1	-	-	-	-	-
Apatite cleaner tails pumps	2	8	16	12	0.4	4.8
Apatite thickener drive & rake 10 000 Dia	1	5	5	4	0.8	3.0
Apatite thickener lift	1	3	3	2	0.1	0.2
Apatite thickener u/f pumps 38 x 25	2	5	10	7	0.4	3.0
Apatite filter 2000 W x 8000 L	1	20	20	15	0.7	10.4
Apatite filtrate receiver	1	-	-	-	-	-
Apatite filtrate return pump	1	5	5	4	0.1	0.4
Flotation Area O/H crane (vert.)	1	3	3	2	0.1	0.2
Flotation Area O/H crane (horiz.)	1	3	3	2	0.1	0.2
Flotation Area O/H crane (travel.)	1	3	3	2	0.1	0.2

ANDORJA PROJECT

19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 243 - MAGNETITE CONCENTRATION **********						
Spir./tab. tails pumpbox 2500 Dia X 2500 H	1	-	-	-	-	-
Spirals/tables tails pumps 350 x 300	2	125	250	187	0.4	74.6
Magnetite thickener and rake 17 000 Dia	1	5	5	4	0.8	3.0
Magnetite thickener lift	1	2	2	1	0.2	0.3
Magnetite thickener u/f pumps 50 x 38	2	10	20	15	0.4	6.0
Magnetite regrind mill 2440 Dia x 2740 L	1	350	350	261	0.8	208.9
Pumpbox 1500 Dia x 1500 H	1	-	-	-	-	-
Magnetite regrind mill pumps 150 x 100	2	75	150	112	0.4	44.8
Classifying cyclone 254 Dia	4	-	-	-	-	-
Ground mag'tite mag.seps. 916 Dia x 1200 W	3	5	15	11	0.8	9.0
Magnetite surge tank 10 500 Dia x 11 000 H	1	-	-	-	-	-
Magnetite surge tank agitator	1	100	100	75	0.8	59.7
Magnetite surge tank pump 100 x 75	1	10	10	7	0.8	6.0
S'slig/mag'tite filter 2700 Dia x 10 disk	1	6	6	4	0.8	3.6
S'slig/mag'tite filtrate receiver	1	-	-	-	-	-
S'slig/mag'tite filtrate return pump	1	5	5	4	0.8	3.0
Magnetics area sump pump 100 Dia	1	5	5	4	0.2	0.7

ANDORJA PROJECT

19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

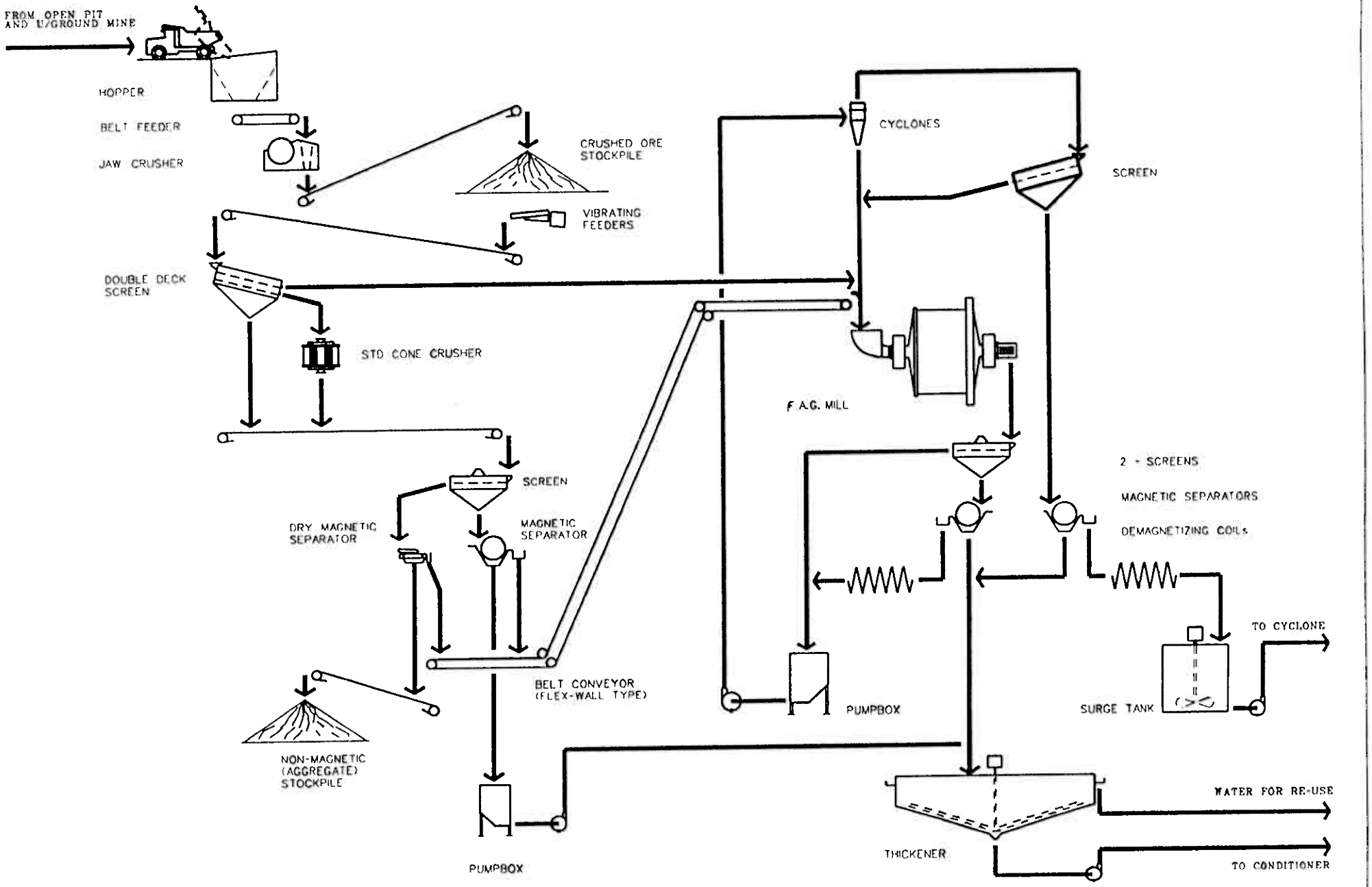
AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 246 - REAGENTS AND ANCILLARIES						
**********						
Barrel pumps	12	1	12	9	0.1	0.9
DOW 250 frother mixing/storage tank	1	-	-	-	-	-
DOW 250 frother pump	1	3	3	2	0.8	1.8
Berol ATRAC 857 mixing/storage tank	1	-	-	-	-	-
Berol ATRAC 857 pump	1	3	3	2	0.8	1.8
Xanthate mixing/storage tank	1	-	-	-	-	-
Xanthate pump	1	3	3	2	0.8	1.8
Sodium Hydroxide mixing/storage tank	1	-	-	-	-	-
NaOH pump	1	3	3	2	0.8	1.8
Amine mixing/storage tank	1	-	-	-	-	-
Amine pump	1	3	3	2	0.8	1.8
Dextrin mixing/storage tank	1	-	-	-	-	-
Dextrin pump	1	3	3	2	0.8	1.8
Potable water tank	1	-	-	-	-	-
Process water tank	1	-	-	-	-	-
Process water pump	2	15	30	22	0.4	9.0
Gland water pump	1	5	5	4	0.8	3.0
Flocc mixing tank	1	-	-	-	-	-
Flocc agitator	1	1	1	1	0.8	0.6
Flocc transfer pump	1	1	1	1	0.8	0.6
Flocc storage/aging tank	1	-	-	-	-	-
Flocc metering pump	1	1	1	1	0.8	0.6
Disk filter vacuum pump C2 3000	1	200	200	149	0.8	119.4
Belt filter vacuum pump	1	125	125	93	0.8	74.6
Disk filter blower	1	20	20	15	0.8	11.9
Flotation cell blowers	2	40	80	60	0.8	47.7
Air compressor	1	75	75	56	0.8	44.8
Lighting allowance	1	200	200	149	0.4	59.7
Maintenance shop	1	100	100	75	0.4	29.8
Assay laboratory	1	100	100	75	0.4	29.8

ANDORJA PROJECT

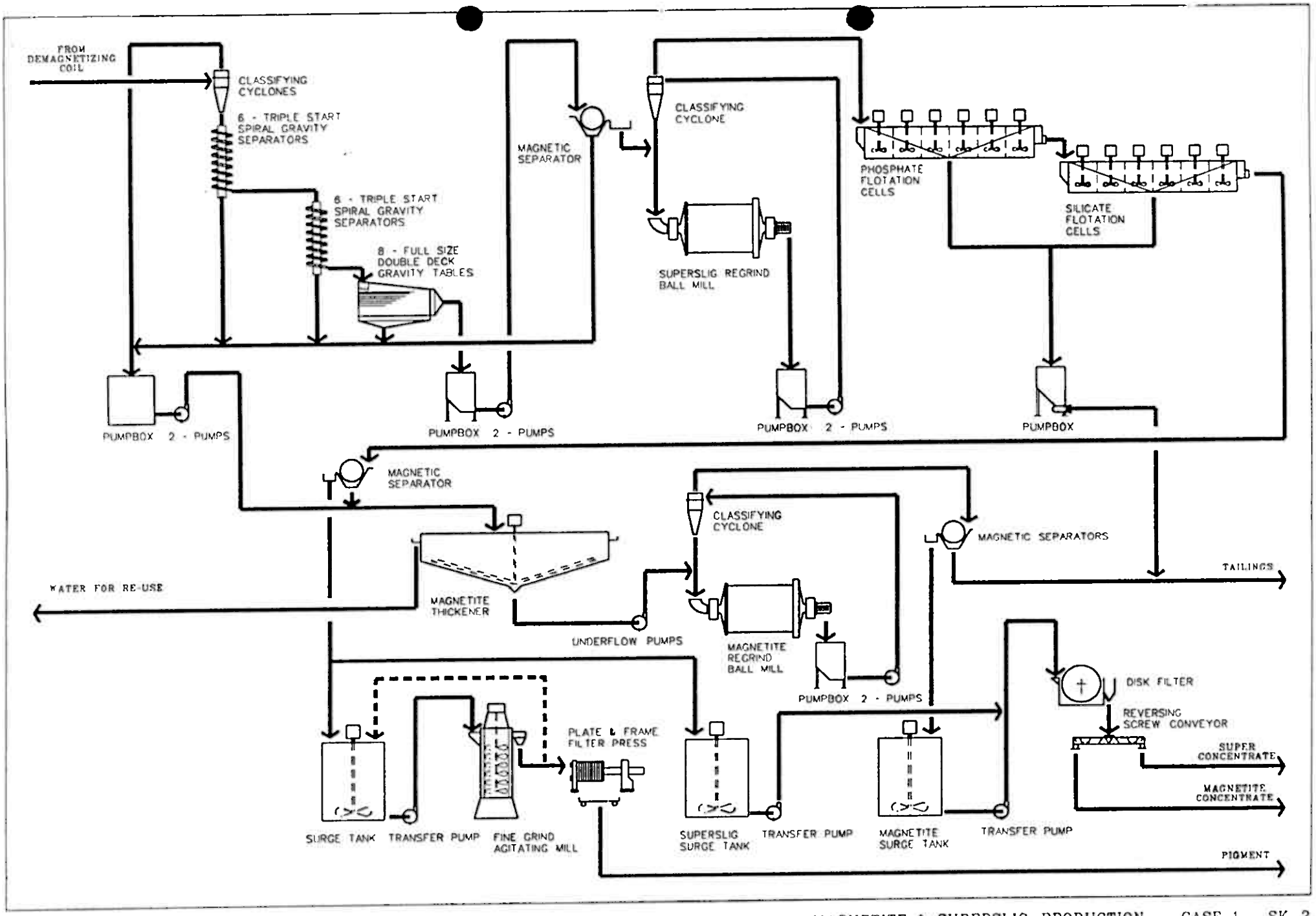
19-Jun-91
09:15 AM

EQUIPMENT LIST, MOTOR LIST AND POWER COSTS: CASE 2

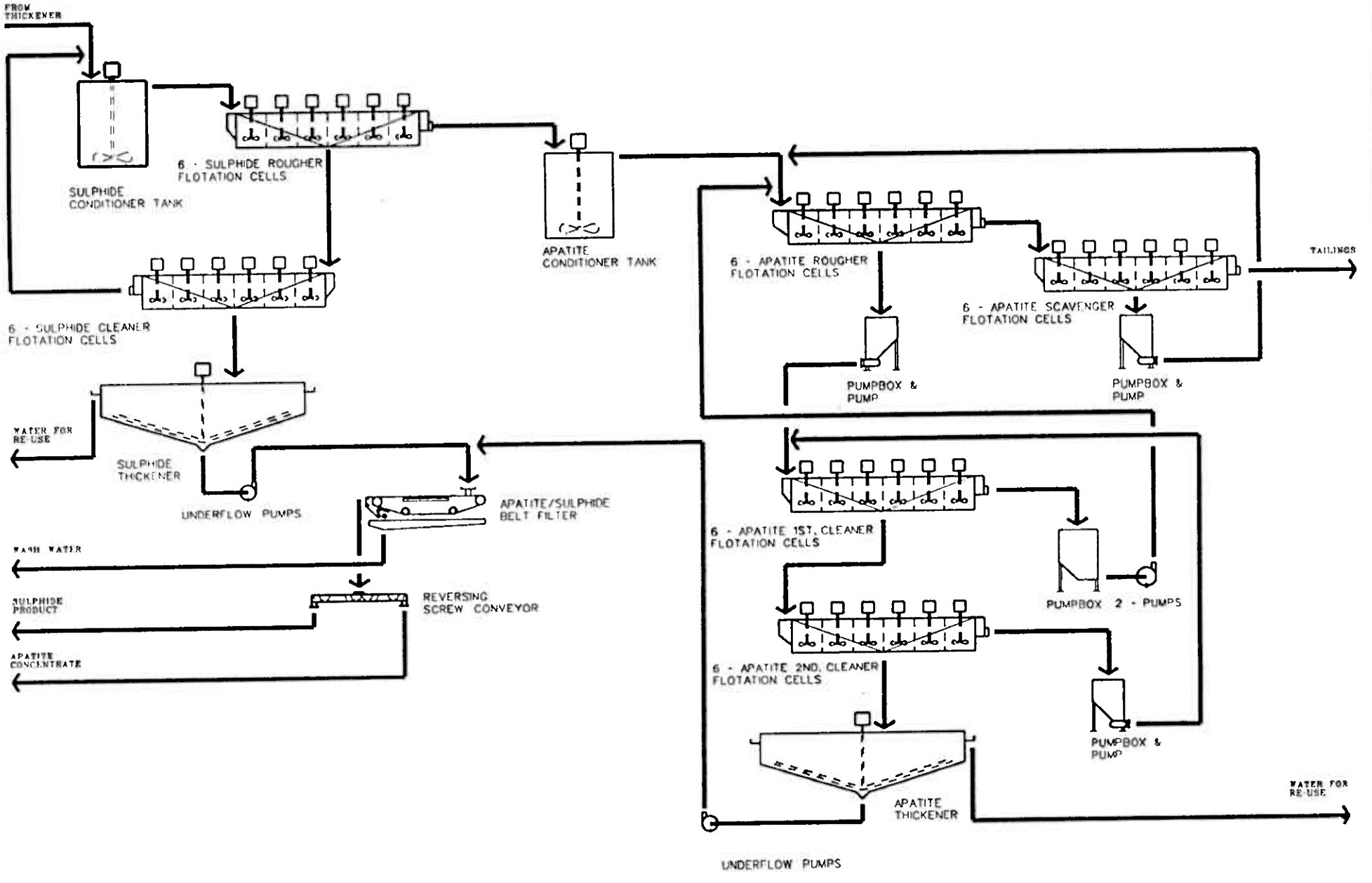
AREA AND EQUIPMENT ITEM	NO. ITEMS INSTALLED	INSTALLED HP/ITEM	TOTAL INSTALLED HP	TOTAL INSTALLED KW	LOAD FACTOR	OPERATING LOAD KW
AREA 220 - PACKAGING, HANDLING, STORAGE AND LOADOUT						
**********						
Pigment bagging unit	1	10	10	7	0.1	0.7
Superslig/magnetite product conveyor	1	25	25	19	0.2	3.7
Superslig stockpile feed conveyor	1	10	10	7	0.2	1.5
Common product reclaim hopper	1	-	-	-	-	-
Apatite product conveyor	1	20	20	15	0.2	3.0
Product reclaim conveyor	1	40	40	30	0.4	11.9
Shiploading conveyor	1	20	20	15	0.4	6.0
TOTAL	210	---	9,116	6,801	---	4,988



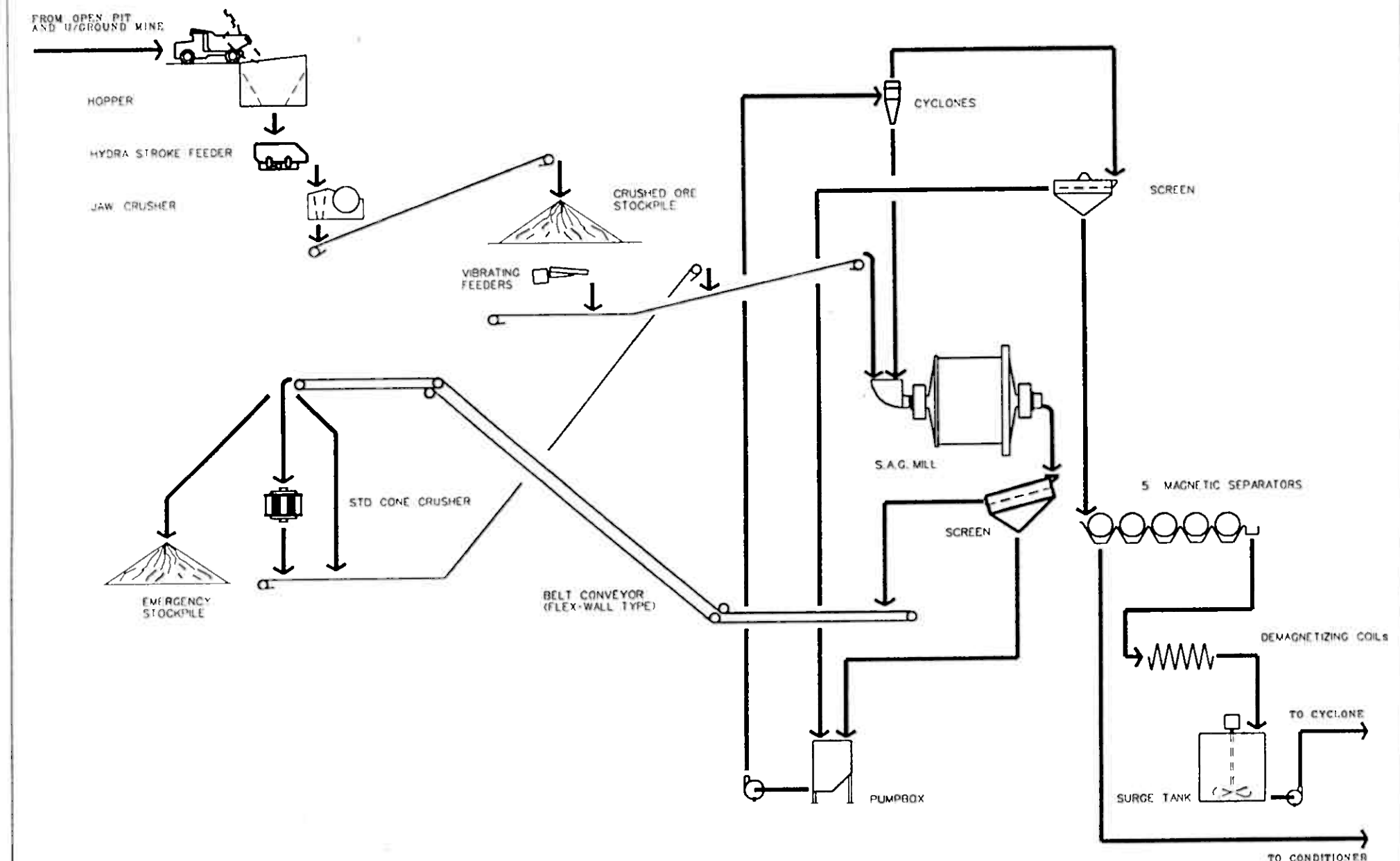
ORE RECEIVING , CRUSHING & GRINDING CASE 1 SK 1



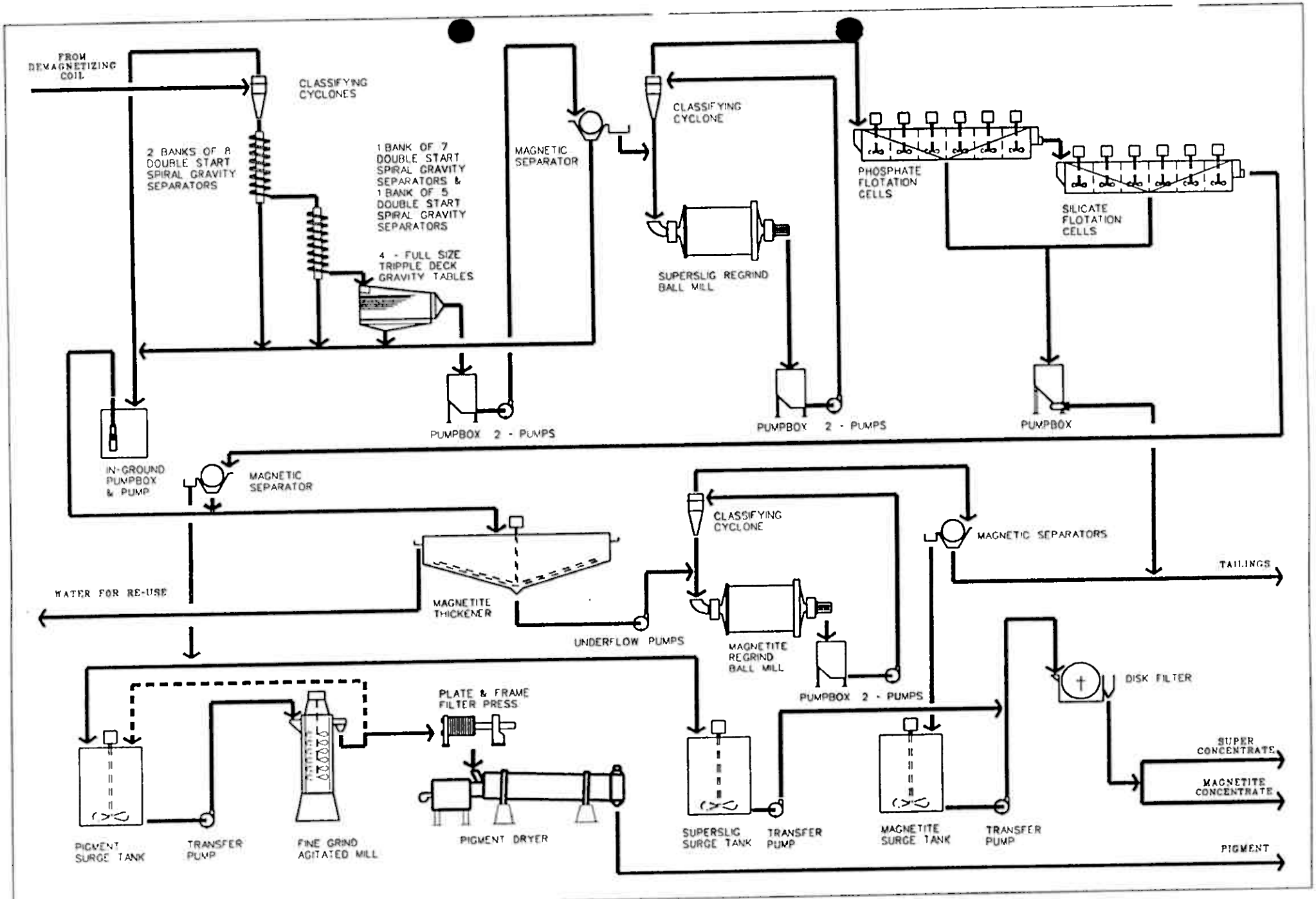
MAGNETITE & SUPERSLIG PRODUCTION CASE 1 SK 2



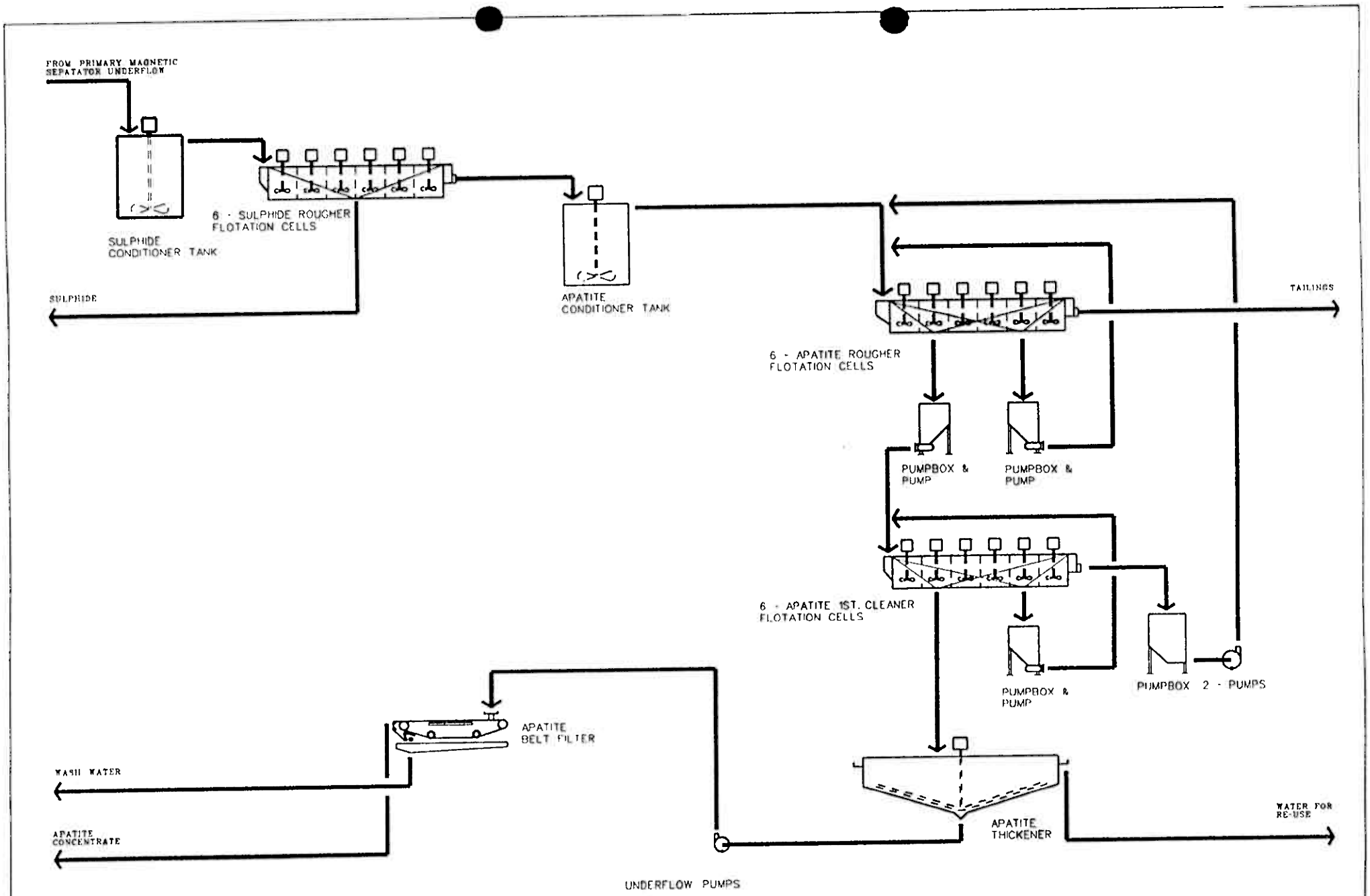
APATITE PRODUCTION CASE 1 SK 3



ORE RECEIVING , CRUSHING & GRINDING CASE 2 SK 1



MAGNETITE & SUPERSLIG PRODUCTION CASE 2 SK 2



APATITE PRODUCTION CASE 2 SK 3

A.R. MACPHERSON CONSULTANTS LTD.

GRINDABILITY REPORT

R. MacPherson Consultants Ltd.

t venture of Hazen Research and Lakefield Research

PROPOSED GRINDING SYSTEM
FOR
ANDORJA MAGNETITE-PHOSPHATE ORE - NORWAY
BASED ON
SMALL-SCALE GRINDING TESTS
AT
HAZEN RESEARCH, INC.
PREPARED BY
A.R. MACPHERSON CONSULTANTS LTD.
JULY 1991

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INTRODUCTION

A 365-pound sample was sent by Falkhammer Ibestad Magnetitt, N-9450 Hamnvik, Norway, to Hazen Research, Inc. (Hazen) for autogenous grindability testing. Since the orebody is considered to be "fairly" homogeneous, only one sample was sent for the test program. The Andorja ore is a mixture of magnetite, apatite, and gangue.

Feed rate to the mill will be 4,000 mt/day. The mill will receive minus 225-millimeter material from a jaw crusher. The final grind from the circuit is 80% passing 70 microns. Ground product will be processed in a magnetic separation/flotation beneficiation circuit.

SUMMARY OF TEST WORK

The Andorja sample was prepared for semiautogenous grinding (SAG) in an 18-inch air-swept Aerofall mill, and for Bond rod and ball mill grindability testing. The sample was crushed to minus $1^1/_4$ inch, blended, and samples split for Bond rod and ball mill testing. The remaining material was prepared for 18-inch mill grindability studies.

A summary of test work performed at Hazen is given in Table 1. Full details of the grinding test study are presented in the Hazen Report.

The commercially correlated gross autogenous work index is 12.3 kwh/st or 13.5 kwh/mt. The Bond rod and ball mill work indices are similar, but are less than the autogenous work index. These indices classify the magnetite/phosphate ore as a borderline material for fully autogenous grinding. A SAG mill grinding circuit with a small ball charge would be the best way to grind this ore.

GRINDING PLANT DESIGN

Since the ore is a magnetite/phosphate material, and work indices indicate that the ore is a borderline fully autogenous material, the grinding plant should probably consist of a semiautogenous primary mill and secondary ball mill. A SAG mill circuit is also easier to operate than an ABC grinding circuit. The grinding circuit will be fed minus 225-millimeter material. Final grind is 80% passing 70 microns.

Table 1

Summary of Grindability Data for Andorja Ore

Item	Results
Client Identification	Magnetite-Phosphate Ore
MacPherson Test No.	26
Gross Output, lb/h	24.59
Gross Power, kwh/st	7.61
Feed Size, P_{80} in microns	21,403
Product Size, P_{80} in microns	265
Gross Autogenous Work Index, AW_i	13.9
Commercially Correlated Gross AW_i	12.3
Bond Work Index	
Rod Mill, RW_i	10.6
Ball Mill, BW_i	
At 100% passing 150 mesh	10.0
At 100% passing 200 mesh	11.6

A prefeasibility circuit design is being made and will be compared with the utilization of a 27-ft by 18-ft taconite grinding mill with two 3500-hp wound-rotor motors. Because of the size of this mill, it is assumed that the final grind of 80% passing 70 microns is expected to be produced from the mill in closed circuit with hydrocyclones. Since the ore contains magnetite, its removal from the grinding circuit is required when partially liberated, so that magnetite buildup does not occur in the primary mill circuit.

GRINDING PLANT DESIGN

The commercially correlated autogenous work index is 12.3 kwh/st and is slightly higher than the Bond rod mill (10.6 kwh/st) and ball mill (10.0 and 11.6 kwh/st) indices. These work indices indicate that the material should be ground in a semiautogenous mill.

OPERATING AND DESIGN DATA

Feed rate/day = 4,000 mt
Feed rate/h = 167 mt
Feed rate at 87.5% availability = 191 mt/h
SAG mill feed size = minus 225 mm (minus nine inches)
Motor drive efficiency service factor = 0.96
Primary mill grind size = P_{80} 265 microns
Final circuit grind size = P_{80} 70 microns
Commercially correlated AW_i = 13.5 kwh/mt
Bond ball mill work index = 11.0 kwh/mt

SAG MILL SIZING

- With the crusher in the circuit, the work index for the material ground in the fully autogenous mill should be decreased to 11.0 kwh/mt. Since the ore has a high specific gravity and balls are added to the mill, additional power must be added to the grinding mill. Therefore, the AW_i has been increased by 15% or to 12.7 kwh/mt.

- SAG Mill Power/mt $= 12.7 \left(\frac{10}{\sqrt{265}} - \frac{10}{\sqrt{150,000}} \right)$

  $= 12.7\ (0.614 - 0.026)$
  $= 12.7\ (0.588)$
  $= 7.46$ kwh/mt

- Mill Motor Power = (191)(7.46)
  = 1,426 kw (Net)
  = 1,912 hp (Net)
  = 1,991 hp (Gross)

- Approximate SAG mill size is 24 ft by 9 ft with a 2,200-hp variable-speed motor. A four to six volume percent charge of four-inch balls is appropriate.

SECONDARY GRINDING MILL

- The Bond ball mill work index is increased by 20% to compensate for any increase in magnetite particle size because the work index for breaking across magnetite grains is between 25 and 30 kwh/st.

- Secondary Mill Power/mt $= 13.2 \left(\frac{10}{\sqrt{70}} \quad \frac{10}{\sqrt{265}} \right)$

  $= 13.2\ (1.195 - 0.614)$
  $= 13.2\ (0.581)$
  $= 7.67$ kwh

- Secondary Mill Motor Power = (191)(6.67)
  = 1,465 kw (Net)
  = 1,964 hp (Net)
  = 2,045 hp (Gross)

- Approximate ball mill size is 15 ft by 18 ft with a 2,200-hp motor.

Since Kilborn had indicated that the Andorja ore will have an in-line crusher for critical size control, the accompanying flowsheet (Figure 1) shows the circuit design, which A.R. MacPherson Consultants Ltd. (MacPherson Consultants) have derived from the small-scale testing.

The total power indicated by the work indices generated at Hazen is approximately 4,400 hp. Taconite plants in Minnesota use 12,000-hp mills to grind about 400 long tons (lt) per hour. This indicates a horsepower requirement of about 5,225 for a feed rate of 191 mt/h. For taconite, the average ball mill work index from Bond's list of "Average Work Indexes by Type of Materials" is 14.9 kwh/st or 16.4 kwh/mt or lt. The adjusted Bond ball mill work index for the magnetite/phosphate ore is 13.2 kwh/mt. The difference in work indices (16.4 - 13.2 = 3.2 kwh/mt) is equivalent to about 500 hp. To make sure that the comparison between taconite and the Andorja ore is reasonable, a Bond ball mill test was made at 100% passing 200 mesh. This grind gave a product of 80% passing 63 microns and indicated magnetite grain-size effect. The 200-mesh Bond grindability test gave a work index of 11.6 kwh/st or 12.8 kwh/mt. The above data indicate that the magnetite/phosphate ore can not be compared to Minnesota taconite.

COMMENTS OF SINGLE-STAGE AUTOGENOUS GRINDING

The 27-ft by 18-ft mill as the only grinding machine in the circuit could possibly be suitable if a flowsheet similar to the one used at HIBTAC in Minnesota is mimicked. A high-grade magnetite concentrate is produced from taconite ground in the single-stage fully autogenous mill. However, circulating load in the grinding circuit can be as high as 800%. This flowsheet would have to be

SEMIAUTOGENOUS PRIMARY MILL WITH CRUSHER IN THE CIRCUIT

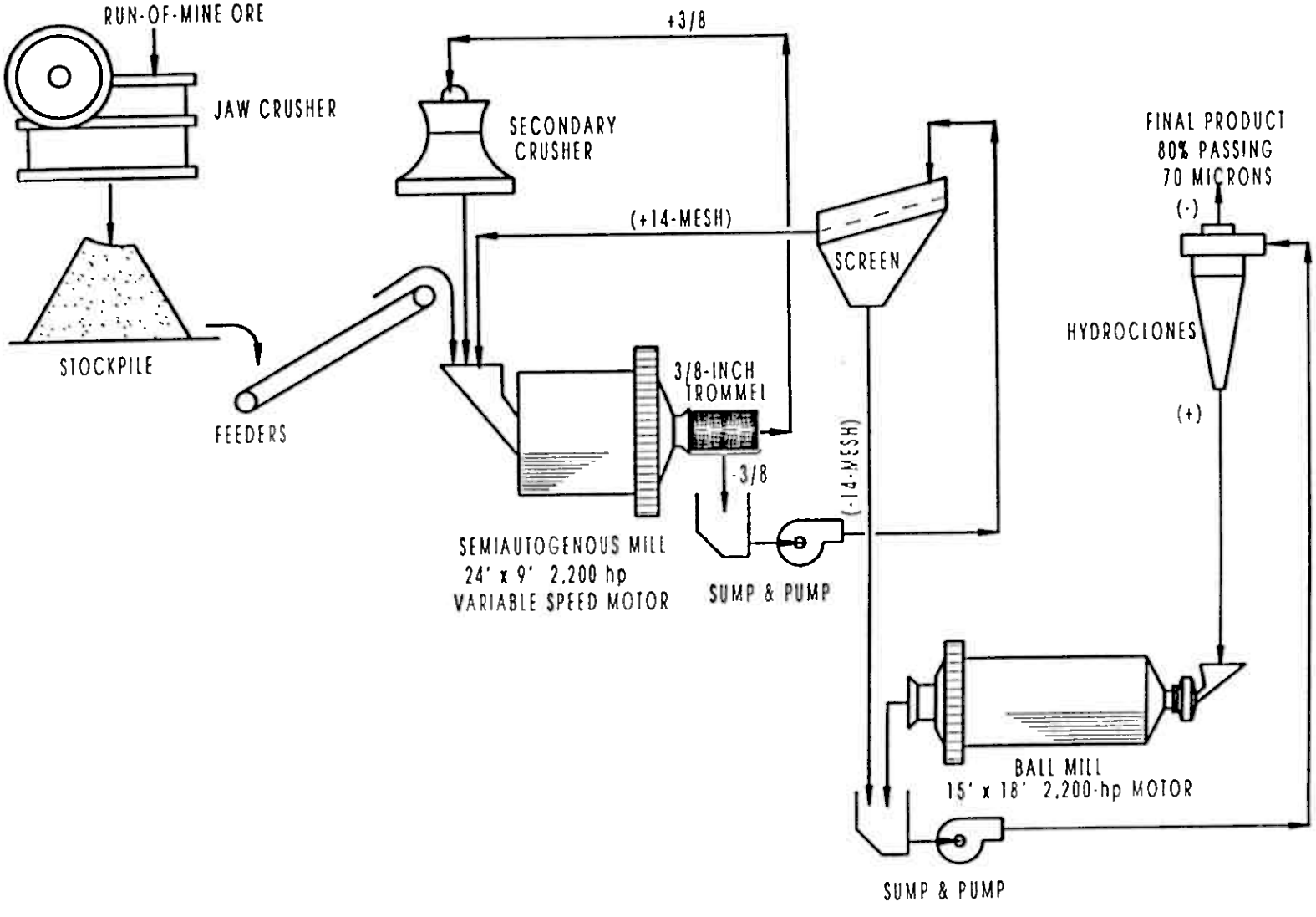

FIGURE 1

modified to accomodate the flotation of apatite from nonmagnetic tailings. Figure 2 shows the circuit arrangement. The cone crusher for pebble control is dotted in because the 27-foot by 18-foot mill should have more than enough power to grind the ore. If a pebble problem develops, balls can be added to the mill to crush the critical-size material.

The flowsheet in Figure 2 could be simulated on minus 14-mesh product from the 18-inch Aerofall mill. The following test program would be required to determine if single-stage grinding can be used on Andorja ore.

- The minus 14-mesh material is processed in a low-gradient, rougher magnetic separation step. The magnetic concentrate is screened at 48, 65, 100, 150, and 200 mesh. Each screen fraction is sampled and analyzed for total iron. From the iron analyses, the mesh size at which a final concentrate might be made is determined. Processing the material passing the liberation mesh size in a Davis tube will indicate the final obtainable concentrate.
- Tailings from the rougher magnetic separation will indicate the phosphate content. The material is screened at 150 mesh. The plus 150-mesh fraction is ground to minus 150 mesh and mixed with the screen undersize. The flotation characteristics of the apatite can be determined on the minus 150-mesh material.

Figure 2 indicates the flowsheet simulated by the above test work and is considered the best treatment sequence for the Andorja ore ground in a single-stage circuit. By separating the liberated magnetite from the minus 10-mesh material, buildups of the magnetite in the grinding circuit is eliminated. This creates two beneficiation routes, one for the magnetite and the other for the apatite.

If the decision is made to grind the ore to 80% passing minus 70 micron in a single-stage milling circuit, the 27-ft by 18-ft mill is large enough to accomplish the grind. Calculation of the power required to grind the Andorja ore from 80% passing 150,000 microns to 80% passing 70 microns is given below.

- The commercially correlated work index is increased by 15% to compensate for the high-specific-gravity ore and the possibility that coarser-grained magnetite will be encountered in the orebody. AW_i is (13.5)(1.15) = 15.53 kwh/mt.

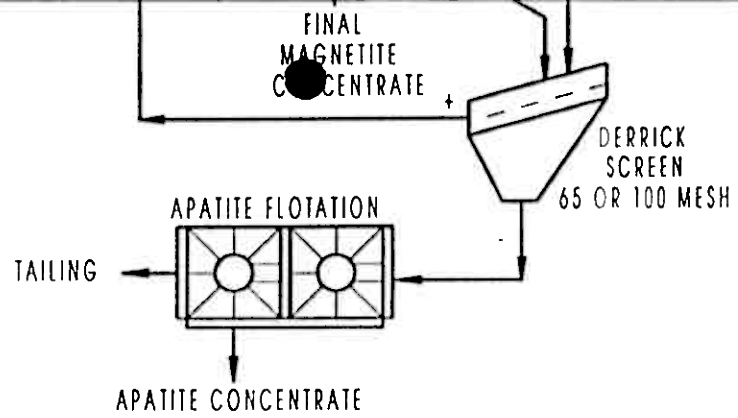
FINAL
MAGNETITE
CONCENTRATE
DERRICK
SCREEN
65 OR 100 MESH
APATITE FLOTATION
TAILING
APATITE CONCENTRATE

FIGURE 2

- Total Grinding Power/mt $= 15.53 \left(\frac{10}{\sqrt{70}} - \frac{10}{\sqrt{150{,}000}} \right)$

$= 15.53\ (1.195 - 0.026)$
$= 15.53\ (1.169)$
$= 18.15$ kwh

- Total Required Grinding Power $= 18.15\ (191)$
$= 3{,}467$ kw (Net)
$= 4{,}647$ hp (Net)
$= 4{,}841$ hp (Gross)

Since the 27-ft by 18-ft mill has 7,000 installed horsepower, this mill should be capable of grinding the Andorja ore in a single-stage, fully-autogenous circuit to 80% passing 70 microns. However, high circulating loads will probably be encountered. MacPherson Consultants feel that this approach to grinding the magnetic/phosphate ore is not the preferred route.

CONCLUSIONS

nc. asked MacPherson Consultants to comment on the use of a 27-ft by 18-ft taconite h two 3,500-hp wound rotor motors. This mill is considerably oversize for grinding netite/phosphate ore. Michigan magnetite ores are ground at a similar feed rate in 24- utogenous mill with 2,200-hp motor. If the crusher is eliminated from the circuit and rcent charge of four-inch balls added for critical size control, the primary SAG mill : as follows:

G mill power with 15% allowance · high-specific-gravity : and ball charge $= 15.53 \left(\frac{10}{\sqrt{265}} - \frac{10}{\sqrt{150{,}000}} \right)$

$= 15.53\ (0.588)$
$= 9.13$ kwh/mt

AG Mill Motor Power = 191 (9.13)
= 1,744 kw (Net)
= 2,337 hp (Net)
= 2,434 hp (Gross)

pproximate SAG mill size is 24 ft by 9 ft with a 2,500-hp, variable-speed motor.

econdary mill size for this grinding circuit would be similar to the ball mill reported in e SAG mill grinding circuit reported in Figure 3 is preferred and is a simpler circuit ntains no crusher. However, if critical-size material develops as the mining plan d can not be controlled by increased ball charge in the SAG circuit, a reverse trommel n the circuit design. The most costly part of a crushing circuit for critical size control lace if needed. The trommel would also protect the primary circuit screen from excessive

SEMIAUTOGENOUS PRIMARY MILL WITH NO CRUSHER IN THE CIRCUIT

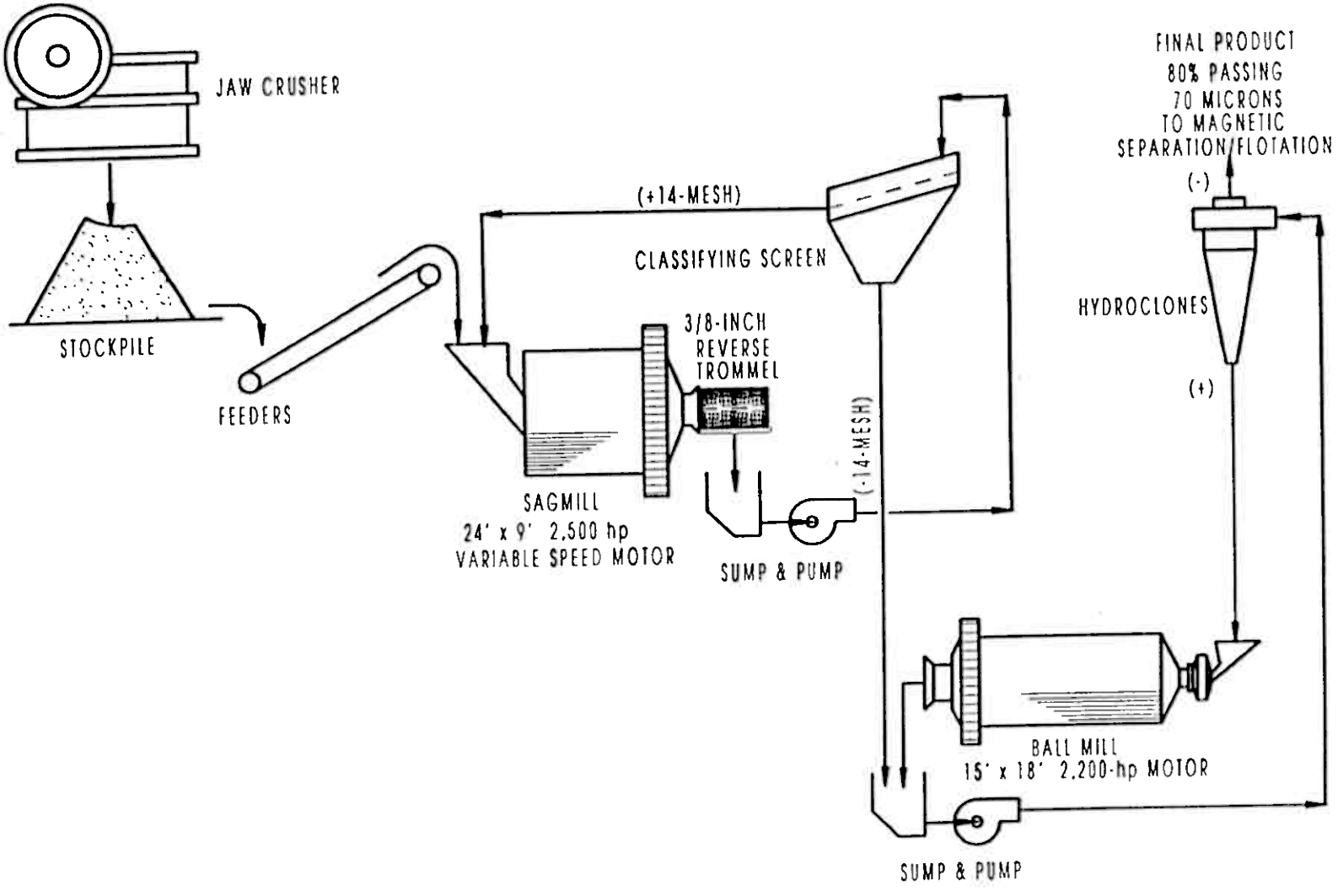

FIGURE 3

ATTACHMENT I

Hazen Research, Inc.
4601 Indiana St. · Golden, Colo. 80403
Tel:(303) 279-4501 · Telex 45-860
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ANDORJA MAGNETITE/PHOSPHATE PROJECT

KILBORN INC.

Performed by

HAZEN RESEARCH, INC.

JULY 1991

A standard semiautogenous grindability test and Bond rod and ball mill grindability tests were conducted on a sample from the Andorja magnetite/phosphate deposit. Feed to the semiautogenous grindability test was prepared to 100% passing $1^1/_4$ inch, and samples were split out for Bond rod and ball mill grindability testing. These samples were stage-crushed to the following appropriate top sizes: 100% passing $^1/_2$ inch for the Bond rod mill test and 100% passing 6 mesh for the Bond ball mill tests. The Bond rod and ball mill grindability tests were conducted at 100% passing 14 mesh and 100% passing 150 and 200 mesh, respectively.

Descriptions of the 18-inch Aerofall test mill used for the autogenous grindability test and ancillary equipment are presented in Attachment 1. Test methodology for determining an autogenous work index is presented in Attachment 2. Detailed data from the semiautogenous grindability test are presented in Appendix A. Bond rod and ball mill work indices are reported in Appendices B and C, respectively. The grindability results were given to A.R. MacPherson Consultants Ltd. for interpretation.

ATTACHMENT I

HAZEN

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
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Fax:(303) 278-1528

DESCRIPTION OF THE AEROFALL TEST MILL

The Aerofall test mill, as shown in the attached figure, consists of an 18-inch diameter mill as a crushing and grinding unit, a draft fan to supply the airflow required to remove the ground material from the mill, and a collection system to recover the ground material from the airstream.

The Aerofall mill consists of a cylindrical steel shell 18 inches in diameter by 10.5 inches long and is fitted with axially-mounted hollow steel trunnions on ball bearings in the bearing housings. The mill ends are lined with deflector-shaped steel liners, while 18 impact bars, or rails, line the breast. The mill is driven at 52 rpm or 83% of critical speed by a $^1/_2$-hp motor.

Six peripheral discharge ports for discharge of a coarse product, if desired, are cut into the mill shell and are located on the discharge side below the deflector liners.

The draft fan is a Sheldon's 1203-B "PH" blower fitted with a variable-speed drive and gives a range of airflow capacities up to 180 cubic feet per minute.

The collection equipment located between the mill and the draft fan are:

1. An eight-inch diameter Model V2 Vertical Classifier used as a coarse primary collector. The collected product is discharged continuously through a discharge trap sealed by a rubber flap.

2. A nine-inch diameter 6B cyclone used as a fine-product collector and fitted with a double-flap discharge trap for the continuous discharge of the collected product.

3. A CD-1 Pangborn dust collector used for collecting fine dust and fitted with a manually-operated valve for the intermittent discharge of the collected product.

The mill is fed from a feed hopper by a four-inch wide by ten-inch long Syntron feeder actuated automatically by a Milltronics Limited feed rate control system. This control continuously regulates the feed rate by maintaining a preset sound level with a microphone located below the mill shell and therefore controls mill load level.

Net mill power is calculated according to the relationship established by prony brake tests:

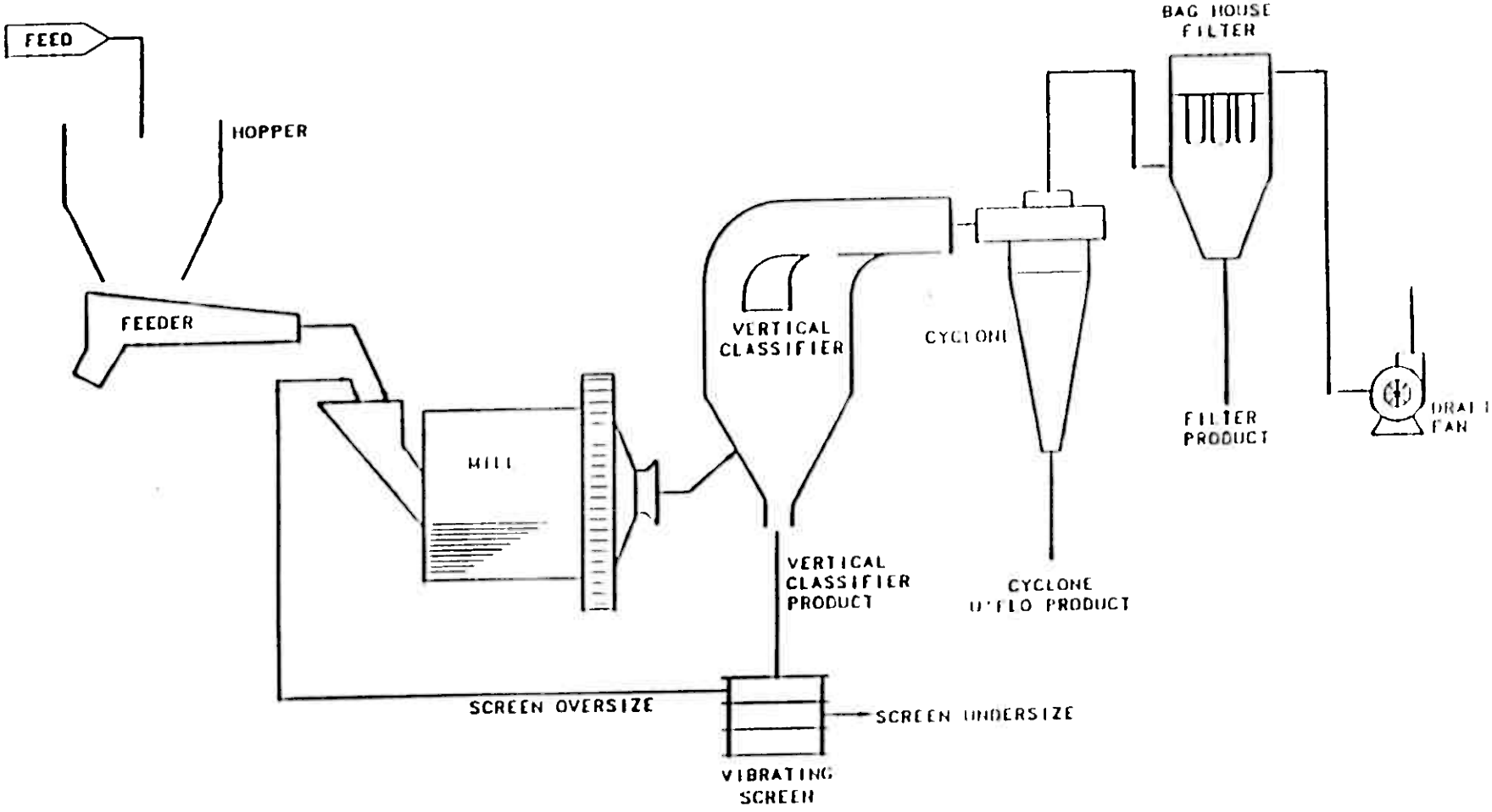
$$\text{Net Watts} = 0.682\,(3.2 - 3 \times Lf)\,(Lf)\,(D)$$

where D = density of the total mill load, lb/cu ft

and Lf = fractional filling of the mill.

In practice, the mill is operated under a given set of conditions for a period of time sufficient to establish balanced mill conditions. The feed rate is controlled automatically, and output and product distributions are established by weighing the collected products at regular timed intervals. Samples are taken normally over a one- or two-hour period and at regular timed intervals.

MacPHERSON SYSTEM, 18" MILL TEST CIRCUIT



ATTACHMENT II

APPENDIX A
STANDARD MACPHERSON GRINDABILITY TEST
Hazen Research, Inc.

MACPHERSON GRINDABILITY TEST 26

PROJECT NO - 7615
DATE - 06/30/91

PURPOSE: To conduct an 18 inch autogenous grindability test on the feed sample according to a procedure described as the MacPherson system.

SAMPLE: Approx. 365 lbs of client identified "Magnetite - Phosphate Ore" (HRI sample no.45356) stage crushed to 100 percent minus 1.25 inch.

PROCEDURE: Standard MacPherson test methodology as described in attachments 1 and 2.

RESULTS:

MILL PRODUCTS AT STEADY STATE

MILL PRODUCT	DIRECT WEIGHT %
Total Feed (Computed)	100.00
+14 mesh Screen	(1.78) *
-14 mesh Screen	1.40
Cyclone Underflow	93.93
Bag House (Filter)	4.67

* +14 mesh screen product (recycle to mill) included as recirculating load.

POWER CALCULATIONS & SUMMARY DATA

ORE CHARGE:

lb	=	50.85
cu ft	=	0.349
lb/cu ft	=	145.75

ORE CHARGE PLUS BALL CHARGE:

lb	=	90.77
cu ft	=	0.443
lb/cu ft	=	204.75

Gross Output, lb/hr	=	28.03
% +14 Mesh in Feed	=	87.73
Net Output, lb/hr	=	24.59
Net Mill Watts	=	98.19
kW-hr/ston, Gross	=	7.00
kW-hr/ston, Net	=	7.98
F80, microns	=	21403
P80, microns	=	265
Awi, Per Gross Output	=	12.82
Awi, Per Net Output	=	14.62

METHODOLOGY FOR 18" DIAMETER MILL TESTS TO DETERMINE AUTOGENOUS WORK INDEX

The following method is used for the testing of ores to establish an autogenous work index according to the MacPherson procedure.

The ore samples are crushed in a 3-inch by 5-inch jaw crusher with an open side setting of 1-inch to produce a minus 1.25-inch feed size as required by the 18-inch diameter Aerofall mill.

The standard air-swept system is used without peripheral discharge. The product from the vertical classifier is passed over a 24-inch diameter Sweco screen fitted with a wire mesh screen having square openings of 1190 microns (14 mesh). The screen oversize material is returned to the mill as a circulating load; the screen undersize material is collected as a product. The products from the cyclone and baghouse "filter" are collected separately. (See Figure 1).

The mill is operated with a 40 pound ball charge, graded in size to approximate that given naturally from a 2.5-inch make-up ball diameter as follows:

Diameter, inches	Percent Weight
-2.5 + 2.0	58.00%
-2.0 + 1.5	29.00
-1.5 + 1.0	10.50
-1.0 + 0.5	2.50
Total	100.0

The mill is put into operation and new feed added under manual control until a normal mill load level is established, then switched to automatic sound control.

The mill is operated for a period of time sufficient to have established balanced mill conditions, then operated for one to two hours during which samples of all products are taken for size analysis and product weight distribution. The mill load is removed for size and volumetric analysis at the end of the test.

APPENDIX A

MACPHERSON GRINDABILITY TEST

STANDARD MACPHERSON GRINDABILITY TEST

Hazen Research, Inc.

Test No. - 25
Project No. - 7615

PRODUCT PARTICLE SIZE DISTRIBUTION

SCREEN SIZE (Retained)		DIRECT WEIGHT % DISTRIBUTION							CUM % PASSING
				SCREEN PRODUCTS					
MESH (Tyler)	MICRONS	MILL FEED	MILL CHARGE	+14 mesh	-14 mesh	CYCLONE U'FLOW	BAG HOUSE (Filter)	TOTAL (Computed)	TOTAL MILL PRODUCT
TOTAL (Computed)		100.00	100.00	100.00	100.00	100.00	100.00	100.00	---
1 - Inch	25400	12.74	2.75	0.00	0.00	0.00	0.00	0.00	100.00
3/4	19050	13.31	25.94	0.00	0.00	0.00	0.00	0.00	100.00
1/2	12700	11.92	24.91	0.00	0.00	0.00	0.00	0.00	100.00
3/8	9525	12.77	10.27	0.00	0.00	0.00	0.00	0.00	100.00
1/4	6350	12.63	11.84	0.00	0.00	0.00	0.00	0.00	100.00
4 Mesh	4760	9.58	3.96	36.01	0.00	0.00	0.00	0.00	100.00
6	3360	5.44	12.90	13.48	0.00	0.00	0.00	0.00	100.00
8	2380	4.64	2.14	13.95	0.00	0.00	0.00	0.00	100.00
10	1680	2.49	1.59	12.64	0.00	0.00	0.00	0.00	100.00
14	1190	2.21	1.23	18.13	1.22	0.00	0.00	0.02	99.98
20	841	1.56	0.69	5.79	17.86	0.03	0.00	0.28	99.70
28	595	1.00	0.58	0.00	31.16	0.30	0.02	0.72	98.98
35	420	0.86	0.43	0.00	24.54	1.99	0.10	2.13	96.85
48	297	0.92	0.28	0.00	10.81	4.15	0.21	4.06	92.79
65	210	0.46	0.18	0.00	5.88	7.54	0.35	7.18	85.61
100	149	0.75	0.10	0.00	3.07	8.75	0.48	8.29	77.32
150	105	1.16	0.09	0.00	1.17	12.54	0.61	11.83	65.50
200	74	1.94	0.05	0.00	3.02	15.16	2.11	14.38	51.11
270	53	1.41	0.03	0.00	0.64	11.34	1.79	10.75	40.36
325	44	0.48	0.04	0.00	0.42	10.82	2.22	10.27	30.10
-325	-44	1.73	0.00	0.00	0.21	27.46	92.12	30.10	0.00

STANDARD MACPHERSON GRINDABILITY TEST

Hazen Research, Inc.

Appendix Page - 3
Test No. - 26
Project No. - 7615

DETAILED PARTICLE SIZE ANALYSIS

SCREEN SIZE (Retained)		MILL FEED, +1/4 inch				MILL FEED, -1/4 inch				MILL FEED, TOTAL		
				CUM %				CUM %			CUM %	
MESH (Tyler)	MICRONS	lb	DIRECT WT %	PASS	RET'D	g	DIRECT WT %	PASS	RET'D	DIRECT WT %	PASS	RET'D
4- Inch	101600		0.00	100.00	0.00					0.00	100.00	0.00
2-3/4	69850		0.00	100.00	0.00					0.00	100.00	0.00
2	50800		0.00	100.00	0.00					0.00	100.00	0.00
1-1/2	38100		0.00	100.00	0.00					0.00	100.00	0.00
1-1/4	31750		0.00	100.00	0.00					0.00	100.00	0.00
1	25400	46.60	12.74	87.26	12.74					12.74	87.26	12.74
3/4	19050	48.70	13.31	73.95	26.05					13.31	73.95	26.05
1/2	12700	43.60	11.92	62.03	37.97					11.92	62.03	37.97
3/8	9525	46.70	12.77	49.26	50.74					12.77	49.26	50.74
1/4	6350	46.20	12.63	36.63	63.37					12.63	36.63	63.37
-1/4 Inch	-6350	134.00	36.63	0.00	100.00							
TOTAL		365.8	100.00	--	--							
4 Mesh	4760					517.00	25.16	73.84	26.16	9.58	27.05	72.95
6	3360					293.50	14.85	58.99	41.01	5.44	21.61	78.39
8	2380					250.20	12.66	46.33	53.67	4.64	16.97	83.03
10	1680					134.60	6.81	39.52	60.48	2.49	14.48	85.52
14	1190					119.10	6.03	33.50	66.50	2.21	12.27	87.73
20	841					84.00	4.25	29.25	70.75	1.56	10.71	89.29
28	595					54.10	2.74	26.51	73.49	1.00	9.71	90.29
35	420					46.50	2.35	24.16	75.84	0.86	8.85	91.15
48	297					49.70	2.51	21.64	78.36	0.92	7.93	92.07
65	210					24.60	1.24	20.40	79.60	0.46	7.47	92.53
100	149					40.70	2.06	18.34	81.66	0.75	6.72	93.28
150	105					62.80	3.18	15.16	84.84	1.16	5.55	94.45
200	74					104.40	5.28	9.88	90.12	1.94	3.62	96.38
270	53					75.90	3.84	6.04	93.96	1.41	2.21	97.79
325	44					25.80	1.31	4.73	95.27	0.48	1.73	98.27
-325	-44					93.50	4.73	0.00	100.00	1.73	0.00	100.00
TOTAL						1976.4	100.00	--	--	100.00	--	--

STANDARD MACPHERSON GRINDABILITY TEST

Hazen Research, Inc.

Test No. - 26
Project No. - 7615

DETAILED PARTICLE SIZE ANALYSIS

SCREEN SIZE (Retained)		MILL CHARGE, +1/4 inch				MILL CHARGE, -1/4 inch				MILL CHARGE, TOTAL		
				CUM %				CUM %			CUM %	
MESH (Tyler)	MICRONS	g	DIRECT WT %	PASS	RET'D	g	DIRECT WT %	PASS	RET'D	DIRECT WT %	PASS	RET'D
4 - Inch	101600		0.00	100.00	0.00					0.00	100.00	0.00
2-3/4	69850		0.00	100.00	0.00					0.00	100.00	0.00
2	50800		0.00	100.00	0.00					0.00	100.00	0.00
1-1/2	38100		0.00	100.00	0.00					0.00	100.00	0.00
1-1/4	31750		0.00	100.00	0.00					0.00	100.00	0.00
1	25400	634.00	2.75	97.25	2.75					2.75	97.25	2.75
3/4	19050	5976.00	25.94	71.31	28.69					25.94	71.31	28.69
1/2	12700	5739.00	24.91	46.39	53.61					24.91	46.39	53.61
3/8	9525	2366.00	10.27	36.12	63.88					10.27	36.12	63.88
1/4	6350	2727.00	11.84	24.29	75.71					11.84	24.29	75.71
-1/4 Inch	-6350	5595.00	24.29	0.00	100.00							
TOTAL		23037.0	100.00	--	--							
4 Mesh	4760					211.40	16.29	83.71	16.29	3.96	20.33	79.67
6	3360					689.50	53.13	30.58	69.42	12.90	7.43	92.57
8	2380					114.30	8.81	21.77	78.23	2.14	5.29	94.71
10	1680					84.70	6.53	15.24	84.76	1.59	3.70	96.30
14	1190					65.80	5.07	10.17	89.83	1.23	2.47	97.53
20	841					37.00	2.85	7.32	92.68	0.69	1.78	98.22
28	595					31.10	2.40	4.92	95.08	0.58	1.20	98.80
35	420					23.10	1.78	3.14	96.86	0.43	0.76	99.24
48	297					14.70	1.13	2.01	97.99	0.28	0.49	99.51
65	210					9.50	0.73	1.28	98.72	0.18	0.31	99.69
100	149					5.80	0.43	0.85	99.15	0.10	0.21	99.79
150	105					4.60	0.35	0.49	99.51	0.09	0.12	99.88
200	74					2.90	0.22	0.27	99.73	0.05	0.07	99.93
270	53					1.50	0.12	0.15	99.85	0.03	0.04	99.96
325	44					2.00	0.15	0.00	100.00	0.04	0.00	100.00
-325	-44					0.00	0.00	0.00	100.00	0.00	0.00	100.00
TOTAL						1297.7	100.00	--	--	100.00	--	--

APPENDIX B

BOND ROD MILL GRINDABILITY TEST

APPENDIX C
STANDARD BOND BALL MILL GRINDABILITY TEST
Hazen Research, Inc.

HRI Ball Mill Grindability Test 853

PROJECT NO:7615
DATE :07/01/91

PURPOSE: To determine the ball mill grindability of the test sample in terms of a Bond Work Index number.

PROCEDURE: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

SAMPLE: Client identified "Magnetite - Phosphate Ore" (HRI sample 45356) staged crushed to minus 6 mesh. This material was used as feed for the grindability test.

RESULTS:

CALCULATION OF A BOND WORK INDEX

$$BWi = \frac{44.5}{(P1)^{0.23} * (GBP)^{0.82} * (10/(P80)^{0.5} - 10/(F80)^{0.5})}$$

P1	= 100% passing size of product	74	microns
Gbp	= Grams per revolution	1.44	grams
P80	= 80% passing size of product	63	microns
F80	= 80% passing size of feed	2363	microns

BWi = 11.6

STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 853
HRI Sample No : 45356

Appendix Page: 2
Date : Jul-91

TEST CONDITIONS AND NOTES:

100% mesh of grind = 200
Test Feed Weight (700 cc) = 1841.0 g
% Minus 200 M in Feed = 14.3 %
Target Product Weights:
+200 M = 1315.0
-200 M = 526.0

TEST BALL CHARGE:

Nominal Ball Size Inch	No. of Balls	Weight g
1.50	31	7524
1.25	48	6771
1.00	10	795
0.75	88	3213
0.50	105	1822
Total:	282	20125

Stage No.	Revolutions	New Feed g	Undersize In Feed g	Undersize To Be Ground g	U'Size In Product g	Undersize Product Total g	Undersize Product Per Mill Revolution g	% Circ. Load
1	175	1841.0	263.3	1051.7	519.6	256.3	1.46	254
2	308	519.6	74.3	1240.7	529.7	455.4	1.48	248
3	304	529.7	75.7	1239.3	533.9	458.2	1.51	245
4	298	533.9	76.3	1238.7	514.3	438.0	1.47	258
5	308	514.3	73.5	1241.5	518.5	445.0	1.44	255
6	313	518.5	74.1	1240.9	529.8	455.7	1.46	247
7	309	529.8	75.8	1239.2	517.5	441.7	1.43	256
Average last three cycles =							1.44	253

STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 853
HRI Sample No : 45356

Appendix Page: 3
Date : Jul-91

DETAILED PARTICLE SIZE ANALYSES:

SCREEN SIZE (Retained)		MILL FEED, -6 M				CIRCULATING LOAD, +200 M				TEST PRODUCT, -200 M			
				CUM % (1)				CUM % (1)				CUM % (1)	
MESH (Tyler)	MICRONS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS
6 Mesh	3360			100.00	102.40			100.00	--				
8	2380	268.4	14.58	85.42	80.38	36.4	2.75	97.25	--				
10	1680	388.4	21.10	64.32	64.23	64.0	4.84	92.41	--				
14	1190	260.7	14.16	50.16	52.45	32.4	2.45	89.97	--				
20	841	157.1	8.53	41.63	43.57	20.5	1.55	88.42	--				
28	595	105.1	5.71	35.92	36.82	18.0	1.36	87.06	--				
35	420	77.9	4.23	31.69	31.51	25.1	1.90	85.16	--				
48	297	63.2	3.43	28.26	27.30	42.1	3.18	81.98	--				
65	210	49.6	2.69	25.56	23.85	72.6	5.49	76.49	--				
100	149	58.0	3.15	22.41	20.99	167.8	12.68	63.82	--				
150	105	68.9	3.74	18.67	18.50	400.5	30.26	33.55	--				
200	74	80.6	4.38	14.29	16.34	444.1	33.55	0.00					
-200	-74	263.1	14.29	0.00									
TOTAL		1841.00	100.00	--	--	1323.50	100.00	--	--				
200	74										0.00	100.00	99.24
270	53									58.2	38.55	61.45	63.21
400	37									38.0	24.69	36.76	35.76
-400	-37									53.6	36.76	0.00	
TOTAL										145.80	100.00	--	--

(1) The regressed value of Cumulative % Passing is calculated from the linear regression data on Appendix Page 4. These values are used for calculating the P80 and F80.

STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 853
HRI Sample No : 45356

Appendix Page: 4
Date : Jul-91

PARTICLE SIZE ANALYSES DATA:

MILL FEED, -6 M

Regression Output:	
Constant	-3.53162
Std Err of Y Est	2.526483
R Squared	0.993692
No. of Observations	12
Degrees of Freedom	8

X Coefficient(s)	0.023660	-1.40085	7.185037
Std Err of Coef.	0.018453	3.785377	12.80001

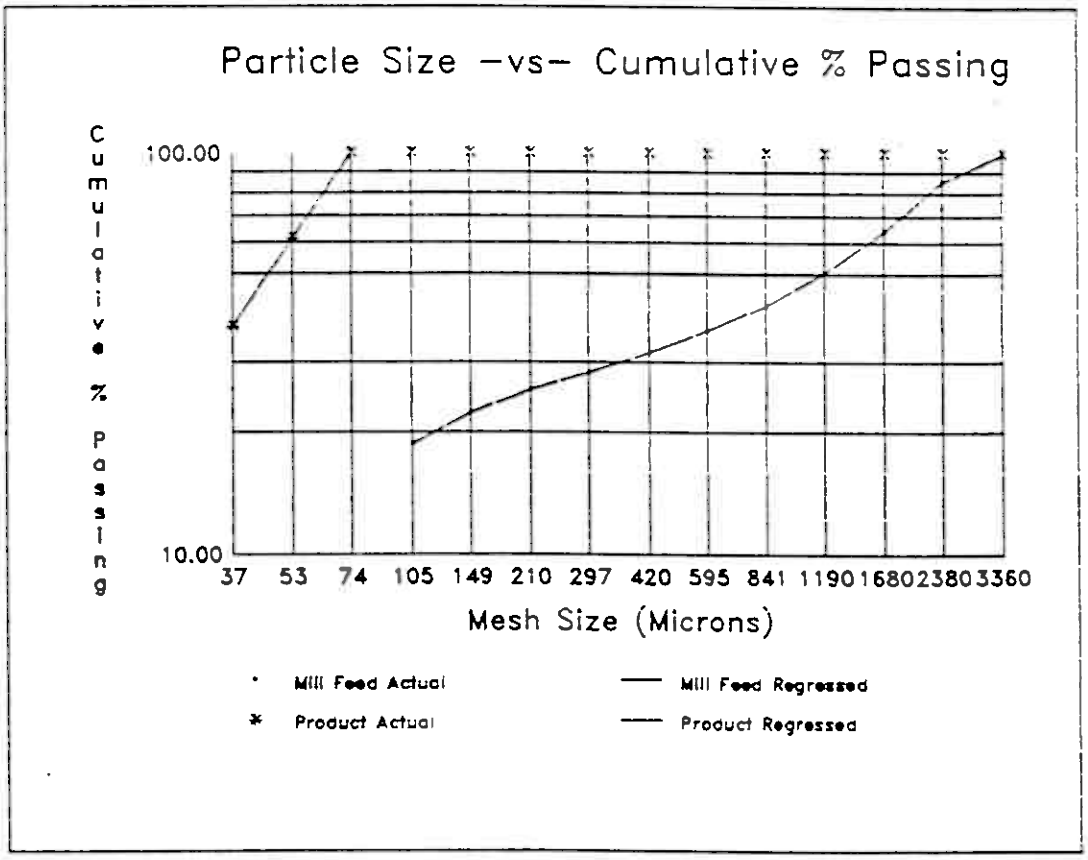
F80 = 2383 microns

TEST PRODUCT, -200 M

Regression Output:	
Constant	-27.7106
Std Err of Y Est	2.180828
R Squared	0.997701
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s)	1.715540
Std Err of Coef.	0.082340

P80 = 63 microns



STANDARD MACPHERSON GRINDABILITY TEST

Hazen Research, Inc.

Appendix Page - 5
Test No. - 25
Project No. - 7815

DETAILED PARTICLE SIZE ANALYSIS

SCREEN SIZE (Retained)		SCREEN OVERSIZE				SCREEN UNDERSIZE				CYCLONE U'FLOW				BAG HOUSE (Filter)			
				CUM %				CUM %				CUM %				CUM %	
MESH Tyler	MICRONS	g	DIRECT WT %	PASS	RET'D	g	DIRECT WT %	PASS	RET'D	g	DIRECT WT %	PASS	RET'D	g	DIRECT WT %	PASS	RET'D
4-Inch	101600		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
2-3/4	69850		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
2	50800		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
1-1/2	38100		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
1-1/4	31750		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
1	25400		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
3/4	19050		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
1/2	12700		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
3/8	9525		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
1/4	6350		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
4 Mesh	4760	85.20	36.01	63.99	36.01		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
6	3360	31.90	13.48	50.51	49.49		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
8	2380	33.00	13.95	36.56	63.44		0.00	100.00	0.00		0.00	100.00	0.00		0.00	100.00	0.00
10	1680	29.90	12.64	23.92	76.08	0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00
14	1190	42.90	18.13	5.79	94.21	2.30	1.22	98.78	1.22	0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00
20	841	13.70	5.79	0.00	100.00	33.70	17.86	80.92	19.08	0.30	0.03	99.97	0.03	0.00	0.00	100.00	0.00
28	595	0.00	0.00	0.00	100.00	58.80	31.16	49.76	50.24	3.00	0.30	99.66	0.34	0.20	0.02	99.98	0.02
35	420	0.00	0.00	0.00	100.00	46.30	24.54	25.23	74.77	18.70	1.90	97.77	2.23	1.00	0.10	99.88	0.12
48	297	0.00	0.00	0.00	100.00	20.40	10.81	14.41	85.59	40.90	4.15	93.61	6.39	2.10	0.21	99.68	0.32
65	210	0.00	0.00	0.00	100.00	11.10	5.88	8.53	91.47	74.20	7.54	86.08	13.92	3.80	0.35	99.32	0.68
100	149	0.00	0.00	0.00	100.00	5.80	3.07	5.46	94.54	86.20	8.75	77.32	22.68	4.90	0.48	98.84	1.16
150	105	0.00	0.00	0.00	100.00	2.20	1.17	4.29	95.71	123.50	12.54	64.78	35.22	6.20	0.61	98.24	1.76
200	74	0.00	0.00	0.00	100.00	5.70	3.02	1.27	98.73	149.30	15.16	49.62	50.38	21.50	2.11	96.13	3.87
270	53	0.00	0.00	0.00	100.00	1.20	0.64	0.64	99.36	111.70	11.34	38.28	61.72	18.30	1.79	94.33	5.67
325	44	0.00	0.00	0.00	100.00	0.80	0.42	0.21	99.79	106.50	10.82	27.46	72.54	22.60	2.22	92.12	7.88
-325	-44	0.00	0.00	0.00	100.00	0.40	0.21	0.00	100.00	270.40	27.46	0.00	100.00	939.90	92.12	0.00	100.00
TOTAL		236.6	100.00	--	--	188.7	100.00	--	--	984.7	100.00	--	--	1020.3	100.00	--	--

APPENDIX B
STANDARD BOND ROD MILL GRINDABILITY TEST
Hazen Research, Inc.

HRI Rod Mill Grindability Test 206

PROJECT NO:7615
DATE :06/04/91

PURPOSE: To determine the rod mill grindability of the test sample in terms of a Bond Work Index number.

PROCEDURE: The equipment and procedure used duplicate the Bond method for determining rod mill work indices.

SAMPLE: Client identified "Magnetite - Phosphate Ore" (HRI sample 45356) staged crushed to minus 1/2 inch. This material was used as feed for the grindability test.

RESULTS:

CALCULATION OF A BOND WORK INDEX

$$RWi = \frac{62}{(P1)^{0.23} * (GRP)^{0.625} * (10/(P80)^{0.5} - 10/(F80)^{0.5})}$$

P1	= 100% passing size of product	1190 microns
Grp	= Grams per revolution	12.44 grams
P80	= 80% passing size of product	856 microns
F80	= 80% passing size of feed	8987 microns

RWi = 10.6

STANDARD BOND ROD MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 206
HRI Sample No : 45356

Date : Jun-91

TEST CONDITIONS AND NOTES:

100% mesh of grind	=	14
Test Feed Weight (1250 cc)	=	2678.0 g
% Minus 14 M in Feed	=	16.8 %
Weight of undersize product for 100% circulating load	=	1339.0 g

Stage No.	Revolutions	New Feed g	Undersize In Feed g	Undersize To Be Ground g	U'Size In Product g	Undersize Product Total g	Undersize Product Per Mill Revolution g
1	150	2678.0	449.9	889.1	1843.0	1393.1	9.29
2	111	1843.0	309.6	1029.4	1534.3	1224.7	11.03
3	98	1534.3	257.8	1081.2	1400.6	1142.8	11.66
4	94	1400.6	235.3	1103.7	1413.7	1178.4	12.54
5	88	1413.7	237.5	1101.5	1322.1	1084.6	12.32
6	90	1322.1	222.1	1116.9	1343.1	1121.0	12.46

Average Last Three Stages = 12.44

STANDARD BOND BOD MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 206
HRI Sample No : 45356

Appendix Page: 3
Date : Jun-91

DETAILED PARTICLE SIZE ANALYSES

SCREEN SIZE (Retained)			MILL FEED, -1/2 inch				CIRCULATING LOAD, +14 M				TEST PRODUCT, -14 M			
					CUM % (1)				CUM % (1)				CUM % (1)	
MESH (Tyler)	MICRONS		g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS
1/2 Inch	12700				100.00	101.24			100.00	--				
3/8	9525		132.2	13.41	86.59	83.49	25.2	1.86	98.04	--				
1/4	6350		273.2	27.72	58.86	60.64	73.2	5.93	92.10	--				
4 Mesh	4760		127.1	12.90	45.97	47.07	58.4	4.37	87.73	--				
6	3360		119.0	12.06	33.89	34.18	114.3	8.56	79.17	--				
8	2380		70.0	7.10	26.79	25.26	153.7	11.51	67.65	--				
10	1680		61.2	6.21	20.58	19.86	406.9	30.48	37.17	--				
14	1190		37.2	3.77	16.80	17.73	496.2	37.17	0.00	--				
-14	-1190		165.6	16.80	0.00									
TOTAL			985.5	100.00	--	--	1334.9	100.00	--	--				
14 Mesh	1190												100.00	100.01
20	841										99.8	20.83	79.17	79.16
28	595										63.4	13.23	65.94	65.84
35	420										45.8	9.56	56.39	56.64
48	297										31.4	6.55	49.83	49.62
65	210										30.7	6.41	43.43	43.47
100	149										28.1	5.86	37.56	37.57
-100	-149										180.0	37.56	0.00	
TOTAL											479.2	100.00	--	--

(1) The regressed value of Cumulative % Passing is calculated from the linear regression data on Appendix Page 4. These values are used for calculating the P80 and F80.

STANDARD BOND ROD MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7315
Test No : 206
HRI Sample No : 45356

Appendix Page: 4
Date : Jun-91

PARTICLE SIZE ANLYSES DATA:

MILL FEED, -1/2 inch

Regression Output:

Constant	152.3047
Std Err of Y Est	2.194031
R Squared	0.997119
No. of Observations	8
Degrees of Freedom	4

X Coefficient(s) -0.01650 12.16146 -53.3315
Std Err of Coef. 0.010273 5.674696 25.76590

F80 = 8987 microns

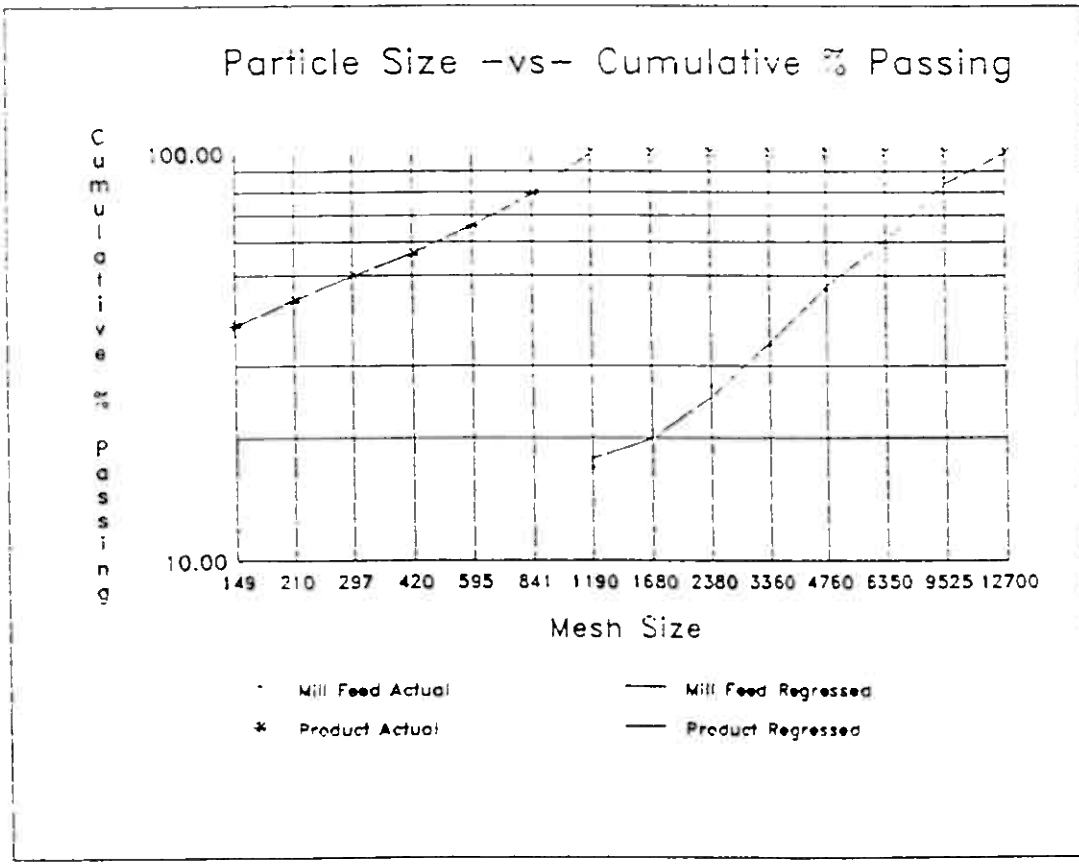
TEST PRODUCT, -14 M

Regression Output:

Constant	-115.783
Std Err of Y Est	0.204793
R Squared	0.999956
No. of Observations	7
Degrees of Freedom	5

X Coefficient(s) 0.132837 -25.0257 83.43164
Std Err of Coef. 0.013562 2.415095 7.544385

P80 = 856 microns



APPENDIX C

BOND BALL MILL GRINDABILITY TESTS

APPENDIX C
STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Ball Mill Grindability Test 836

PROJECT NO:7615
DATE :06/04/91

PURPOSE: To determine the ball mill grindability of the test sample in terms of a Bond Work Index number.

PROCEDURE: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

SAMPLE: Client identified Mag. Phosphate Ore
(HRI sample 45356) stage crushed to minus 6 mesh.
This material was used as feed for the grindability test.

RESULTS:

CALCULATION OF A BOND WORK INDEX

$$BWi = \frac{44.5}{(P1)^{0.23} * (GBP)^{0.82} * (10/(P80)^{0.5} - 10/(F80)^{0.5})}$$

P1	=	100% passing size of product	105 microns
Gbp	=	Grams per revolution	1.97 grams
P80	=	80% passing size of product	86 microns
F80	=	80% passing size of feed	2416 microns

BWi = 10.0

APPENDIX C
STANDARD BOND BALL MILL GRINDABILITY TEST
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Hazen Research, Inc.

HRI Ball Mill Grindability Test 836

PROJECT NO:7615
DATE :06/04/91

PURPOSE: To determine the ball mill grindability of the test sample in terms of a Bond Work Index number.

PROCEDURE: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

SAMPLE: Client identified Mag. Phosphate Ore
(HRI sample 45356) stage crushed to minus 6 mesh.
This material was used as feed for the grindability test.

RESULTS:

CALCULATION OF A BOND WORK INDEX

$$BWi = \frac{44.5}{(P1)^{0.23} \times (GBP)^{0.82} \times (10/(P80)^{0.5} - 10/(F80)^{0.5})}$$

P1	=	100% passing size of product	105 microns
Gbp	=	Grams per revolution	1.97 grams
P80	=	80% passing size of product	86 microns
F80	=	80% passing size of feed	2416 microns

BWi = 10.0

STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 836
HRI Sample No : 45356

Appendix Page: 3
Date : Jun-91

DETAILED PARTICLE SIZE ANALYSES:

SCREEN SIZE (Retained)		MILL FEED, -6 M				CIRCULATING LOAD, +150 M				TEST PRODUCT, -150 M			
				CUM % (1)				CUM % (1)				CUM % (1)	
MESH (Tyler)	MICRONS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS	g	DIRECT WT %	DIRECT PASS	REGRESS PASS
6 Mesh	3360			100.00	102.29			100.00	--				
8	2380	274.7	15.27	84.73	79.18	108.5	8.46	91.54	--				
10	1680	413.6	23.00	61.73	63.17	195.7	15.26	76.28	--				
14	1190	212.6	11.82	49.91	52.13	85.0	6.63	69.66	--				
20	841	125.0	6.95	42.95	44.17	51.9	4.05	65.61	--				
28	595	89.2	4.96	37.99	38.29	44.9	3.50	62.11	--				
35	420	70.2	3.90	34.09	33.69	50.1	3.91	58.20	--				
48	297	51.7	2.87	31.22	29.95	62.0	4.83	53.37	--				
65	210	55.8	3.10	28.11	26.73	116.6	9.09	44.28	--				
100	149	58.6	3.26	24.86	23.88	233.6	18.21	25.06	--				
150	105	103.9	5.78	19.08	21.19	334.3	26.06	0.00	--				
-150	-105	343.1	19.08	0.00									
TOTAL		1798.40	100.00	--	--	1282.60	100.00	--	--				
150 Mesh	105											100.00	100.90
200	74									65.0	30.36	69.64	67.58
270	53									54.8	25.60	44.04	45.01
400	37									35.2	16.44	27.60	27.81
-400	-37									59.1	27.60	0.00	
TOTAL										214.10	100.00	--	--

(1) The regressed value of Cumulative % Passing is calculated from the linear regression data on Appendix Page 4. These values are used for calculating the P80 and F80.

STANDARD BOND BALL MILL GRINDABILITY TEST

Hazen Research, Inc.

HRI Project No: 7615
Test No : 636
HRI Sample No : 45356

Appendix Page: 1
Date : Jun-91

PARTICLE SIZE ANLYSES DATA:

MILL FEED, -6 M

Regression Output:

Constant	-16.4448
Std Err of Y Est	2.769759
R Squared	0.991659
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s)	0.037926 -4.54201 16.99749
Std Err of Coef.	0.021569 5.234047 17.56928

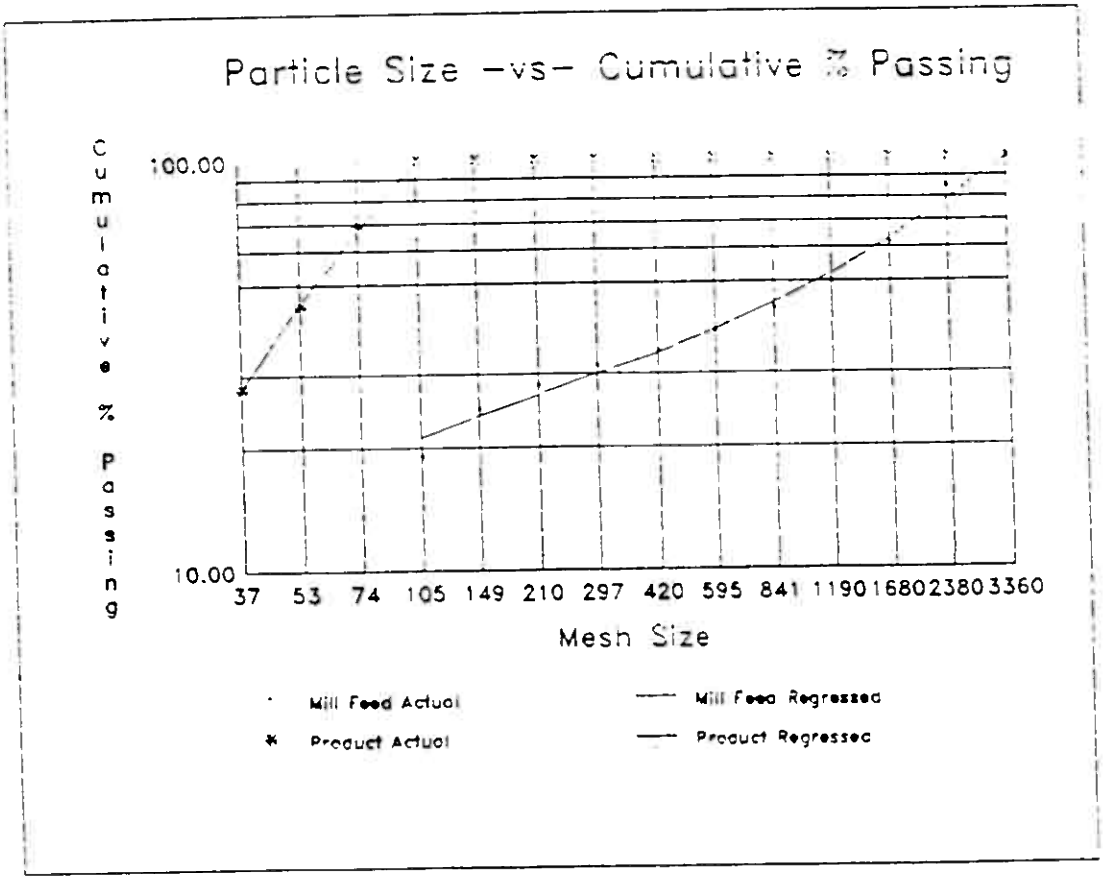
F80 = 2416 microns

TEST PRODUCT, -150 M

Regression Output:

Constant	-11.9587
Std Err of Y Est	1.735846
R Squared	0.997965
No. of Observations	4
Degrees of Freedom	2
X Coefficient(s)	1.074810
Std Err of Coef.	0.034115

P80 = 86 microns



APPENDIX C

LABOUR RATES

FALKHAMMER - IBESTAD MAGNETITE A.S.

ANDØRJA MAGNETITE PROJECT

FEASIBILITY STUDY - VOLUME 1

APPENDIX "C"

LABOUR RATES

The following listing of classifications and labour rates was obtained from Barlindhaug in Tromsoe for recent and ongoing contracts within the Troms county area.

Construction Rates

Classification	Cost US $/hr
General Labour	15.00
Carpenters	24.00
Pipelayers	25.00
Bricklayers	26.00
Steel Workers	34.00
Welders, Riggers	34.00
Concrete Workers	30.00
Electricians and Plumbers	34.00

Above rates include for payroll burden, overhead and profit.

The following are based on average rates prevailing in the Norwegian mining industry.

Mill Rates

Classification	Cost US$/hr
Crusher Operator	16.56
Control Room Operator	16.56
Mill Operator	16.56
Labourer	14.16
Warehouseman/Security	16.16
Mechanics	17.23
Electricians	17.23

Above manhour rates include for 18% payroll burden.

Underground Rates

Classification	Cost US$/hr
Long hole driller	16.52
Drifting: Driller: Blaster	16.52
Roof Bolter	16.52
Longhole: Blaster	16.52
Longhole: Ore Loader	15.34
Drifting: Ore Loader	15.34
Ore Haul: Trucker/Utility	14.16
Mechanic	16.52
Electrician	16.52

Above manhour rates include for 18% payroll burden.

APPENDIX D

PROJECT ESTIMATE

KILBORN MANAGEMENT SYSTEMS ASRF

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA SUMMARY REPORT

RUN DATE : 18JUL91
DATA DATE:
RUN TIME : 14:06:58

AREA	DESCRIPTION	100 SITE WORK	200 BUILDING STRUCTURE	300 BLDG. SERVICE	400 PROCESS MECH.	500 PIPING	600 ELECTRICAL	700 INSTRUMENTATION	900 INDIRECT	TOTAL
110	SITE DEVELOPMENT	0	0	0	0	0	0	0	0	0
121	POTABLE WATER SYSTEMS	31000	0	0	0	0	0	0	0	31000
123	PROCESS WATER SYSTEMS	33500	0	0	0	0	0	0	0	33500
130	SITE ELECTRICAL	0	0	0	0	0	373400	0	0	373400
160	SURFACE MOBILE EQUIPMENT	0	0	0	639000	0	0	0	0	639000
220	INTERBUILDING CONVEYORS	38520	1053396	0	752400	0	0	0	0	1844316
230	CRUSHING PLANT	32625	530573	0	438988	0	0	0	0	1002186
235	RECLAIM STRUCTURE	0	129150	0	0	0	0	0	0	129150
240	CONCENTRATOR	105750	3146389	263200	0	450000	1320000	342390	0	5627729
241	GRINDING	0	104400	0	1776670	0	0	0	0	1881070
242	SUPERSLIG PIGMENT & TONER	0	90180	0	1148676	0	0	0	0	1238856

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

RUN DATE : 18JUL91
DATA DATE:
RUN TIME : 14:06:58

AREA	DESCRIPTION	100 SITE WORK	200 BUILDING STRUCTURE	300 BLDG. SERVICE	400 PROCESS MECH.	500 PIPING	600 ELECTRICAL	700 INSTRUMENTATION	900 INDIRECT	TOTAL
243	MAGNETITE	0	123040	0	803836	0	0	0	0	926876
244	APATITE	0	45788	0	1091088	0	0	0	0	1136876
246	REAGENTS	0	0	0	330536	0	0	0	0	330536
270	PRODUCT STORAGE & LOADOUT/SHIPPING	2520	1120586	0	215790	0	0	0	0	1338896
310	SERVICE COMPLEX	0	220000	0	0	0	0	0	0	220000
400	TAILINGS MANAGEMENT	0	51250	0	0	42140	0	0	0	93390
520	MAIN ACCESS ROAD	0	0	0	0	0	0	0	0	0
540	MARINE DOCK	0	0	0	0	0	0	0	0	0
580	WATER SUPPLY DAM	0	0	0	0	0	0	0	0	0
COST TYPE	0 TOTAL	243915	6614752	263200	7126784	422140	1693400	342390	0	16846781
660	CONSTR. INDIRECTS	0	0	0	0	0	0	0	1684678	1684678

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA	DESCRIPTION	100 SITE WORK	200 BUILDING STRUCTURE	300 BLDG. SERVICE	400 PROCESS MECH.	500 PIPING	600 ELECTRICAL	700 INSTRUMEN TATION	900 INDIRECT	TOTAL
670	E.P.C.M.	0	0	0	0	0	0	0	2038460	2038460
680	CONTINGENCY	0	0	0	0	0	0	0	2057081	2057081
COST TYPE	I TOTAL	0	0	0	0	0	0	0	5780219	5780219
PROJECT TOTAL		243915	6614752	263200	7196984	492140	1693400	342390	5780219	22627000

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
110				SITE DEVELOPMENT								
110.1100.01		100		SITE DEVELOPMENT (BY IBESTAD KOMMUNE)	1	LS	MAT	0.00			0	
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
				110 SITE DEVELOPMENT					TOTAL	0		
											0	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
121				POTABLE WATER SYSTEMS								
121.1211.01		100		POTABLE WATER SYSTEMS	1	LS	MAT	17500.00			17500	E
							LAB	500.00	27.00	500	13500	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	31000	
				121 POTABLE WATER SYSTEMS					TOTAL	500		
											31000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
123				PROCESS WATER SYSTEMS								
123.1230.01		100		PROCESS WATER SYSTEMS	1	LS	MAT	20000.00			20000	E
							LAB	500.00	27.00	500	13500	
							EQP	0.00			0	
							SUB				0	
										ITEM COST ---	33500	
				123 PROCESS WATER SYSTEMS					TOTAL	500		
											33500	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
130				SITE ELECTRICAL								
130.6100.01		600		MAIN POWER DISTRIBUTION	1	LS	MAT	336000.00			336000	E
							LAB	1100.00	34.00	1100	37400	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	373400	
				130 SITE ELECTRICAL					TOTAL	1100		
											373400	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
160				SURFACE MOBILE EQUIPMENT								
160.4950.01		400		FRONT END LOADER - APPROX 8m3 CAPACITY	1	EA	MAT	435000.00			435000	Q
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	435000	
160.4950.03		400		MOBILE CRANE - 10t CAPACITY (USED)	1	EA	MAT	150000.00			150000	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	150000	
160.4950.05		400		PICKUP	2	EA	MAT	27000.00			54000	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	54000	
				160 SURFACE MOBILE EQUIPMENT					TOTAL	0		
											639000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ NO.	WORK CLAS CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
220			INTERBUILDING CONVEYORS								
220.1322.01	100		ROCK EXCAVATION FOR CONVEYOR BENT FOOTINGS	42	m3	MAT	10.00			420	E
						LAB	1.00	27.00	42	1134	
						EQP	23.00			966	
						SUB				36000	
									ITEM COST	38520	
220.2021.01	200		CONCRETE TO CONVEYOR BENT FOOTINGS	42	m3	MAT	320.00			13440	E
						LAB	4.00	27.00	168	4536	
						EQP	20.00			840	
						SUB				0	
									ITEM COST	18816	
220.2210.07	200		STEEL - CONVEYOR BENTS	120	t	MAT	1800.00			216000	E
						LAB	16.00	34.00	1920	65280	
						EQP	200.00			24000	
						SUB				0	
									ITEM COST	305280	
220.2224.02	200		STEEL CONVEYOR SUPPORT (TRUSSES) INCL. WALKWAY, MONORAIL & HALF HOOP (900mm CONVEYORS)	550	m	MAT	770.00			423500	E
						LAB	9.00	34.00	4950	168300	
						EQP	250.00			137500	
						SUB				0	
									ITEM COST	729300	
220.4403.01	400		BELT CONVEYOR NO. 1 - CRUSHER TO STOCKPILE 900W C/W HP DRIVE (USED)	90	m	MAT	720.00			64800	C
						LAB	10.00	34.00	900	30600	
						EQP	50.00			4500	
						SUB				0	
									ITEM COST	99900	

AREA NO.	WORK SEQ NO.	WORK CLAS CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
220			INTERBUILDING CONVEYORS								
220.4403.02	400		BELT CONVEYOR NO. 2 - STOCKPILE TO SAG MILL 900W C/W HP DRIVE (USED)	70	m	MAT	720.00			50400	C
						LAB	10.00	34.00	700	23800	
						EQP	50.00			3500	
						SUB				0	
									ITEM COST	77700	
220.4403.06	400		BELT CONVEYOR NO. 6 - MAGNETITE AND SUPERSLIG PRODUCT STORAGE (USED)	180	m	MAT	720.00			129600	E
						LAB	10.00	34.00	1800	61200	
						EQP	50.00			9000	
						SUB				0	
									ITEM COST	199800	
220.4403.07	400		BELT CONVEYOR NO.7 - APATITE PRODUCT STORAGE (USED)	80	m	MAT	720.00			57600	E
						LAB	10.00	34.00	800	27200	
						EQP	50.00			4000	
						SUB				0	
									ITEM COST	88800	
220.4403.09	400		BELT CONVEYOR NO. 9 - PRODUCT RECLAIM 900W (800 t/h CAPACITY) (USED)	100	m	MAT	720.00			72000	C
						LAB	10.00	34.00	1000	34000	
						EQP	50.00			5000	
						SUB				0	
									ITEM COST	111000	
220.4403.10	400		BELT CONVEYOR NO. 10 - SHIP LOADING 900W (800 t/h CAPACITY)	30	m	MAT	4500.00			135000	C
						LAB	15.00	34.00	450	15300	
						EQP	30.00			900	
						SUB				0	
									ITEM COST	151200	

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
220				INTERBUILDING CONVEYORS								
220.4432.11		400		CHUTES	5	t	MAT	2800.00			14000	E
							LAB	50.00	34.00	250	8500	
							EQP	300.00			1500	
							SUB				0	
										ITEM COST	24000	
				220 INTERBUILDING CONVEYORS					TOTAL	12930		
											1044316	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ NO.	WORK CLAS CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
230			CRUSHING PLANT								
230.1320.03	100		ROCK EXCAV'N - FOR FOOTINGS AND EQUIPMENT BASES & FOUNDATIONS	400	m3	MAT	10.00			4000	E
						LAB	1.00	27.00	400	10800	
						EQP	23.00			9200	
						SUB				0	
									ITEM COST	24000	
230.1330.03	100		BACKFILL	250	m3	MAT	15.00			3750	E
						LAB	0.50	27.00	125	3375	
						EQP	6.00			1500	
						SUB				0	
									ITEM COST	8625	
230.2021.05	200		CONCRETE TO FOOTINGS	25	m3	MAT	320.00			8000	E
						LAB	4.00	27.00	100	2700	
						EQP	20.00			500	
						SUB				0	
									ITEM COST	11200	
230.2022.05	200		CONCRETE TO PIERS	5	m3	MAT	500.00			2500	E
						LAB	20.00	27.00	100	2700	
						EQP	75.00			375	
						SUB				0	
									ITEM COST	5575	
230.2023.05	200		CONCRETE TO GRADE BEAMS & WALLS	25	m3	MAT	320.00			8000	E
						LAB	10.00	27.00	250	6750	
						EQP	25.00			625	
						SUB				0	
									ITEM COST	15375	

FIMAS
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AREA NO.	WORK SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
230			CRUSHING PLANT								
230.2024.05	200		CONCRETE TO SLAB-ON-GRADE	20	m3	MAT	305.00			6100	E
						LAB	4.00	27.00	80	2160	
						EQP	20.00			400	
						SUB				0	
									ITEM COST	8660	
230.2027.05	200		CONCRETE TO DUMP HOPPER	60	m3	MAT	325.00			19500	E
						LAB	8.00	27.00	480	12960	
						EQP	10.00			600	
						SUB				0	
									ITEM COST	33060	
230.2027.06	200		CONCRETE TO FDN FOR JAW CRUSHER	60	m3	MAT	325.00			19500	E
						LAB	8.00	27.00	480	12960	
						EQP	10.00			600	
						SUB				0	
									ITEM COST	33060	
230.2210.02	200		STRUCTURAL STEEL	100	t	MAT	2200.00			220000	E
						LAB	18.00	34.00	1800	61200	
						EQP	300.00			30000	
						SUB				0	
									ITEM COST	311200	
230.2220.02	200		PLATFORM & SUPPORT STEEL	10	t	MAT	2400.00			24000	E
						LAB	20.00	34.00	200	6800	
						EQP	300.00			3000	
						SUB				0	
									ITEM COST	33800	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
230				CRUSHING PLANT								
230.2221.02		200		CHECKER PLATE	120	m2	MAT	120.00			14400	E
							LAB	1.00	34.00	120	4080	
							EQP	80.00			9600	
							SUB				0	
										ITEM COST	28080	
230.2225.06		200		STAIRS	20	m	MAT	400.00			8000	E
							LAB	4.00	34.00	80	2720	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	10720	
230.2226.07		200		HANDRAIL	30	m	MAT	80.00			2400	E
							LAB	0.50	34.00	15	510	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	2910	
230.2290.02		200		HOIST BEAM	1	t	MAT	1800.00			1800	E
							LAB	10.00	34.00	10	340	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	2340	
230.2410.02		200		SIDING	380	m2	MAT	20.00			7600	E
							LAB	1.20	27.00	456	12312	
							EQP	20.00			7600	
							SUB				0	
										ITEM COST	27512	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
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AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
230			CRUSHING PLANT								
230.2430.02	200		ROOFING	100	m2	MAT	15.00			1500	E
						LAB	1.00	27.00	100	2700	
						EQP	20.00			2000	
						SUB				0	
									ITEM COST	6200	
230.2440.05	200		DOOR - EXTERIOR	1	EA	MAT	800.00			800	E
						LAB	3.00	27.00	3	81	
						EQP	0.00			0	
						SUB				0	
									ITEM COST	881	
230.4092.01	400		CONE CRUSHER - 912 DIA C/W 75KW DRIVE FUTURE	0	EA	MAT	0.00			0	Q
						LAB	0.00	0.00	0	0	
						EQP	0.00			0	
						SUB				0	
									ITEM COST	0	
230.4095.01	400		JAW CRUSHER - 1050 X 1200 (200 CSS) C/W 112KW DRIVE - USED (ALLOWANCE BASED ON 60% OF NEW)	1	EA	MAT	180000.00			180000	C
						LAB	900.00	34.00	900	30600	
						EQP	4500.00			4500	
						SUB				0	
									ITEM COST	215100	
230.4158.01	400		SUMP PUMP - STOCKPILE - 100mm DIA C/W 3.7KW DRIVE	1	EA	MAT	9000.00			9000	Q
						LAB	52.00	34.00	52	1768	
						EQP	300.00			300	
						SUB				0	
									ITEM COST	11068	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ NO.	WORK CLAS CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
230			CRUSHING PLANT								
230.4432.01	400		CHUTES: HOPPER-FEEDER-CRUSHER - CONV. #1 DISCH. HOOD COLLARS TO/FROM FEEDERS	12	t	MAT	2200.00			26400	E
						LAB	30.00	34.00	360	12240	
						EQP	150.00			1800	
						SUB				0	
									ITEM COST	40440	
230.4433.01	400		HOPPER - TRUCK DUMP - 100 t CAP'Y	12	t	MAT	2200.00			26400	E
						LAB	30.00	34.00	360	12240	
						EQP	150.00			1800	
						SUB				0	
									ITEM COST	40440	
230.4461.01	400		RECIPROCATING FEEDER - 1524 X 4270 C/W 50 HP MOTOR	1	EA	MAT	86000.00			86000	Q
						LAB	300.00	34.00	300	10200	
						EQP	1500.00			1500	
						SUB				0	
									ITEM COST	97700	
230.4462.01	400		VIBRATING FEEDER - 1200W X 1500L C/W 2.2KW DRIVE (USED)	2	EA	MAT	14000.00			28000	Q
						LAB	80.00	34.00	160	5440	
						EQP	400.00			800	
						SUB				0	
									ITEM COST	34240	
			230 CRUSHING PLANT						TOTAL 6931		
										1002186	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

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AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
235				RECLAIM STRUCTURE								
235.2023.06		200		CONCRETE TO RECLAIM STRUCTURE	210	m3	MAT	320.00			67200	E
							LAB	10.00	27.00	2100	56700	
							EQP	25.00			5250	
							SUB				0	
										ITEM COST	129150	
				235 RECLAIM STRUCTURE					TOTAL	2100		
											129150	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240				CONCENTRATOR								
240.1322.01		100		ROCK EXCAV'N - FOR FOOTINGS AND EQUIPMENT BASES & FOUNDATIONS	1230	m3	MAT	10.00			12300	E
							LAB	1.00	27.00	1230	33210	
							EQP	23.00			28290	
							SUB				0	
										ITEM COST	73800	
240.1330.01		100		BACKFILL TO BLDG FOUNDATIONS WITH GRANULAR MATERIAL	900	m3	MAT	5.00			4500	E
							LAB	0.50	27.00	450	12150	
							EQP	6.00			5400	
							SUB				0	
										ITEM COST	22050	
240.1330.04		100		GRANULAR FILL TO TANK PADS - O/S OF THE CONCENTRATOR	500	m3	MAT	5.00			2500	E
							LAB	0.40	27.00	200	5400	
							EQP	4.00			2000	
							SUB				0	
										ITEM COST	9900	
240.2021.01		200		CONCRETE TO FOOTINGS/PIERS	225	m3	MAT	320.00			72000	E
							LAB	4.00	27.00	900	24300	
							EQP	20.00			4500	
							SUB				0	
										ITEM COST	100800	
240.2023.01		200		CONCRETE TO GRADE BEAMS & WALLS	270	m3	MAT	320.00			86400	E
							LAB	10.00	27.00	2700	72900	
							EQP	25.00			6750	
							SUB				0	
										ITEM COST	166050	

AREA NO.	WORK SEQ CLAS NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240			CONCENTRATOR								
240.2024.01	200		CONCRETE TO SLAB-ON-GRADE	175	m3	MAT	305.00			53375	E
						LAB	4.00	27.00	700	18900	
						EQP	20.00			3500	
						SUB				0	
									ITEM COST	75775	
240.2025.01	200		CONCRETE TO SUMPS & CURBS	20	m3	MAT	640.00			12800	E
						LAB	10.00	27.00	200	5400	
						EQP	45.00			900	
						SUB				0	
									ITEM COST	19100	
240.2026.01	200		CONCRETE TO ELEVATED FLOOR SLABS	50	m3	MAT	370.00			18500	E
						LAB	7.00	27.00	350	9450	
						EQP	50.00			2500	
						SUB				0	
									ITEM COST	30450	
240.2027.03	200		CONCRETE FDN FOR REGRIND MILL	45	m3	MAT	325.00			14625	E
						LAB	8.00	27.00	360	9720	
						EQP	10.00			450	
						SUB				0	
									ITEM COST	24795	
240.2027.04	200		CONCRETE TO MISC TANK & EQUIP FDNS & BASES	125	m3	MAT	325.00			40625	E
						LAB	8.00	27.00	1000	27000	
						EQP	10.00			1250	
						SUB				0	
									ITEM COST	68875	

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240			CONCENTRATOR								
240.2027.05	200		CONCRETE TO SAG MILL FOUNDATION	600	m3	MAT	325.00			195000	E
						LAB	8.00	27.00	4800	129600	
						EQP	10.00			6000	
						SUB				0	
									ITEM COST	330600	
240.2027.06	200		CONCRETE FDN FOR REGRIND MILL	75	m3	MAT	325.00			24375	E
						LAB	8.00	27.00	600	16200	
						EQP	10.00			750	
						SUB				0	
									ITEM COST	41325	
240.2100.01	200		200mm CONCRETE BLOCK WALLS	530	m2	MAT	70.00			37100	E
						LAB	2.00	27.00	1060	28620	
						EQP	10.00			5300	
						SUB				0	
									ITEM COST	71020	
240.2210.01	200		STRUCTURAL FRAMING STEEL	420	t	MAT	2200.00			924000	E
						LAB	18.00	34.00	7560	257040	
						EQP	300.00			126000	
						SUB				0	
									ITEM COST	1307040	
240.2210.02	200		INTERIOR FRAMING & FLOORS, PLATFORMS	54	t	MAT	2400.00			129600	E
						LAB	20.00	34.00	1080	36720	
						EQP	300.00			16200	
						SUB				0	
									ITEM COST	182520	

AREA NO.	WORK SEQ CLAS NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240			CONCENTRATOR								
240.2210.03	200		CRANE RAILS & CRANE BEAMS	15	t	MAT	1800.00			27000	E
						LAB	10.00	34.00	150	5100	
						EQP	200.00			3000	
						SUB				0	
									ITEM COST	35100	
240.2210.04	200		EXTERIOR FRAMING PLATFORMS AND PIPERACKS TO O/S TANKS	30	t	MAT	2400.00			72000	E
						LAB	20.00	34.00	600	20400	
						EQP	300.00			9000	
						SUB				0	
									ITEM COST	101400	
240.2222.01	200		GRATING/CHECKERPLATE/EXPANDED METAL	450	m2	MAT	100.00			45000	E
						LAB	1.00	34.00	450	15300	
						EQP	30.00			13500	
						SUB				0	
									ITEM COST	73800	
240.2225.01	200		STAIRS INCL HANDRAILING	40	m	MAT	250.00			10000	E
						LAB	4.00	34.00	160	5440	
						EQP	0.00			0	
						SUB				0	
									ITEM COST	15440	
240.2226.01	200		HANDRAILING	540	m	MAT	40.00			21600	E
						LAB	0.50	34.00	270	9180	
						EQP	0.00			0	
						SUB				0	
									ITEM COST	30780	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240				CONCENTRATOR								
240.2410.01	200			SIDING (INSULATED)	2620	m2	MAT	40.00			104800	E
							LAB	1.20	27.00	3144	84888	
							EQP	20.00			52400	
							SUB				0	
										ITEM COST	242088	
240.2430.01	200			ROOFING	1800	m2	MAT	35.00			63000	E
							LAB	1.00	27.00	1800	48600	
							EQP	20.00			36000	
							SUB				0	
										ITEM COST	147600	
240.2440.02	200			OVERHEAD DOORS - 3600 X 3600	3	EA	MAT	4000.00			12000	E
							LAB	30.00	27.00	90	2430	
							EQP	500.00			1500	
							SUB				0	
										ITEM COST	15930	
240.2440.03	200			SINGLE EXTERIOR & INTERIOR MAN-DOORS	9	EA	MAT	500.00			4500	E
							LAB	3.00	27.00	27	729	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	5229	
240.2440.04	200			DOUBLE DOORS	3	SETS	MAT	1500.00			4500	E
							LAB	12.00	27.00	36	972	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	5472	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

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AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240			CONCENTRATOR								
240.2470.01	200		PAINTING (ALLOWANCE)	1	LS	MAT	7000.00			7000	E
						LAB	500.00	27.00	500	13500	
						EQP	2000.00			2000	
						SUB				0	
									ITEM COST	22500	
240.2815.01	200		PORTACABS - (2) SINGLES (INCLUDING FURNISHINGS)	2	EA	MAT	13000.00			26000	E
						LAB	50.00	27.00	100	2700	
						EQP	2000.00			4000	
						SUB				0	
									ITEM COST	32700	
240.3000.01	300		BUILDING SERVICES (HEATING & VENT) (ALLOWANCE) AREA HEATING	1	LS	MAT	175000.00			175000	E
						LAB	2300.00	34.00	2300	78200	
						EQP	10000.00			10000	
						SUB				0	
									ITEM COST	263200	
240.5000.01	500		PROCESS PIPING (AS A FACTOR ON INSTALLED PROCESS MECHANICAL EQUIPMENT)	1	LS	MAT	278500.00			278500	E
						LAB	4150.00	34.00	4150	141100	
						EQP	30400.00			30400	
						SUB				0	
									ITEM COST	450000	
240.6000.01	600		ELECTRICAL - BASED ON CONNECTED HP FOR ALL PROCESS AREAS INCLUDING LIGHTING	1	LS	MAT	794400.00			794400	E
						LAB	13400.00	34.00	13400	455600	
						EQP	70000.00			70000	
						SUB				0	
									ITEM COST	1320000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
240				CONCENTRATOR								
240.7000.01		700		INSTRUMENTATION (ALLOWANCE)	1	LS	MAT	278625.00			278625	E
							LAB	1625.00	34.00	1625	55250	
							EQP	8515.00			8515	
							SUB				0	
										ITEM COST	342390	
				240 CONCENTRATOR						TOTAL 51992		
											5627729	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
241				GRINDING								
241.2310.01		200		SURGE TANK - 9000 DIA X 9000	1	EA	MAT	42000.00			42000	E
							LAB	1600.00	34.00	1600	54400	
							EQP	8000.00			8000	
							SUB				0	
										ITEM COST	104400	
241.4104.01		400		SAG MILL - 8534 DIA X 3048L C/W 3730KW DRIVE, CR-MOLY LINERS - RETRACTABLE FEED CHUTE, LUBE SYSTEM - USED	1	EA	MAT	0.00			0	C
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				1100000	
										ITEM COST	1100000	
241.4108.01		400		INITIAL BALL CHARGE - SAG MILL	120	t	MAT	800.00			96000	Q
							LAB	1.00	34.00	120	4080	
							EQP	5.00			600	
							SUB				0	
										ITEM COST	100680	
241.4109.01		400		LINER HANDLER - INCLUDED WITH USED SAG MILL PACKAGE	1	EA	MAT	0.00			0	
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
241.4111.01		400		VIBRATING SCREEN - HORIZONTAL - 1200 X 3050 S/D C/W 7.5KW MOTOR (USED)	1	EA	MAT	9000.00			9000	Q
							LAB	75.00	34.00	75	2550	
							EQP	900.00			900	
							SUB				0	
										ITEM COST	12450	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
241				GRINDING								
241.4111.02		400		VIBRATING SCREEN - S/D - 1830W X 3280L C/W 3.7KW DRIVE (INCLINED)	1	EA	MAT	22000.00			22000	Q
							LAB	75.00	34.00	75	2550	
							EQP	900.00			900	
							SUB				0	
										ITEM COST	25450	
241.4142.01		400		CYCLONE PAK - 8 X 375 DIA (USED)	1	EA	MAT	55000.00			55000	Q
							LAB	80.00	34.00	80	2720	
							EQP	1600.00			1600	
							SUB				0	
										ITEM COST	59320	
241.4151.01		400		AC PUMPS - CYCLONE FEED - 300 X 250 C/W 56KW MOTOR	2	EA	MAT	36000.00			72000	Q
							LAB	50.00	34.00	100	3400	
							EQP	1300.00			2600	
							SUB				0	
										ITEM COST	78000	
241.4151.03		400		AC PUMPS (NON-MAGNETICS) 250 X 200 C/W 30KW MOTOR	2	EA	MAT	14000.00			28000	Q
							LAB	40.00	34.00	80	2720	
							EQP	500.00			1000	
							SUB				0	
										ITEM COST	31720	
241.4151.05		400		AC PUMPS (SURGE TANK FEED) 125 X 125 C/W 15KW MOTOR	2	EA	MAT	9000.00			18000	Q
							LAB	40.00	34.00	80	2720	
							EQP	300.00			600	
							SUB				0	
										ITEM COST	21320	

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
241				GRINDING								
241.4151.07		400		AC PUMP (SURGE TANK) 125 X 125 C/W 15KW MOTOR	2	EA	MAT	9000.00			18000	Q
							LAB	40.00	34.00	80	2720	
							EQP	300.00			600	
							SUB				0	
										ITEM COST	21320	
241.4158.02		400		SUMP PUMP (GRINDING) 100mm X 3.7KW	1	EA	MAT	9000.00			9000	Q
							LAB	30.00	34.00	30	1020	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	10320	
241.4231.01		400		MAGNETIC SEPARATOR - 916 DIA X 3000W C/W 7.5KW DRIVE	5	EA	MAT	16000.00			80000	Q
							LAB	40.00	34.00	200	6800	
							EQP	700.00			3500	
							SUB				0	
										ITEM COST	90300	
241.4231.02		400		CONCENTRATE & OVERFLOW LAUNDERS	10	EA	MAT	2000.00			20000	E
							LAB	50.00	34.00	500	17000	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	37000	
241.4317.01		400		AGITATOR (SURGE TANK) C/W 22KW DRIVE INCLUDING BRIDGE	1	EA	MAT	31000.00			31000	Q
							LAB	235.00	34.00	235	7990	
							EQP	1200.00			1200	
							SUB				0	
										ITEM COST	40190	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
241				GRINDING								
241.4320.01		400		DEMAGNETIZING COIL (ALLOWANCE)	1	EA	MAT	10000.00			10000	Q
							LAB	20.00	34.00	20	680	
							EQP	500.00			500	
							SUB				0	
										ITEM COST	11180	
241.4432.17		400		CHUTES: TO/FROM SCREEN #4111.01 (ALLOWANCE)	5	t	MAT	2800.00			14000	E
							LAB	70.00	34.00	350	11900	
							EQP	400.00			2000	
							SUB				0	
										ITEM COST	27900	
241.4437.01		400		UNDERPANS: SCREENS #4111.01, -02 (ALLOWANCE)	5	t	MAT	2800.00			14000	E
							LAB	40.00	34.00	200	6800	
							EQP	400.00			2000	
							SUB				0	
										ITEM COST	22800	
241.4441.01		400		O/H CRANE 15t CAP'Y - GRINDING AREA C/W 3 X 2.2KW MOTOR S	1	EA	MAT	37000.00			37000	Q
							LAB	120.00	34.00	120	4080	
							EQP	700.00			700	
							SUB				0	
										ITEM COST	41780	
241.4811.01		400		PUMPBOX - DOUBLE	1	EA	MAT	16000.00			16000	E
							LAB	120.00	34.00	120	4080	
							EQP	1300.00			1300	
							SUB				0	
										ITEM COST	21380	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
241				GRINDING								
241.4811.02		400		PUMPBOX - SINGLE	1	EA	MAT	9000.00			9000	E
							LAB	70.00	34.00	70	2380	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	11780	
241.4811.03		400		PUMPBOX - SINGLE	1	EA	MAT	9000.00			9000	E
							LAB	70.00	34.00	70	2380	
							EQP	400.00			400	
							SUB				0	
										ITEM COST		
											11780	
				241 GRINDING					TOTAL	4205		
											1081070	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.2310.02		200		SURGE TANK (PIGMENT) 7000 DIA X 7500H	1	EA	MAT	27000.00			27000	E
							LAB	385.00	34.00	385	13090	
							EQP	5000.00			5000	
							SUB				0	
										ITEM COST	45090	
242.2310.03		200		SURGE TANK (SUPERSLIG) 7000 DIA X 7500H	1	EA	MAT	27000.00			27000	E
							LAB	385.00	34.00	385	13090	
							EQP	5000.00			5000	
							SUB				0	
										ITEM COST	45090	
242.4101.01		400		REGRIND MILL - SUPERSLIG - 1500 DIA X 300L C/W 93.7KW DRIVE - COMPLETE WITH FEED CHUTE (USED)	1	EA	MAT	75000.00			75000	Q
							LAB	120.00	34.00	120	4080	
							EQP	3500.00			3500	
							SUB				0	
										ITEM COST	82580	
242.4106.01		400		GRINDING MILL - VERTICAL/AGITATED (SUPERSLIG) 540t/YR CAP'Y C/W 75KW DRIVE AND COMPLETE WITH RECYCLE PUMP AND BOX	1	EA	MAT	210000.00			210000	Q
							LAB	90.00	34.00	90	3060	
							EQP	1600.00			1600	
							SUB				0	
										ITEM COST	214660	
242.4120.01		400		FLOTATION CELLS (PHOSPHATE) 1.4m3 EA - 1 BANK OF 6 C/W 4KW DRIVES	1	EA	MAT	60000.00			60000	Q
							LAB	150.00	34.00	150	5100	
							EQP	900.00			900	
							SUB				0	
										ITEM COST	66000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.4120.02	400			FLOTATION CELLS (SILICATE) BANK OF 6 X 1.4m3 C/W 4KW DRIVES	1	EA	MAT	60000.00			60000	Q
							LAB	150.00	34.00	150	5100	
							EQP	900.00			900	
							SUB				0	
										ITEM COST	66000	
242.4142.02	400			CYCLONES (USED) - CLASSIFYING - 375 DIA	2	EA	MAT	5000.00			10000	Q
							LAB	90.00	34.00	180	6120	
							EQP	500.00			1000	
							SUB				0	
										ITEM COST	17120	
242.4142.04	400			CYCLONES - CLASSIFYING - 254 DIA - (USED)	1	EA	MAT	4000.00			4000	Q
							LAB	90.00	34.00	90	3060	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	7460	
242.4151.09	400			AC PUMPS - (MAGNETIC SEPARATOR FEED) 100 X 75 C/W 15KW MOTOR	1	EA	MAT	6000.00			6000	Q
							LAB	50.00	34.00	50	1700	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	8000	
242.4151.12	400			AC PUMP (PIGMENT SURGE) 100 X 75 C/W 15KW MOTOR	1	EA	MAT	6000.00			6000	Q
							LAB	50.00	34.00	50	1700	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	8000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.4151.13		400		AC PUMP (PIGMENT FILTRATE RETURN) 38 X 25 C/W 3.7KW MOTOR	1	EA	MAT	4500.00			4500	Q
							LAB	34.00	34.00	34	1156	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5856	
242.4151.41		400		AC PUMP (SUPERSLIG SURGE) 100 X 75 C/W 15KW MOTOR	1	EA	MAT	6000.00			6000	Q
							LAB	50.00	34.00	50	1700	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	8000	
242.4152.01		400		VERT PUMP WITH TANK (PHOSPHATE/SILICATE)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	
242.4152.22		400		VERT PUMP WITH TANK (SPIRAL GRAVITY SEPARATORS)	4	EA	MAT	6000.00			24000	E
							LAB	50.00	34.00	200	6800	
							EQP	300.00			1200	
							SUB				0	
										ITEM COST	32000	
242.4152.27		400		VERT PUMP WITH TANK (SUPERSLIG REGRIND) 50 X 38 C/W 19KW MOTOR	1	EA	MAT	6000.00			6000	E
							LAB	50.00	34.00	50	1700	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	8000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.4227.01	400			FILTER PRESS (PIGMENT) 300 X 300 X 10 PLATES (USED)	1	EA	MAT	11000.00			11000	Q
							LAB	200.00	34.00	200	6800	
							EQP	1000.00			1000	
							SUB				0	
										ITEM COST	13800	
242.4231.06	400			MAGNETIC SEPARATOR - COARSE SUPERSLIG 916 DIA X 900W C/W 2.2KW MOTOR	1	EA	MAT	3000.00			3000	Q
							LAB	100.00	34.00	100	3400	
							EQP	500.00			500	
							SUB				0	
										ITEM COST	11900	
242.4231.07	400			MAGNETIC SEPARATOR - FINE SUPERSLIG 916 DIA X 900W C/W 2.2KW DRIVES	2	EA	MAT	8000.00			16000	Q
							LAB	100.00	34.00	200	6800	
							EQP	500.00			1000	
							SUB				0	
										ITEM COST	23800	
242.4238.01	400			GRAVITY SEPARATORS - PRIMARY TWIN START SPIRALS - 2 BANKS OF 8	2	EA	MAT	48000.00			96000	Q
							LAB	80.00	34.00	160	5440	
							EQP	1000.00			2000	
							SUB				0	
										ITEM COST	103440	
242.4238.03	400			GRAVITY SEPARATORS - SECONDARY TWIN START SPIRALS - 1 BANK OF 7	1	EA	MAT	44000.00			44000	Q
							LAB	40.00	34.00	40	1360	
							EQP	1000.00			1000	
							SUB				0	
										ITEM COST	46360	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.4238.04		400		GRAVITY SEPARATORS - TERTIARY TWIN START SPIRALS - 1 BANK OF 5	1	EA	MAT	32000.00			32000	Q
							LAB	40.00	34.00	40	1360	
							EQP	1000.00			1000	
							SUB				0	
										ITEM COST	34360	
242.4239.01		400		CONCENTRATING TABLES - TRIPLE DECK	4	EA	MAT	50000.00			200000	Q
							LAB	60.00	34.00	240	8160	
							EQP	1000.00			4000	
							SUB				0	
										ITEM COST	212160	
242.4317.02		400		AGITATOR (TANK #2310-02).. C/W 22KW DRIVE	1	EA	MAT	31000.00			31000	Q
							LAB	80.00	34.00	80	2720	
							EQP	1200.00			1200	
							SUB				0	
										ITEM COST	34920	
242.4317.03		400		AGITATOR (TANK #2310.03) C/W 22KW DRIVE	1	EA	MAT	31000.00			31000	Q
							LAB	80.00	34.00	80	2720	
							EQP	1200.00			1200	
							SUB				0	
										ITEM COST	34920	
242.4432.19		400		CHUTES: TO/FROM SUPERSLIG REGRIND MILL; FROM FILTER PRESS TO KILN	5	t	MAT	2800.00			14000	E
							LAB	50.00	34.00	250	8500	
							EQP	400.00			2000	
							SUB				0	
										ITEM COST	24500	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
242				SUPERSLIG PIGMENT & TONER								
242.4436.01		400		DIVERTER BOX -- 4 WAY -- CONCENTRATING TABLES (ALLOWANCE)	1	EA	MAT	9000.00			9000	E
							LAB	70.00	34.00	70	2330	
							EQP	500.00			500	
							SUB				0	
										ITEM COST	11830	
242.4531.01		400		KILN (PIGMENT DRYER) 560 DIA X 3660	1	EA	MAT	53000.00			53000	Q
							LAB	200.00	34.00	200	6800	
							EQP	1600.00			1600	
							SUB				0	
										ITEM COST	61400	
				242 SUPERSLIG PIGMENT & TONER					TOTAL	3684		
											1238856	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ CLAS NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL		COST	ESTIMATE SOURCE
243			MAGNETITE									
243.2310.04	200		SURGE TANK (MAGNETITE) 10500 DIA X 11000	1	EA	MAT	59000.00				59000	E
						LAB	1560.00	34.00	1560		53040	
						EQP	11000.00				11000	
						SUB					0	
										ITEM COST	123040	
243.2310.05	400		THICKENER TANK - 17000 DIA	1	EA	MAT	30000.00				30000	E
						LAB	800.00	34.00	800		27200	
						EQP	6000.00				6000	
						SUB					0	
										ITEM COST	63200	
243.4101.02	400		REGRIND MILL (MAGNETITE) 2440 DIA X 3660 C/W 261KW MOTOR AND FEED CHUTE (USED)	1	EA	MAT	110000.00				110000	Q
						LAB	950.00	34.00	950		32300	
						EQP	7500.00				7500	
						SUB					0	
										ITEM COST	149800	
243.4142.05	400		CYCLONES - CLASSIFYING - 254 DIA (USED)	4	EA	MAT	4000.00				16000	Q
						LAB	25.00	34.00	100		3400	
						EQP	500.00				2000	
						SUB					0	
										ITEM COST	21400	
243.4151.14	400		AC PUMPS (MAGNETITE SURGE) 100 X 75 C/W 7.5KW DRIVE	1	EA	MAT	6000.00				6000	Q
						LAB	32.00	34.00	32		1088	
						EQP	200.00				200	
						SUB					0	
										ITEM COST	7288	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
243				MAGNETITE								
243.4151.15		400		AC PUMPS (SUPERSLIG/MAGNETITE FILTRATE RETURN) 23 X 23 C/W 3.7KW DRIVE	1	EA	MAT	4500.00			4500	Q
							LAB	34.00	34.00	34	1156	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5856	
243.4151.18		400		AC PUMPS (THICKENER U/FLOW) - 50 X 38 C/W 7.5KW MOTORS	1	EA	MAT	4000.00			4000	Q
							LAB	36.00	34.00	36	1224	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	5624	
243.4151.20		400		AC PUMPS (MAGNETITE REGRIND) 150 X 100 C/W 56KW MOTORS	1	EA	MAT	13000.00			13000	Q
							LAB	40.00	34.00	40	1360	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	14760	
243.4152.28		400		VERT PUMPS (CONC TABLES TAILS) 350 X 300 C/W 150KW MOTORS	2	EA	MAT	55000.00			110000	Q
							LAB	80.00	34.00	160	5440	
							EQP	800.00			1600	
							SUB				0	
										ITEM COST	117040	
243.4153.03		400		SUMP PUMP (MAGNETICS) 100 C/W 3.7KW MOTOR	1	EA	MAT	6000.00			6000	Q
							LAB	32.00	34.00	32	1088	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	7388	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
243				MAGNETITE								
243.4221.01		400		DISC FILTER (SUPERSLIG/MAGNETITE) 2700 DIA X 10 DISC C/W 2 X 2.2KW DRIVES (USED)	1	EA	MAT	100000.00			100000	Q
							LAB	250.00	34.00	250	8500	
							EQP	2000.00			2000	
							SUB				0	
										ITEM COST	110500	
243.4231.09		400		MAGNETIC SEPARATORS - GROUND MAGNETITE 916 DIA X 1200 C/W 2.2KW MOTORS	3	EA	MAT	10000.00			30000	Q
							LAB	110.00	34.00	330	11220	
							EQP	500.00			1500	
							SUB				0	
										ITEM COST	42720	
243.4317.04		400		AGITATOR (TANK #2310-04) C/W 75KW DRIVE	1	EA	MAT	52000.00			52000	Q
							LAB	160.00	34.00	160	5440	
							EQP	1600.00			1600	
							SUB				0	
										ITEM COST	59040	
243.4318.01		400		MECHANISM FOR 17000 DIA THICKENER C/W BRIDGE, RAKE AND 3.7KW DRIVE	1	EA	MAT	120000.00			120000	Q
							LAB	800.00	34.00	800	27200	
							EQP	6500.00			6500	
							SUB				0	
										ITEM COST	153700	
243.4432.22		400		CHUTES: MILL - PUMPBOX; MAGNETIC SEPARATORS - PUMPBOX	5	t	MAT	2800.00			14000	E
							LAB	54.00	34.00	270	9180	
							EQP	400.00			2000	
							SUB				0	
										ITEM COST	25180	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
243				MAGNETITE								
243.4811.06		400		PUMPBOX (SINGLE)	1	EA	MAT	9000.00			9000	E
							LAB	70.00	34.00	70	2380	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	11780	
243.4832.01		400		RECEIVER (SUPERSLIG/MAGNETITE FILTRATE) (ALLOWANCE)	1	EA	MAT	7000.00			7000	E
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	8560	
				243 MAGNETITE						TOTAL 5664		
											926876	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ CLAS NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
244			APATITE								
244.2310.06	400		TANK (SULPHIDE CONDITIONER) 6000 DIA X 6000	1	EA	MAT	22000.00			22000	E
						LAB	582.00	34.00	582	19788	
						EQP	4000.00			4000	
						SUB				0	
									ITEM COST	45788	
244.2310.07	200		TANK (APATITE CONDITIONER) 6000 DIA X 6000	1	EA	MAT	22000.00			22000	E
						LAB	582.00	34.00	582	19788	
						EQP	4000.00			4000	
						SUB				0	
									ITEM COST	45788	
244.4120.03	400		FLOTATION CELLS (SULPHIDE ROUGHER) - BANK OF 6 X 14.2m3 C/W 30KW DRIVES	1	EA	MAT	185000.00			185000	Q
						LAB	400.00	34.00	400	13600	
						EQP	3000.00			3000	
						SUB				0	
									ITEM COST	201600	
244.4120.04	400		FLOTATION CELLS (APATITE ROUGHER) BANK OF 6 X 14.2m3 C/W 30KW DRIVES	1	EA	MAT	185000.00			185000	Q
						LAB	400.00	34.00	400	13600	
						EQP	3000.00			3000	
						SUB				0	
									ITEM COST	201600	
244.4120.05	400		FLOTATION CELLS (APATITE CLEANER) BANK OF 6 X 8.5m3 C/W 22KW DRIVES	1	EA	MAT	172000.00			172000	Q
						LAB	400.00	34.00	400	13600	
						EQP	2500.00			2500	
						SUB				0	
									ITEM COST	188100	

AREA NO.	WORK SEQ NO.	WORK CLAS	CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
244				APATITE								
244.4151.22	400			AC PUMPS (APATITE FILTRATE RETURN) 38 X 25 C/W 3.7KW MOTOR	1	EA	MAT	4500.00			4500	Q
							LAB	34.00	34.00	34	1156	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5856	
244.4151.23	400			AC PUMPS (APATITE THICKENER U/FLOW) 38 X 25 C/W 3.7KW DRIVE	1	EA	MAT	4500.00			4500	Q
							LAB	34.00	34.00	34	1156	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5856	
244.4151.24	400			AC PUMP - TAILINGS (ALLOWANCE)	1	EA	MAT	10000.00			10000	E
							LAB	60.00	34.00	60	2040	
							EQP	300.00			300	
							SUB				0	
										ITEM COST	12340	
244.4151.25	400			AC PUMPS (APATITE CLEANER TAILS) 50 X 38 C/W 7.5KW MOTOR	2	EA	MAT	5000.00			10000	Q
							LAB	36.00	34.00	72	2448	
							EQP	200.00			400	
							SUB				0	
										ITEM COST	12848	
244.4152.02	400			VERT PUMP (SULPHIDE ROUGHER)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
244				APATITE								
244.4152.03		400		VERT PUMP WITH TANK (APATITE ROUGHER)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	
244.4152.04		400		VERT PUMP WITH TANK (APATITE SCAVENGER)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	
244.4152.05		400		VERT PUMP WITH TANK (APATITE CLEANER)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	
244.4152.06		400		VERT PUMP WITH TANK (APATITE SECOND CLEANER)	1	EA	MAT	5000.00			5000	Q
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	6560	
244.4223.01		400		BELT FILTER (2440 X 6100) C/W 5.6KW MOTOR (USED)	1	EA	MAT	160000.00			160000	Q
							LAB	350.00	34.00	350	11900	
							EQP	2000.00			2000	
							SUB				0	
										ITEM COST	173900	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
244				APATITE								
244.4317.05		400		AGITATOR (TANK #2310.06) C/W 15KW DRIVE	1	EA	MAT	24000.00			24000	Q
							LAB	70.00	34.00	70	2380	
							EQP	800.00			800	
							SUB				0	
										ITEM COST	27180	
244.4317.06		400		AGITATOR (TANK #2310.07) C/W 15KW DRIVE	1	EA	MAT	24000.00			24000	Q
							LAB	70.00	34.00	70	2380	
							EQP	800.00			800	
							SUB				0	
										ITEM COST	27180	
244.4318.02		400		THICKENER HI CAP'Y (APATITE) 20000 DIA C/W TANK, RAKE, LIFT AND 3.7KW DRIVE	1	EA	MAT	102000.00			102000	Q
							LAB	800.00	34.00	800	27200	
							EQP	6500.00			6500	
							SUB				0	
										ITEM COST	135700	
244.4811.08		400		PUMPBOX (APATITE CLEANER TAILS)	1	EA	MAT	9000.00			9000	E
							LAB	70.00	34.00	70	2380	
							EQP	400.00			400	
							SUB				0	
										ITEM COST	11780	
244.4832.02		400		RECEIVER (APATITE FILTRATE) (ALLOWANCE)	1	EA	MAT	7000.00			7000	E
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	8560	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS	UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
244			APATITE							
			244 APATITE				TOTAL	4164		
									1136876	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246				REAGENTS								
246.2310.08		400		TANK (POTABLE WATER) (ALLOWANCE)	1	EA	MAT	10000.00			10000	E
							LAB	264.00	40.00	264	10560	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	20760	
246.2310.09		400		TANK (PROCESS WATER) (ALLOWANCE)	1	EA	MAT	30000.00			30000	E
							LAB	794.00	34.00	794	26996	
							EQP	9000.00			9000	
							SUB				0	
										ITEM COST	65996	
246.4151.27		400		AC PUMP (FLOCCULANT) 25mm C/W 2.2KW MOTOR	2	EA	MAT	4500.00			9000	Q
							LAB	30.00	34.00	60	2040	
							EQP	200.00			400	
							SUB				0	
										ITEM COST	11440	
246.4151.29		400		AC PUMP (XANTHATE) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
							LAB	30.00	34.00	30	1020	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5720	
246.4151.30		400		AC PUMP (BEROL ATRAC 857) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
							LAB	30.00	34.00	30	1020	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	5720	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246			REAGENTS								
246.4151.31	400		AC PUMP (DOW 250) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
						LAB	30.00	34.00	30	1020	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	5720	
246.4151.32	400		AC PUMPS (PROCESS WATER) (ALLOWANCE)	2	EA	MAT	2000.00			4000	E
						LAB	40.00	34.00	80	2720	
						EQP	200.00			400	
						SUB				0	
									ITEM COST	7120	
246.4151.34	400		AC PUMPS (GLAND WATER) (ALLOWANCE)	2	EA	MAT	3000.00			6000	E
						LAB	40.00	34.00	80	2720	
						EQP	200.00			400	
						SUB				0	
									ITEM COST	9120	
246.4151.36	400		AC PUMP (NAOH) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
						LAB	30.00	34.00	30	1020	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	5720	
246.4151.37	400		AC PUMP (AMINE) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
						LAB	30.00	34.00	30	1020	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	5720	

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246			REAGENTS								
246.4151.38	400		AC PUMP (DEXTRIN) 25mm C/W 2.2KW MOTOR	1	EA	MAT	4500.00			4500	Q
						LAB	30.00	34.00	30	1020	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	5720	
246.4159.01	400		BARREL PUMPS C/W 0.75KW MOTORS	12	EA	MAT	1000.00			12000	Q
						LAB	5.00	34.00	60	2040	
						EQP	100.00			1200	
						SUB				0	
									ITEM COST	15240	
246.4163.01	400		BLOWER (DISC FILTER)	1	EA	MAT	26000.00			26000	Q
						LAB	100.00	34.00	100	3400	
						EQP	500.00			500	
						SUB				0	
									ITEM COST	29900	
246.4163.02	400		BLOWER (FLOTATION CELLS)	1	EA	MAT	26000.00			26000	Q
						LAB	100.00	34.00	100	3400	
						EQP	500.00			500	
						SUB				0	
									ITEM COST	29900	
246.4163.03	400		AIR COMPRESSOR (PLANT AND INSTRUMENT AIR - 215CFM @ 125PSIG & 50 HP MOTOR C/W DRIER, RECEIVER & FILTER)	1	EA	MAT	40000.00			40000	E
						LAB	100.00	34.00	100	3400	
						EQP	500.00			500	
						SUB				0	
									ITEM COST	43900	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246				REAGENTS								
246.4168.01		400		VACUUM PUMP (DISC FILTER) C/W 150KW MOTOR SUPPLIED WITH DISC FILTER	1	EA	MAT	0.00			0	Q
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
246.4168.02		400		VACUUM PUMP (BELT FILTER) C/W 93.7KW MOTOR SUPPLIED WITH BELT FILTER	1	EA	MAT	0.00			0	Q
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
246.4317.07		400		AGITATOR (FLOCCULANT) C/W 0.75KW MOTOR	2	EA	MAT	2000.00			4000	Q
							LAB	20.00	34.00	40	1360	
							EQP	100.00			200	
							SUB				0	
										ITEM COST	5560	
246.4441.03		400		HOIST	1	EA	MAT	2500.00			2500	Q
							LAB	40.00	34.00	40	1360	
							EQP	500.00			500	
							SUB				0	
										ITEM COST	4360	
246.4811.09		400		TANKS (FLOCCULANT) 1000 DIA X 1000H	2	EA	MAT	3000.00			6000	E
							LAB	20.00	34.00	40	1360	
							EQP	100.00			200	
							SUB				0	
										ITEM COST	7560	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246			REAGENTS								
246.4811.11	400		TANK (XANTHATE) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
						LAB	40.00	34.00	40	1360	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	7560	
246.4811.12	400		TANK (BEROL ALTRAC 857) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
						LAB	40.00	34.00	40	1360	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	7560	
246.4811.13	400		TANK (DOW 250) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
						LAB	40.00	34.00	40	1360	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	7560	
246.4811.14	400		TANK (AMINE) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
						LAB	40.00	34.00	40	1360	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	7560	
246.4811.15	400		TANK (DEXTRIN) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
						LAB	40.00	34.00	40	1360	
						EQP	200.00			200	
						SUB				0	
									ITEM COST	7560	

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
246				REAGENTS								
246.4811.16		400		TANK (NAOH) 2000 DIA X 2000	1	EA	MAT	6000.00			6000	E
							LAB	40.00	34.00	40	1360	
							EQP	200.00			200	
							SUB				0	
										ITEM COST	7560	
				246 REAGENTS					TOTAL	2178		
											330536	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS NO.	SEQ WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
270			PRODUCT STORAGE & LOADOUT/SHIPPING								
270.1322.04	100		ROCK EXCAVATION FOR STOCKPILE COVERS (FOOTINGS)	42	m3	MAT	10.00			420	E
						LAB	1.00	27.00	42	1134	
						EQP	23.00			966	
						SUB				0	
									ITEM COST	2520	
270.2021.07	200		CONCRETE TO FOOTINGS (STOCKPILE COVERS)	42	M3	MAT	320.00			13440	E
						LAB	7.00	27.00	294	7938	
						EQP	20.00			840	
						SUB				0	
									ITEM COST	22218	
270.2210.05	200		STRUCTURAL STEEL FRAMING (STOCKPILE COVERS)	250	t	MAT	2200.00			550000	E
						LAB	18.00	34.00	4500	153000	
						EQP	300.00			75000	
						SUB				0	
									ITEM COST	778000	
270.2210.06	200		SUPPORT STRUCTURE FOR THE LOAD-OUT HOPPER - (ALLOWANCE)	1	LS	MAT	25000.00			25000	E
						LAB	1500.00	27.00	1500	40500	
						EQP	2500.00			2500	
						SUB				0	
									ITEM COST	68000	
270.2210.08	200		TRANSFER HOUSE ON JETTY - 7M X 7M X20M HIGH - STRUCTURAL STEEL FRAMING	27	t	MAT	2200.00			59400	E
						LAB	18.00	34.00	486	16524	
						EQP	300.00			8100	
						SUB				0	
									ITEM COST	84024	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
270				PRODUCT STORAGE & LOADOUT/SHIPPING								
270.2225.04		200		STAIRS - INCLUDING HANDRAIL	30	M	MAT	250.00			7500	E
							LAB	4.00	34.00	120	4080	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	11580	
270.2410.03		200		SIDING - TRANSFER HOUSE	560	M2	MAT	20.00			11200	E
							LAB	1.20	27.00	672	18144	
							EQP	20.00			11200	
							SUB				0	
										ITEM COST	40544	
270.2430.04		200		ROOF - TRANSFER HOUSE	50	m2	MAT	15.00			750	E
							LAB	1.00	27.00	50	1350	
							EQP	20.00			1000	
							SUB				0	
										ITEM COST	3100	
270.2430.05		200		METAL ROOF OVER STOCKPILES	3500	m2	MAT	15.00			52500	E
							LAB	0.16	27.00	560	15120	
							EQP	13.00			45500	
							SUB				0	
										ITEM COST	113120	
270.4432.01		400		CHUTES IN TRANSFER STRUCTURES	10	t	MAT	2800.00			28000	E
							LAB	70.00	34.00	700	23800	
							EQP	400.00			4000	
							SUB				0	
										ITEM COST	55800	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
400				TAILINGS MANAGEMENT								
400.2023.11		200		CONCRETE CHAMBER 2 m sq X 10 m HIGH FOR TAILINGS DISPERSAL	25	m3	MAT	500.00			12500	E
							LAB	50.00	27.00	1250	33750	
							EQP	200.00			5000	
							SUB				0	
										ITEM COST	51250	
400.5000.01		500		TAILINGS LINE (HDP) 150mm DIA MILL BUILDING TO JETTY	200	m	MAT	25.00			5000	E
							LAB	0.30	34.00	60	2040	
							EQP	1.50			300	
							SUB				0	
										ITEM COST	7340	
400.5000.02		500		OUTFALL LINE - 300mm DIA HDP	50	m	MAT	50.00			2500	E
							LAB	4.00	34.00	200	6800	
							EQP	100.00			5000	
							SUB				0	
										ITEM COST	14300	
400.5000.03		500		SEA WATER INTAKE 150mm DIA HDP	50	m	MAT	25.00			1250	E
							LAB	2.00	34.00	100	3400	
							EQP	100.00			5000	
							SUB				0	
										ITEM COST	9650	
400.5000.04		500		ENTRAINED AIR TO SHORE 50mm HDP (ALLOWANCE)	50	m	MAT	15.00			750	E
							LAB	3.00	34.00	150	5100	
							EQP	100.00			5000	
							SUB				0	
										ITEM COST	10850	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK SEQ NO.	CLAS	WORK CAT.	DESCRIPTION	QUANTITY	UNITS	UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
400				TAILINGS MANAGEMENT							
				400 TAILINGS MANAGEMENT				TOTAL	1760		
										93390	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
520				MAIN ACCESS ROAD								
520.1120.01		100		ROADS (BY IBESTAD KOMMUNE)	1	LS	MAT	0.00			0	
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
				520 MAIN ACCESS ROAD					TOTAL	0		
											0	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
540				MARINE DOCK								
540.2930.01		200		MARINE DOCK (BY IBESTAD KOMMUNE)	1	LS	MAT	0.00			0	
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST	0	
				540 MARINE DOCK					TOTAL	0		
											0	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
580				WATER SUPPLY DAM								
580.1160.01		100		WATER SUPPLY DAM (BY IBESTAD KOMMUNE)	1	LS	MAT	0.00			0	
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				0	
										ITEM COST		
										-	0	
				500 WATER SUPPLY DAM				TOTAL		0		
											0	
COST TYPE								D TOTAL		106917		
											16846781	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
660				CONSTR. INDIRECTS								
660.9000.01		900		CONSTRUCTION INDIRECTS (10%)	1	LS	MAT	0.00			0	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				1684678	
										ITEM COST	1684628	
				660 CONSTR. INDIRECTS					TOTAL	0		
											1684678	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

FIMAS
ANDORJA PROJECT
PROJECT NUMBER: 3754-15

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
670				E.P.C.M.								
670.9570.01		900	EPCM		1	LS	MAT	0.00			0	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				2038460	
										ITEM COST	2038460	
				670 E.P.C.M.					TOTAL	0		
											2038460	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS		UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
680				CONTINGENCY								
680.9800.01		900		CONTINGENCY (10%)	1	LS	MAT	0.00			0	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				2056991	
										ITEM COST	2056991	
680.9800.02		900		(ROUNDING-OFF ADJUSTMENT)	1	LS	MAT	0.00			0	E
							LAB	0.00	0.00	0	0	
							EQP	0.00			0	
							SUB				90	
										ITEM COST		
										-	-90	
				680 CONTINGENCY				TOTAL		0		
											2057081	
										-	-------	
COST TYPE								I TOTAL		0		
											5780219	
										------	--------	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

AREA NO.	WORK CLAS	SEQ NO.	WORK CAT.	DESCRIPTION	QUANTITY	UNITS	UNIT COST (MH)	WAGE RATE	MANHR TOTAL	COST	ESTIMATE SOURCE
830				CONTINGENCY							
									106917		
PROJECT TOTAL										22627000	

LEGEND: C-CALCULATION BASED ON QUOTES E-ESTIMATED F-FIRM Q-QUOTATION

KONFIDENSIEL

APPENDIX E

DRAWING LIST

FALKHAMMER - IBESTAD MAGNETITE A.S.

ANDØRJA MAGNETITE PROJECT

APPENDIX E

DRAWING LIST

MINING

50-05-F1	Rev. A	Kuliberget Area Open Pit Plan
50-05-F2	Rev. A	Kuliberget Area Open Pit Cross-Sections looking Northeast
50-05-F3	Rev. A	Kuliberget Area Underground Pre-Production Development showing Gropa Orepass
50-05-F4	Rev. A	Kuliberget Area Underground Mine Layout Lower (Footwall) Level
50-05-F5	Rev. A	Kuliberget Area Underground Mine Layout Upper (Hanging Wall) Level
50-05-F6	Rev. A	Gropa Area Open Pit Cross Sections Looking North
50-30-F1		Gropa Area - Final Pit

DRAWING LIST

FLOWSHEETS - CASE 1

100-10-FA1	Rev. B	Crushing and Grinding
100-10-FA2	Rev. B	Concentration & Thickening
100-10-FA3	Rev. B	Minpro AB Pilot Plant
100-10-FA4	Rev. B	Ancillaries and Reagents
100-10-FA5	Rev. A	Product Handling & Storage

FLOWSHEETS - CASE 2

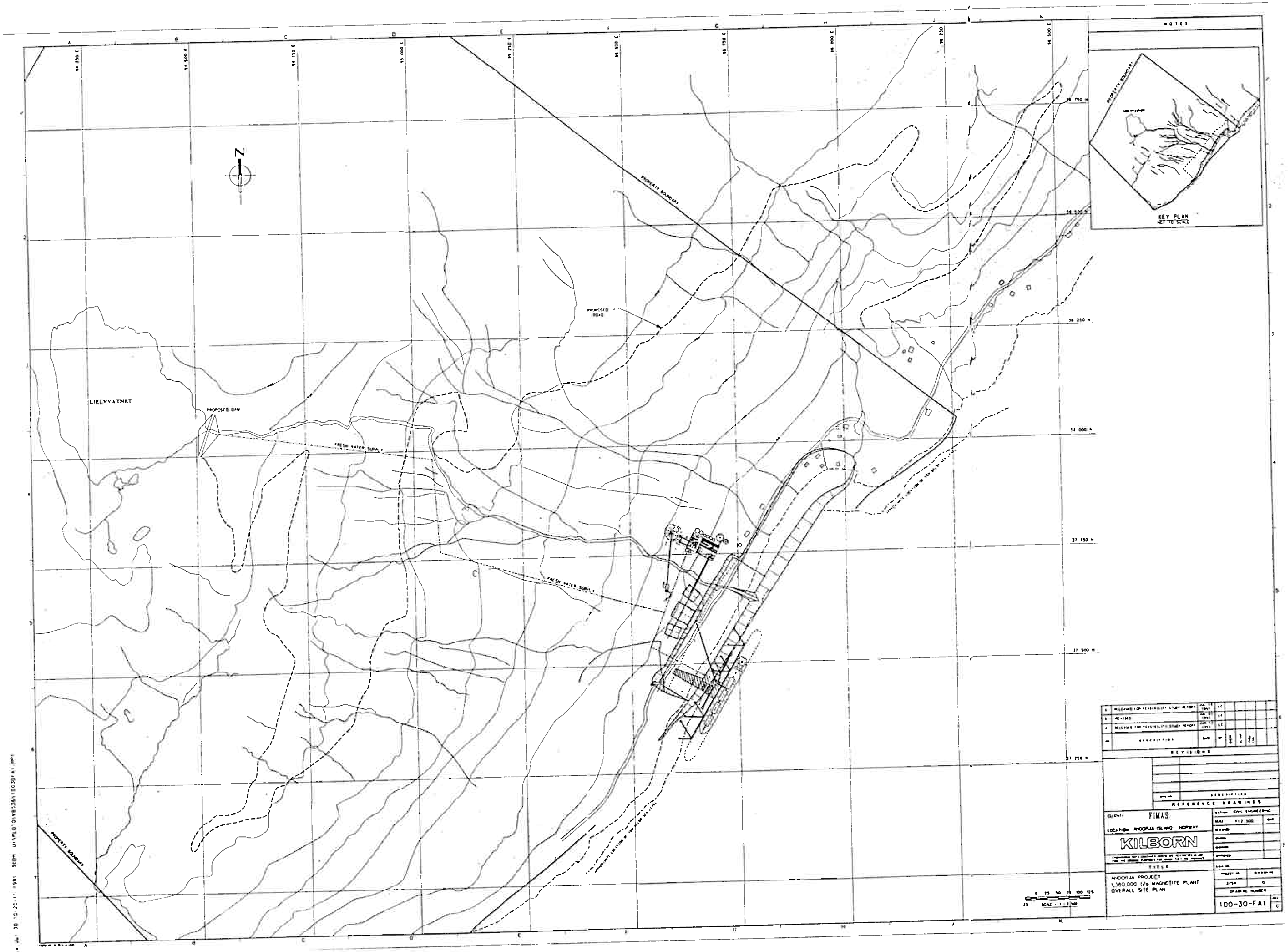
100-10-FB1	Rev. B	Crushing and Grinding
100-10-FB2	Rev. B	Concentration & Thickening
100-10-FB3	Rev. B	Flotation
100-10-FB4	Rev. B	Ancillaries and Reagents
100-10-FB5	Rev. B	Product Handling and Reagents

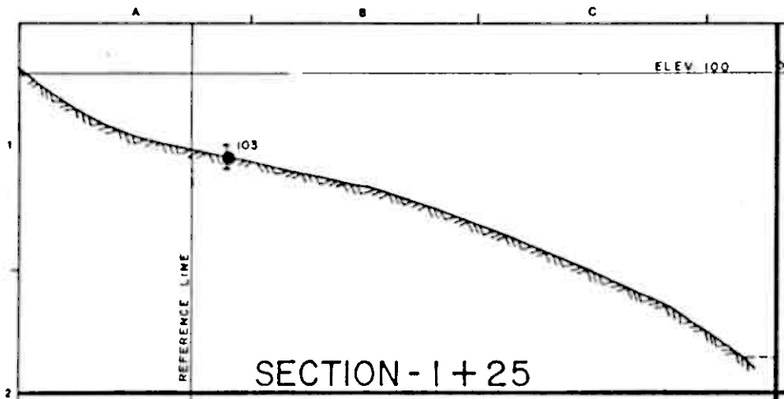
ARRANGEMENTS

100-30-FA1	Rev. C	Overall Site Plan
110-10-FA6	Rev. B	General Arrangement - Ship Loading
240-10-FA1	Rev. B	General Arrangement - Concentrator Plan
240-10-FA2	Rev. B	General Arrangement - Sections A-A, B-B

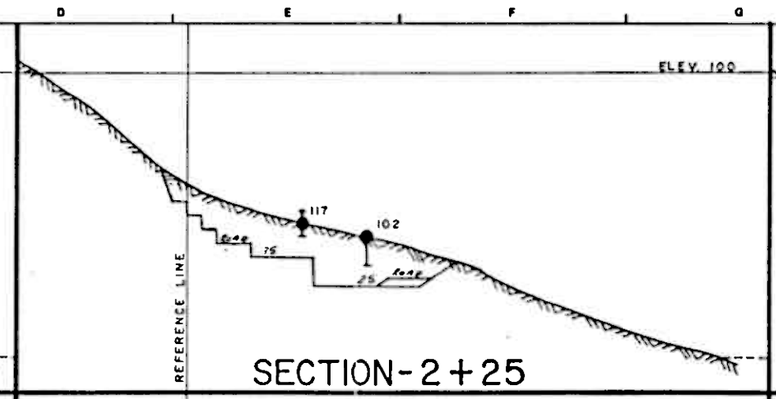
ELECTRICAL

130-19-FA1		Main Single Line Diagram


NOTES
KEY PLAN
NOT TO SCALE
PROPERTY BOUNDARY
LIELVVATNET
PROPOSED DAM
FRESH WATER SUPPLY
PROPOSED ROAD
REVISIONS
REFERENCE DRAWINGS
CLIENT: FIMAS
LOCATION: ANDORJA ISLAND NORWAY
SECTION: CIVIL ENGINEERING
SCALE 1:2 500
KILBORN
TITLE
ANDORJA PROJECT
1,360,000 t/a MAGNETITE PLANT
OVERALL SITE PLAN
DRAWING NUMBER
100-30-FA1
C



SECTION - 1 + 25



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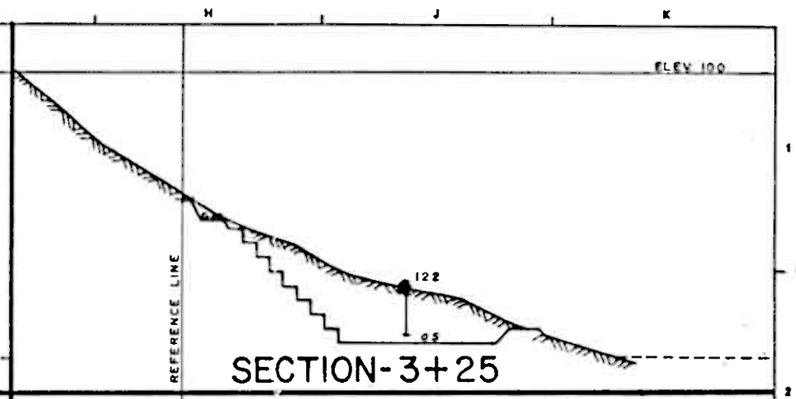

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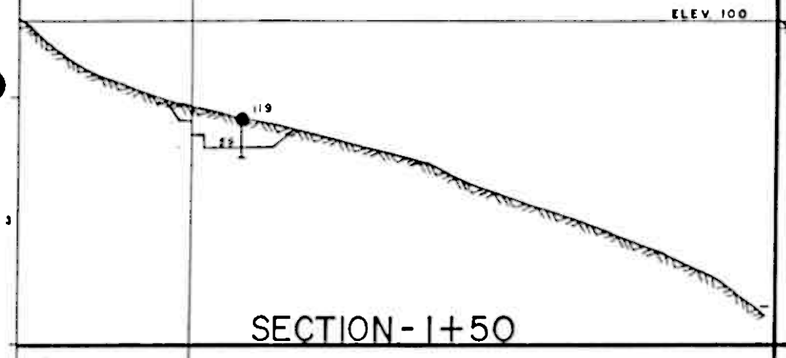

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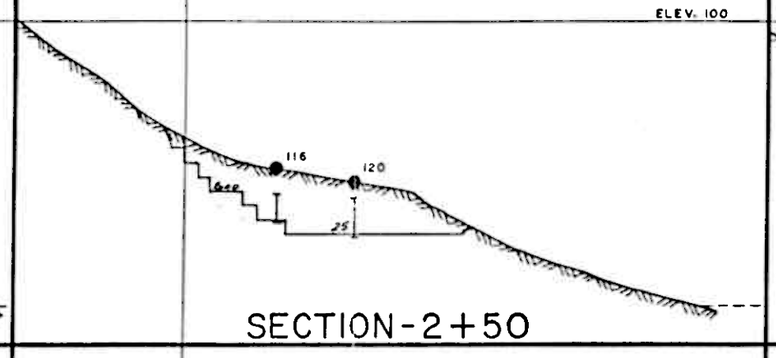

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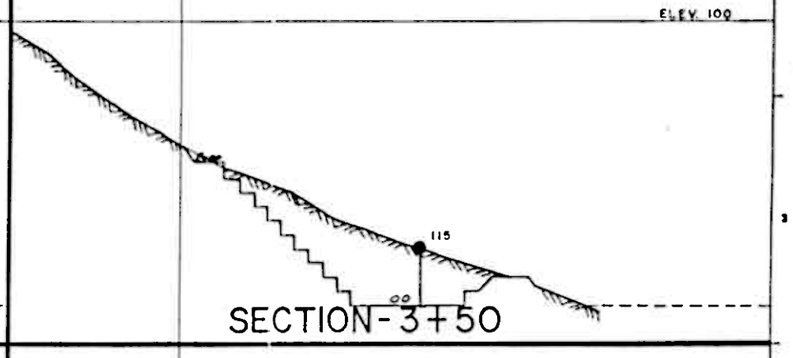

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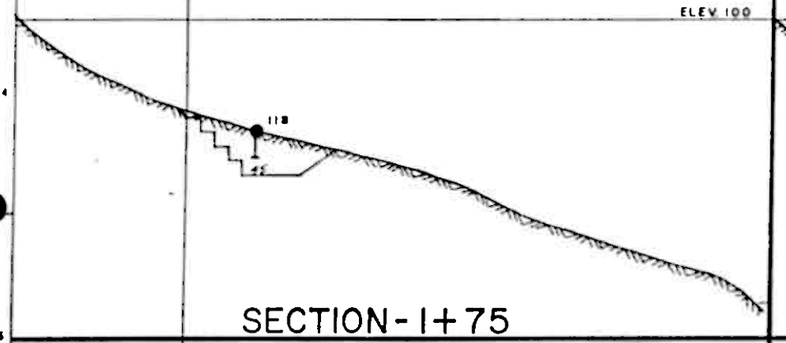

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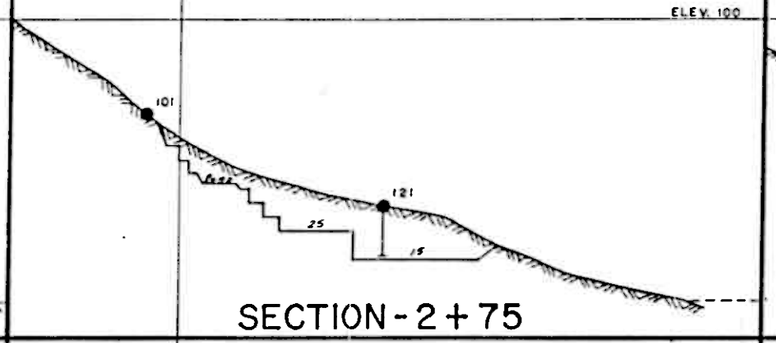

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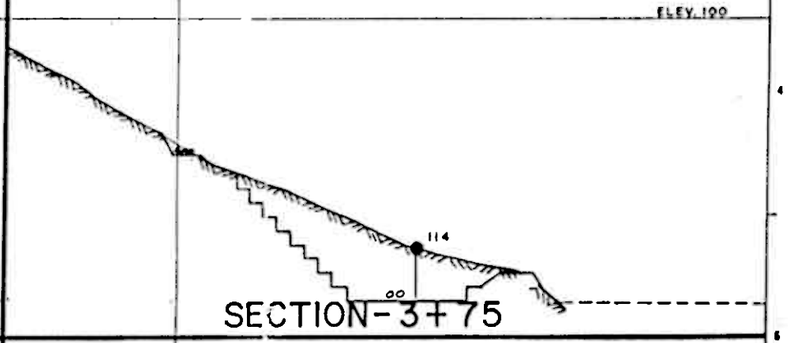

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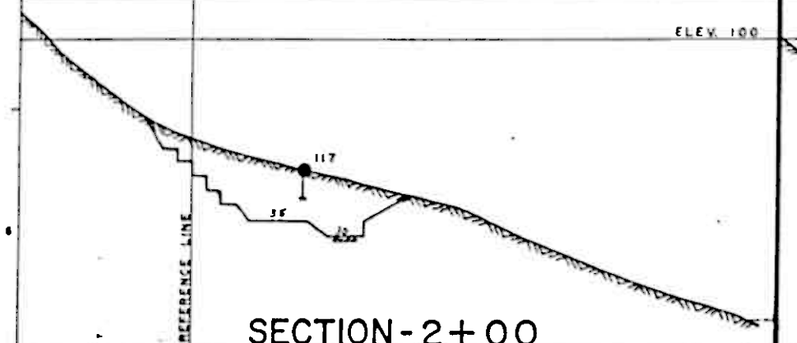

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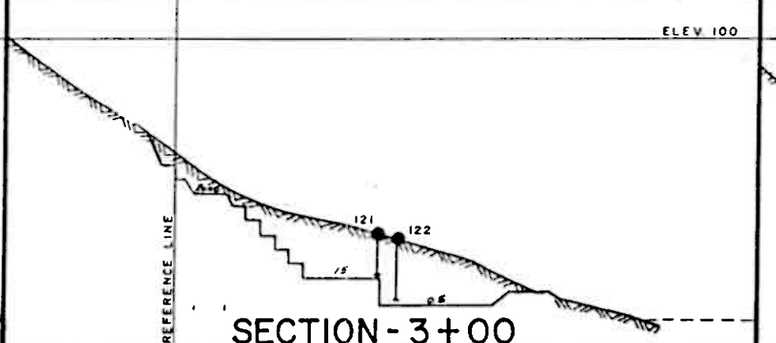

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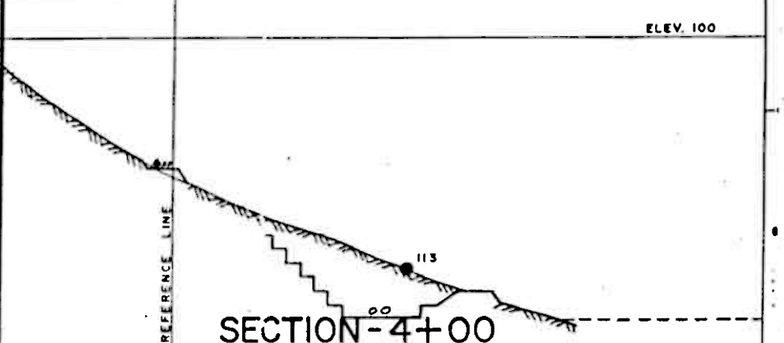


SECTION - 4 + 00

REFERENCE DRAWINGS		REVISIONS		REVISIONS		SECTION: MINING	CLIENT: FIMAS
DWG NO.	DESCRIPTION	NO.	DESCRIPTION DATE BY	NO.	DESCRIPTION DATE BY	SCALE: 1:1000 DATE	LOCATION: ANDORJA ISLAND NORWAY
		CLIENT		CLIENT		DESIGNED: M. J. DAVIE JUL. 91	KILBORN
		FIELD		FIELD		DRAWN: R.W. LAROCQUE JUL. 91	
		CHECK		CHECK		CHECKED	
						APPROVED	

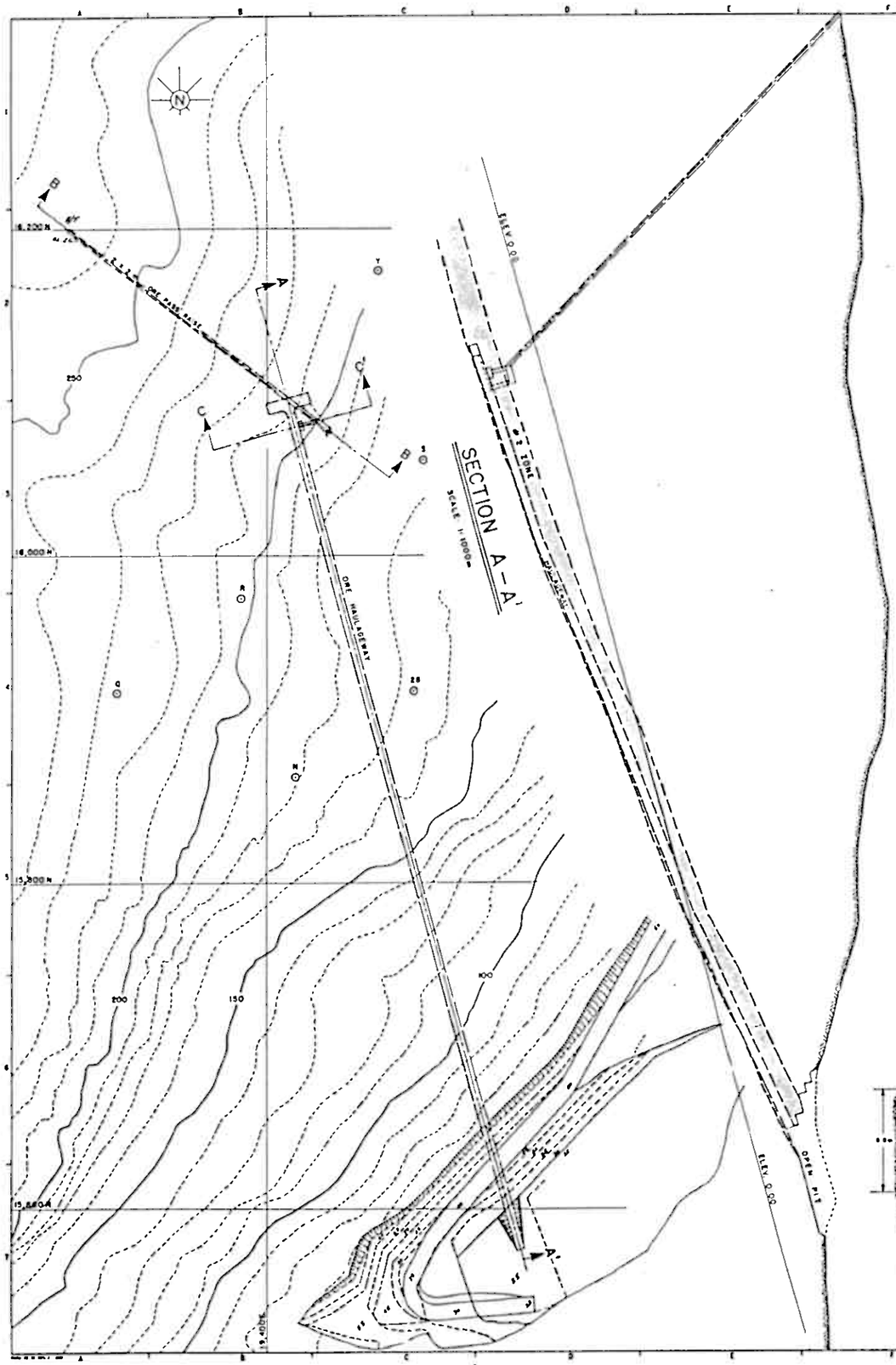
TITLE

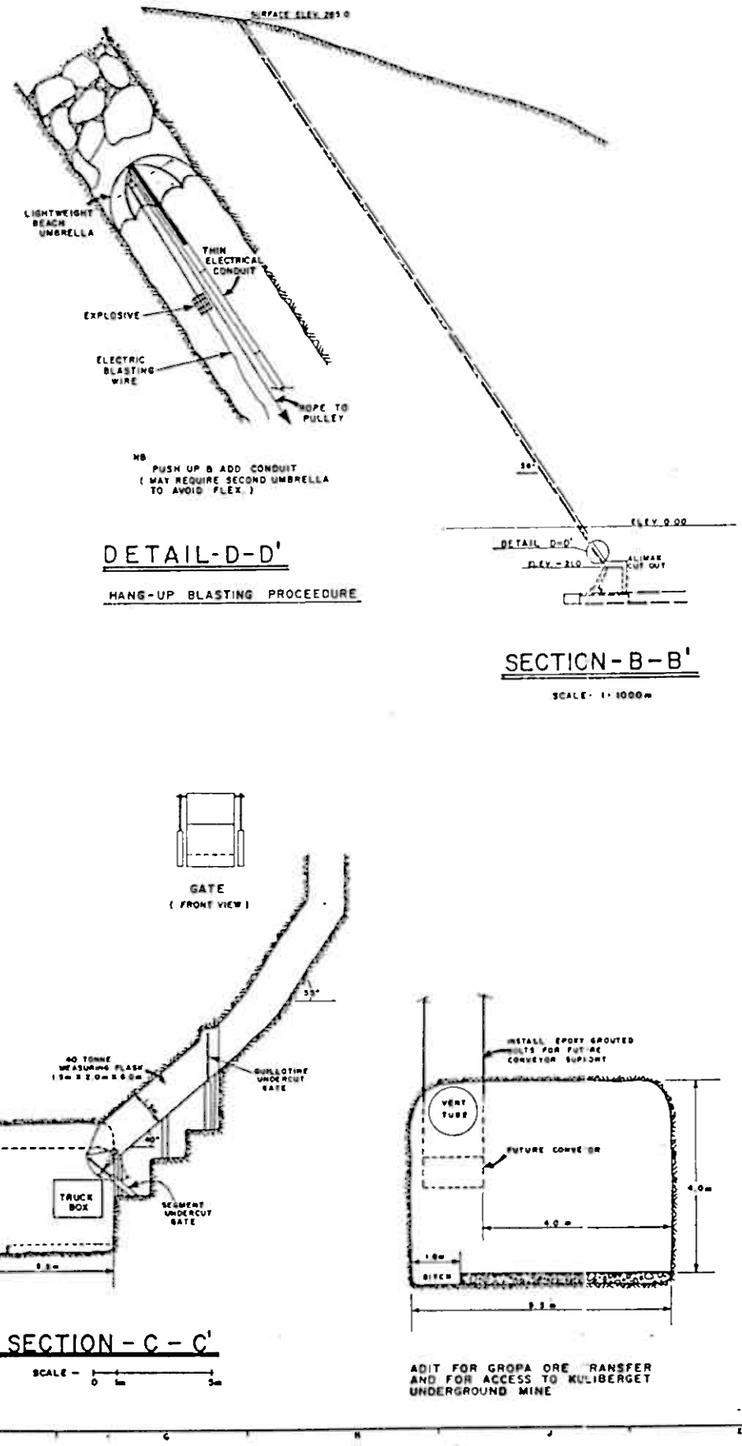
ANDORJA PROJECT
1360000 t/a MAGNETITE PLANT

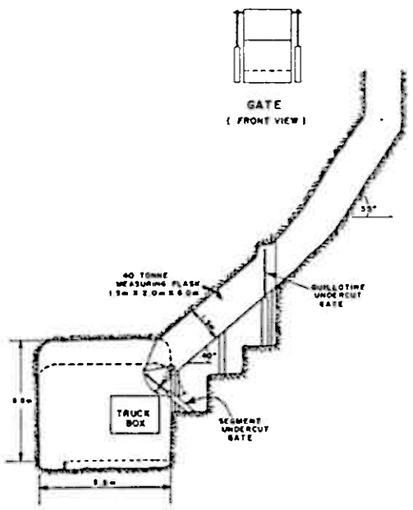
KULIBERGET AREA
OPEN PIT CROSS-SECTIONS
LOOKING NORTHEAST

PROJECT NO.	DIVISION NO.
3754	15

DRAWING NUMBER: 50-05-F2 REV: A







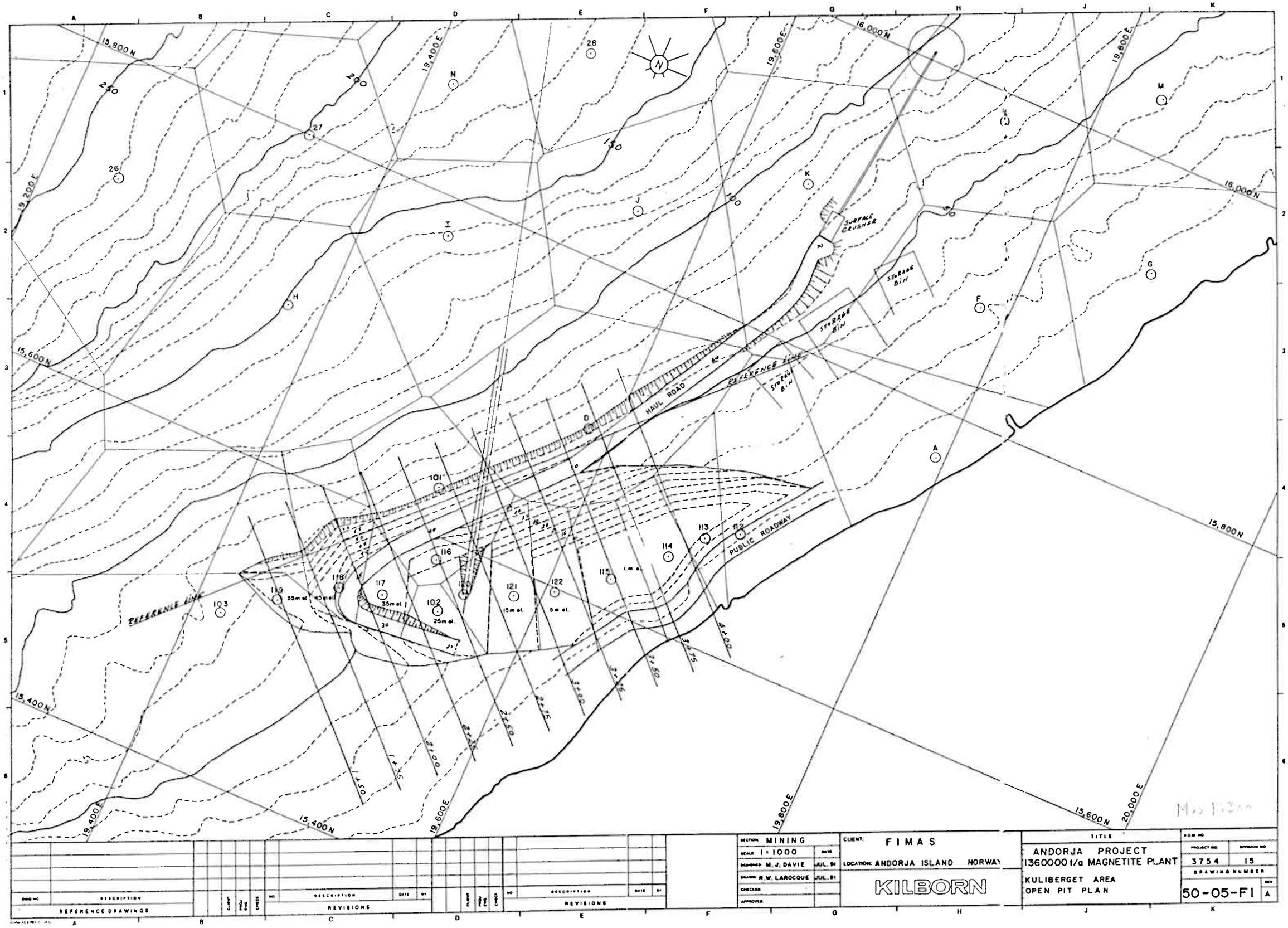
ADIT FOR GROPA ORE TRANSFER AND FOR ACCESS TO KULIBERGET UNDERGROUND MINE

NOTES

REVISIONS				
NO.	DESCRIPTION	DATE	BY	CHK'D

REFERENCE DRAWINGS	
DWG. NO.	DESCRIPTION

CLIENT	FIMA S
LOCATION	ANDORJA ISLAND NORWAY
	KILBORN
TITLE	ANDORJA PROJECT 3600000 t/a MAGNETITE PLANT KULIBERGET AREA UNDERGROUND PRE-PRODUCTION DEVELOPMENT - SHOWING GROPA ORE PASS
DRAWN	MINING
SCALE	1:1000
DESIGNED	W J DAVIE
DRAWN	R W LARICCHIA
CHECKED	
APPROVED	
PROJECT NO.	3754
DRAWING NO.	15
DRAWING NUMBER	50-05-F3
REV.	A



Max 1:2m

REFERENCE DRAWINGS		REVISIONS		REVISIONS	
DWG NO	DESCRIPTION	NO	DESCRIPTION DATE BY	NO	DESCRIPTION DATE BY

SECTION	MINING
SCALE	1:1000 DATE
DESIGNED	M. J. DAVIE JUL. 91
DRAWN	R. W. LAROCQUE JUL. 91
CHECKED	
APPROVED	

CLIENT: FIMAS

LOCATION: ANDORJA ISLAND NORWAY

KILBORN

TITLE

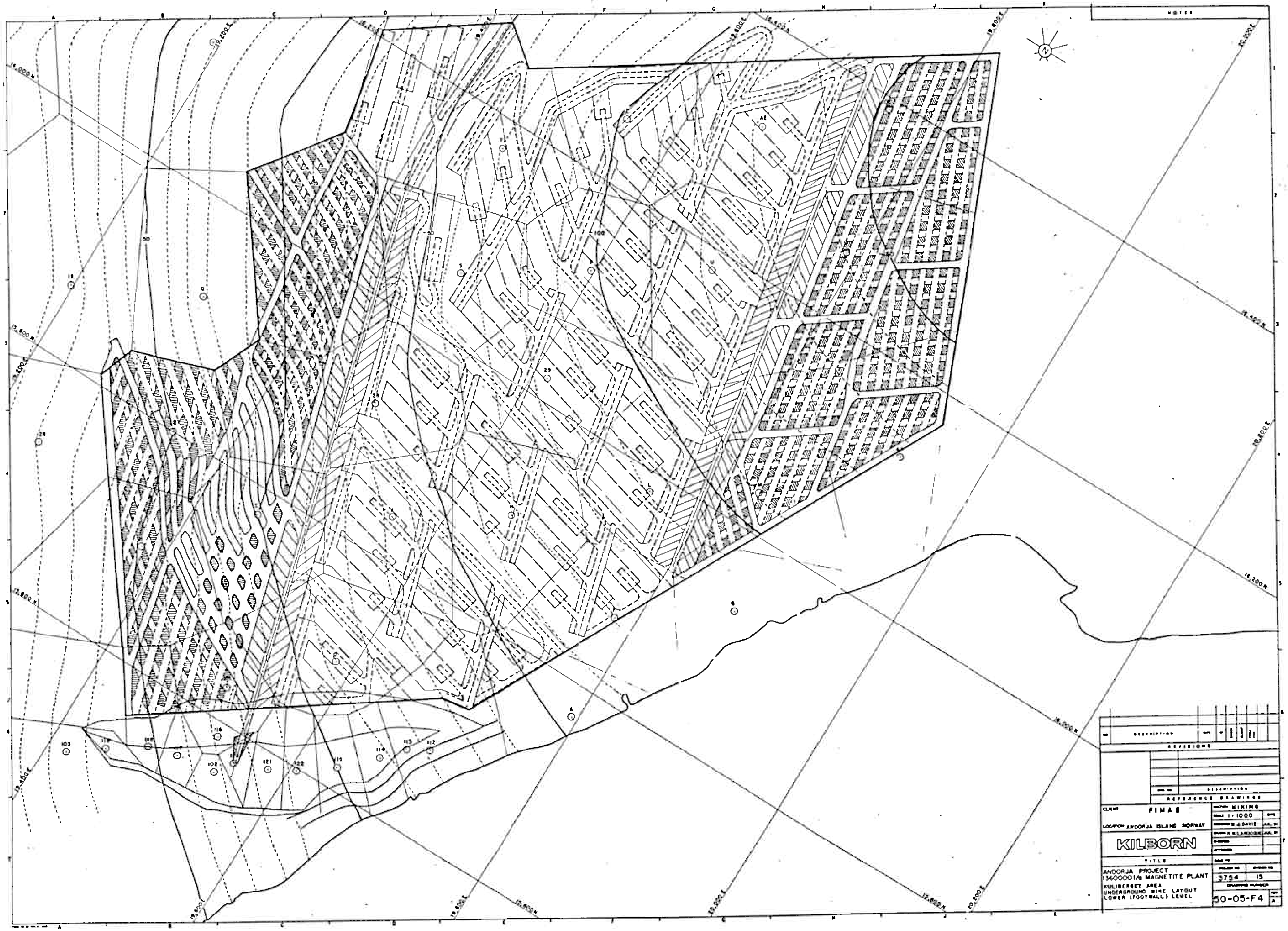
ANDORJA PROJECT
13600001/a MAGNETITE PLANT

KULIBERGET AREA
OPEN PIT PLAN

PROJECT NO	DIVISION NO
3754	15

DRAWING NUMBER

50-05-F1 REV A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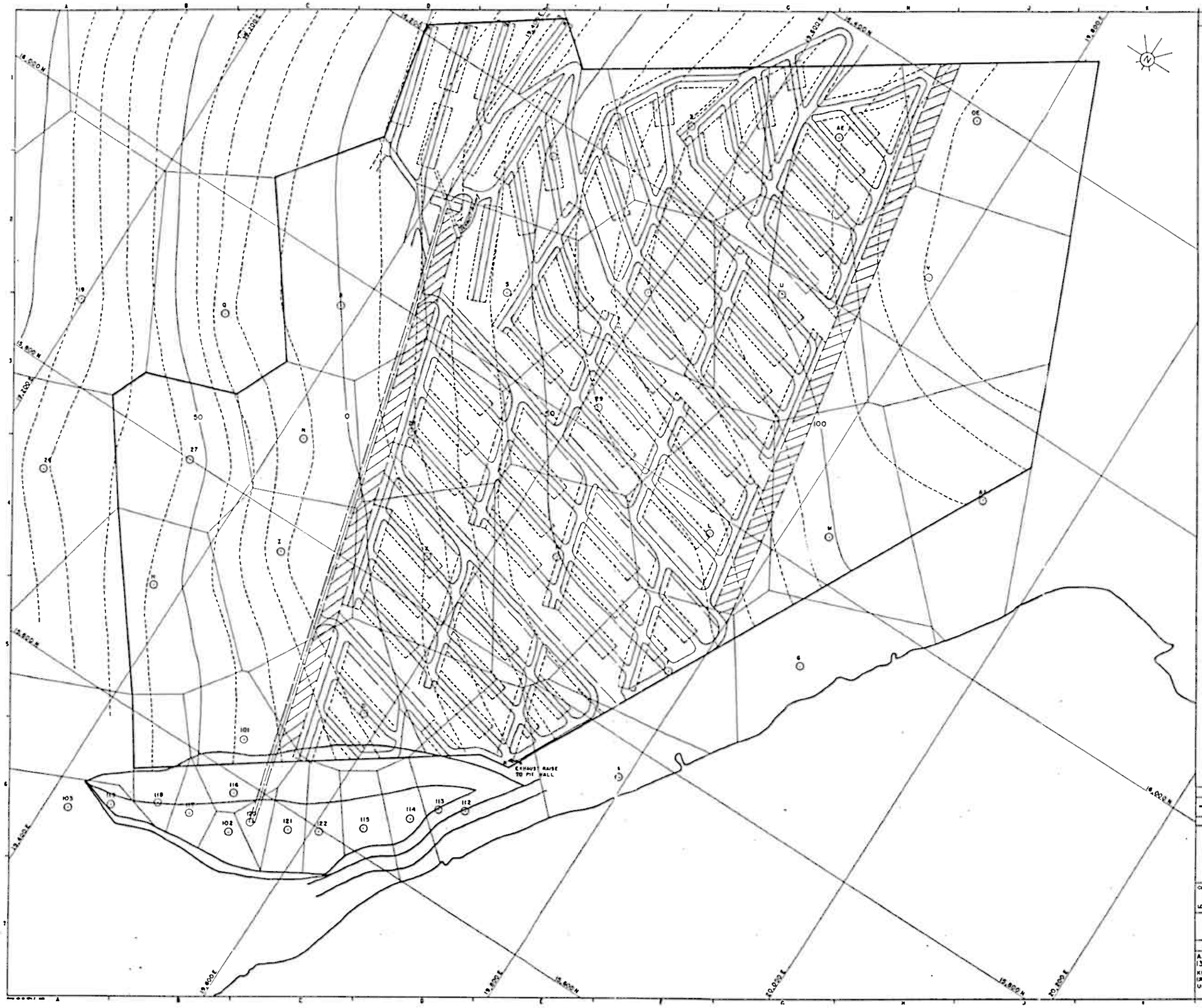
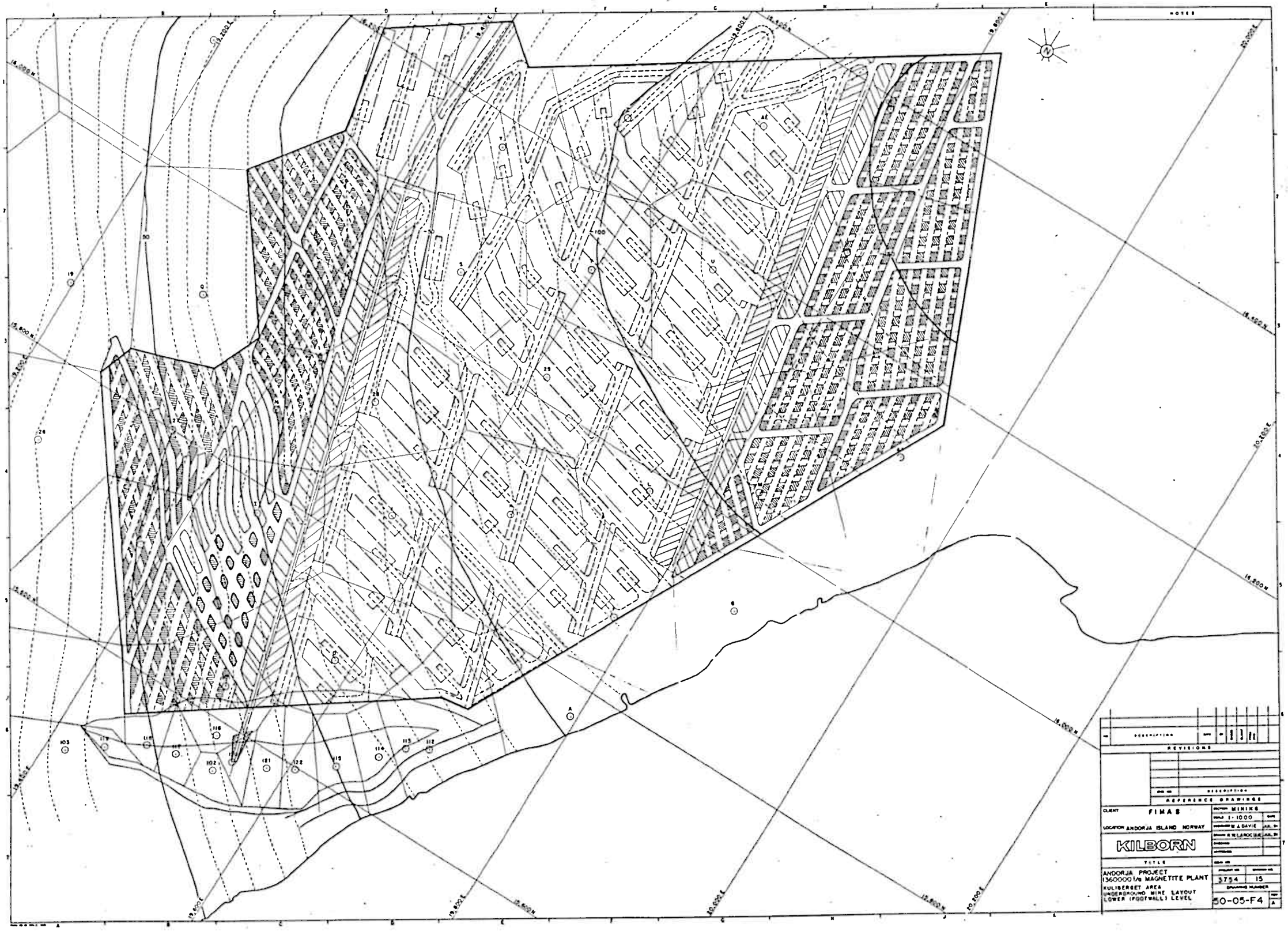
REVISIONS
DESCRIPTION
REFERENCE DRAWINGS
CLIENT FIMAS
LOCATION ANDORJA ISLAND NORWAY
MINING
SCALE 1:1000
KILBORN
TITLE
ANDORJA PROJECT
1360000 t/a MAGNETITE PLANT
KULIBERGET AREA
UNDERGROUND MINE LAYOUT
LOWER (FOOTWALL) LEVEL
3794
15
DRAWING NUMBER
50-05-F4
A


EXHAUST RAISE TO PIT WALL
19,600 E
19,800 E
20,000 E
20,200 E
19,600 N
19,800 N
20,000 N
20,200 N
NOTES
REVISIONS
REFERENCE DRAWINGS
CLIENT FIMAS
LOCATION ANDORJA ISLAND NORWAY
MINING
SCALE 1:1000
KILBORN
TITLE
ANDORJA PROJECT
13600001/0 MAGNETITE PLANT
KULIBERGET AREA
UNDERGROUND MINE LAYOUT
UPPER (HANGINGWALL) LEVEL
3754
15
DRAWING NUMBER
50-05-F5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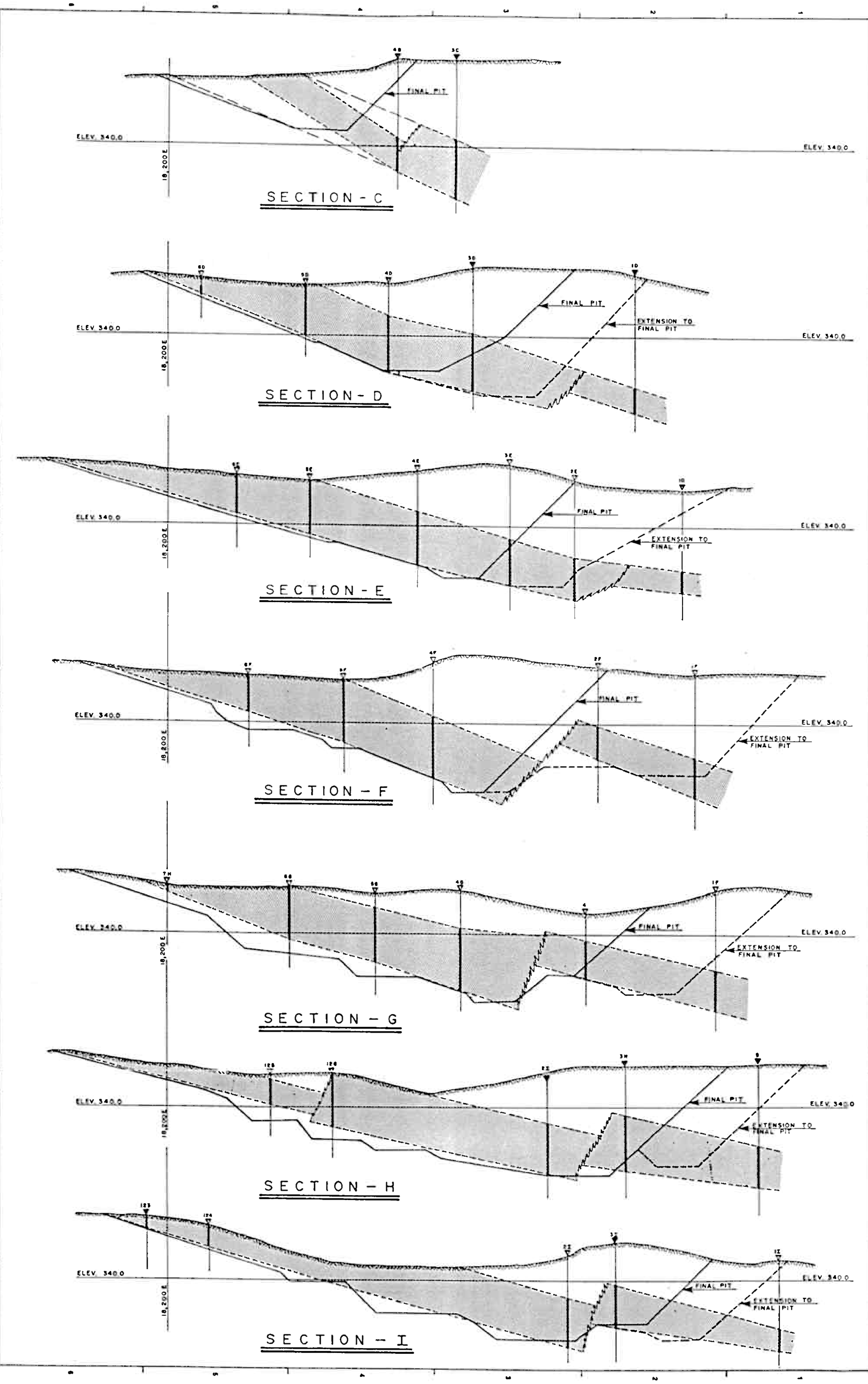
LOCATION ANDORJA ISLAND NORWAY
MINING
SCALE 1:1000
DRAWN M.J.DAVIE
KILBORN
TITLE
ANDORJA PROJECT
1360000 t/a MAGNETITE PLANT
KULIBERGET AREA
UNDERGROUND MINE LAYOUT
LOWER (FOOTWALL) LEVEL
PROJECT NO. 3734
DRAWING NUMBER 50-05-F4
REV A



REFERENCE DRAWINGS

REVISIONS

REVISIONS

SECTION: MINING

SCALE: 1:1000

DESIGNED: T. HOCKING JUL.91

DRAWN: R.W. LAROCQUE JUL.91

CHECKED

APPROVED

CLIENT: FIMAS

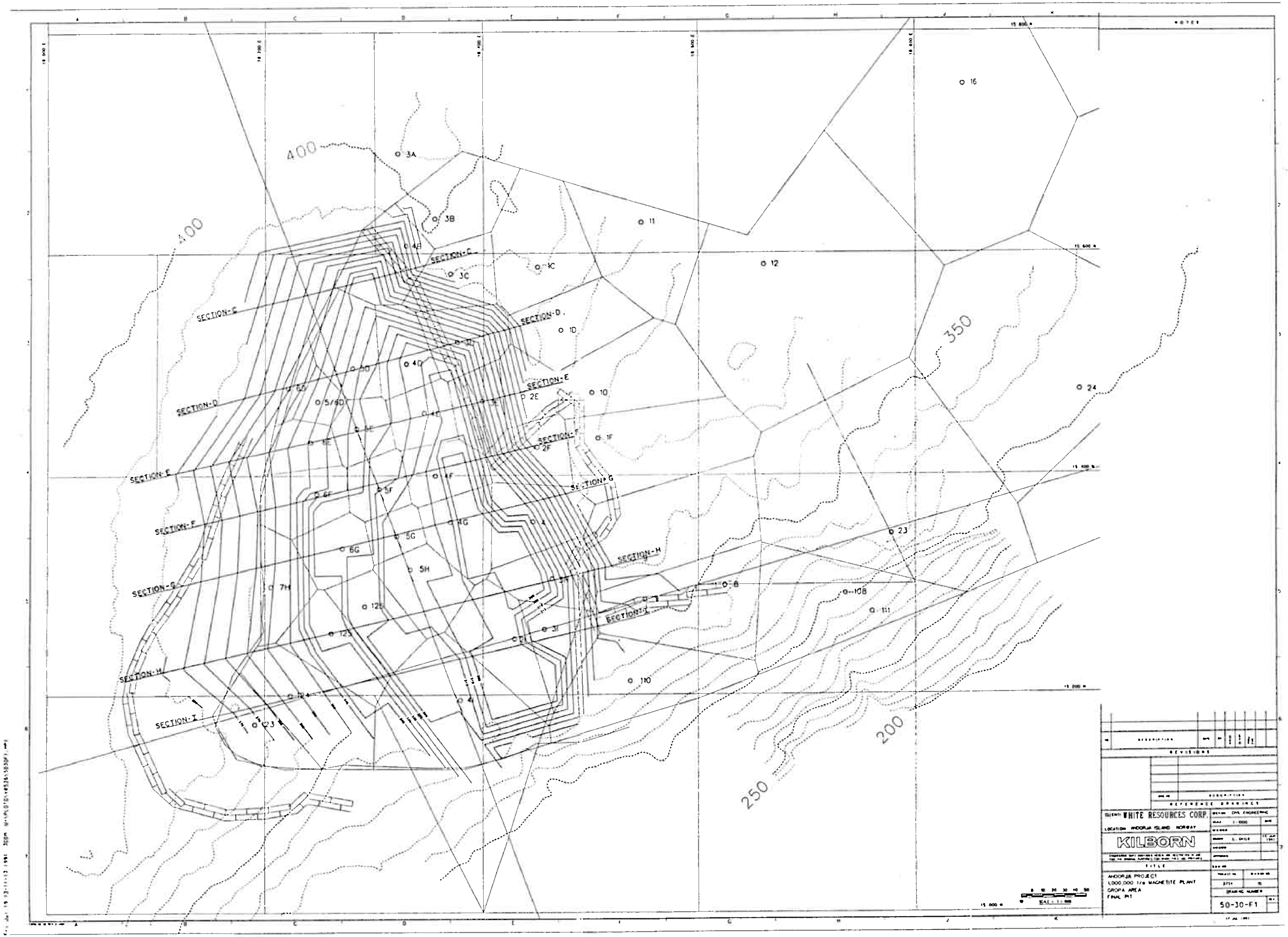
LOCATION: ANDORJA ISLAND NORWAY

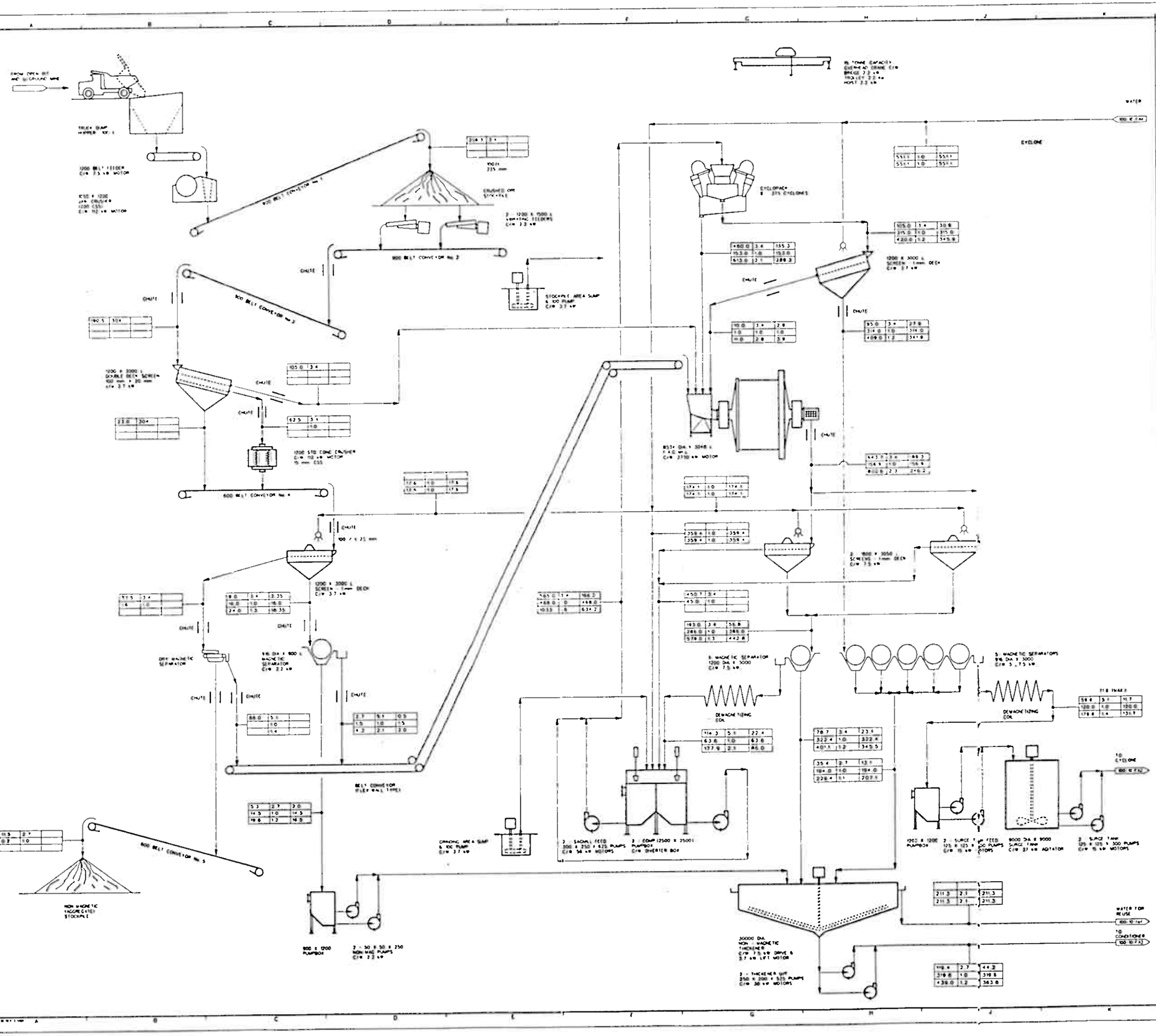
KILBORN

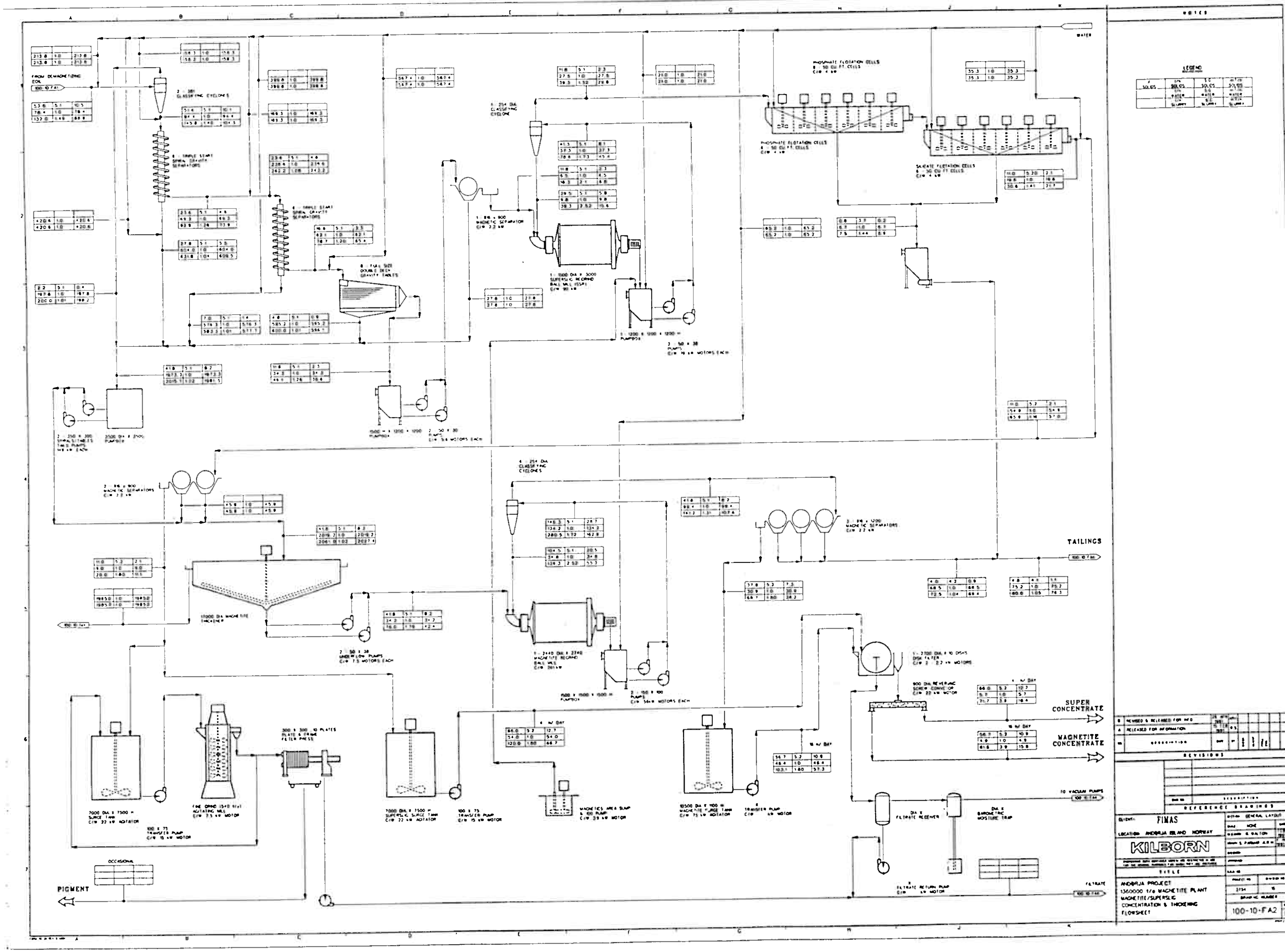
TITLE: ANDORJA PROJECT
1360000 t/a MAGNETITE PLANT
GROPA AREA
OPEN PIT CROSS-SECTIONS
LOOKING NORTH

PROJECT NO. 3754 | DIVISION NO. 15

DRAWING NUMBER 50-05-F6 | REV A


400
400
350
250
200
SECTION-C
SECTION-D
SECTION-E
SECTION-F
SECTION-G
SECTION-H
SECTION-I
3A
3B
4B
3C
1C
11
12
16
1D
4D
5/6D
2E
1E
1F
1O
2F
4F
5F
6F
23
24
4G
5G
6G
5H
7H
8
10B
111
110
12S
12I
WHITE RESOURCES CORP.
LOCATION ANDORJA ISLAND NORWAY
CIVIL ENGINEERING
KILBORN
ANDORJA PROJECT
1,000,000 t/a MAGNETITE PLANT
GROPA AREA
FINAL PIT
50-30-F1


TRUCK DUMP
1200 BELT FEEDER
C/W 7.5 kW MOTOR
K55 x 1200
JAW CRUSHER
1200 CSS
C/W 110 kW MOTOR
900 BELT CONVEYOR No 1
100 t/h
225 mm
CRUSHED ORE STOCKPILE
2 - 1200 X 1500 L
VIBRATING FEEDERS
C/W 7.2 kW
900 BELT CONVEYOR No 2
CHUTE
STOCKPILE AREA SUMP
& 100 PUMP
C/W 37 kW
900 BELT CONVEYOR No 3
1200 X 3000 L
DOUBLE DECK SCREEN
100 mm x 20 mm
C/W 37 kW
1200 STD CONE CRUSHER
C/W 110 kW MOTOR
15 mm CSS
600 BELT CONVEYOR No 4
100 x 25 mm
1200 X 3000 L
SCREEN 1 mm DECK
C/W 37 kW
DRY MAGNETIC SEPARATOR
816 DIA X 800 L
MAGNETIC SEPARATOR
C/W 2.2 kW
BELT CONVEYOR (FLEX WALL TYPE)
600 BELT CONVEYOR No 5
NON MAGNETIC (AGGREGATE) STOCKPILE
800 X 1200 PUMPBOX
2 - 50 X 50 X 250 NON MAG PUMPS
C/W 7.2 kW
DRAINING AREA SUMP
& 100 PUMP
C/W 37 kW
2 - SKAWLL FEED 200 X 350 X 425 PUMPS C/W 56 kW MOTORS
2 - CCMP (2500 X 2500) PUMPBOX C/W DIVERTER BOX
BSH DIA X 3048 L
X 40 MP UL
C/W 2300 kW MOTOR
30000 DIA
NON MAGNETIC
THICKENER
C/W 7.5 kW DRIVE &
3.7 kW LIFT MOTOR
2 - THICKENER UNIT
250 X 200 X 525 PUMPS
C/W 30 kW MOTORS
35 TONNE CAPACITY
ELECTRIC HOIST 22 kW
BRIDGE 7.5 kW
TROLLEY 3.7 kW
HOIST 22 kW
WATER
CYCLONE
CYCLOPACK
8 - 375 CYCLONES
1200 X 3000 L
SCREEN 1 mm DECK
C/W 37 kW
2 - 1800 X 3050 L
SCREENS 1 mm DECK
C/W 75 kW
5 - MAGNETIC SEPARATOR
1200 DIA X 3000
C/W 7.5 kW
5 - MAGNETIC SEPARATORS
816 DIA X 3000
C/W 5.75 kW
DEMAGNETIZING COIL
DEMAGNETIZING COIL
DEMAGNETIZING COIL
1200 X 1200 PUMPBOX
2 - SURGE 7 MP FEED 100 PUMPS C/W 15 kW MOTORS
9000 DIA X 9000 SURGE TANK C/W 37 kW AGITATOR
3 - SURGE TANK 1200 X 1200 X 300 PUMPS C/W 15 kW MOTORS
WATER FOR REUSE
TO CONDITIONER
TO CYCLONE
NOTES
LEGEND
SOLIDS
SLURRY
WATER
REVISIONS
REFERENCE DRAWINGS
CLIENT: FIMAS
LOCATION: ANDØRJA ISLAND NORWAY
KILBORN
TITLE
ANDØRJA PROJECT
1360000 t/a MAGNETITE PLANT
CRUSHING AND GRINDING
FLOWSHEET
GENERAL LAYOUT
DRAWING NUMBER
100-10-FA1
B



WATER
TAILINGS
SUPER CONCENTRATE
MAGNETITE CONCENTRATE
PIGMENT
FILTRATE
NOTES
LEGEND
REVISIONS
REFERENCE DRAWINGS
CLIENT: FIMAS
LOCATION: ANDØRJA ISLAND NORWAY
KILBORN
TITLE
ANDØRJA PROJECT
1360000 t/a MAGNETITE PLANT
MAGNETITE/SUPERSLIG
CONCENTRATION & THICKENING
FLOWSHEET
100-10-FA2

NOTES

LEGEND

	L/s	t/h	m³/h
	WATER	SOLIDS	SLURRY

1	L/s	t/h	m³/h
SOLIDS	WATER	SOLIDS	SLURRY

FROM THICKENER

6000 x 6000 SULPHIDE CONDITIONER 1 tank C/W 15 kW AGITATOR

8 - SULPHIDE ROUGHER FLOTATION CELLS 16.2 m³ EACH C/W 30 kW

PUMPBOX & PUMP

6000 x 6000 APATITE CONDITIONER 1 tank C/W 15 kW AGITATOR

8 - SULPHIDE CLEANER FLOTATION CELLS 5.1 m³ EACH C/W 15 kW

PUMPBOX & PUMP

8 - APATITE ROUGHER FLOTATION CELLS 16.2 m³ EACH C/W 30 kW

PUMPBOX & PUMP

8 - APATITE SCAVENGER FLOTATION CELLS 16.2 m³ EACH C/W 30 kW

PUMPBOX & PUMP

TAILINGS

3000 DIA SULPHIDE THICKENER C/W 11 kW RAKE DRIVE

2 - 38 x 25 UNDERFLOW PUMPS C/W 15 kW

4 M³ DAY

8 - APATITE 1ST CLEANER FLOTATION CELLS 8.5 m³ EACH C/W 22 kW

PUMPBOX & PUMP

PUMPBOX

2 PUMPS C/W kW MOTORS

WATER

2000 W x 8000 L APATITE/SULPHIDE BELT FILTER C/W kW DRIVE

WASH WATER

8 - APATITE 2ND CLEANER FLOTATION CELLS 8.5 m³ EACH C/W 22 kW

PUMPBOX & PUMP

PUMPBOX & PUMP

10 VACUUM PUMPS

DIA 3 BAROMETRIC MOISTURE TRAP

DIA 3 FILTRATE RECEIVER

20 M³ DAY

FILTRATE

1 - 8 FILTRATE RETURN PUMP C/W kW

4 M³ DAY

SULPHIDE PRODUCT

1 - 600 DIA REVERSING SCREW CONVEYOR C/W 15 kW MOTOR

APATITE CONCENTRATE

10 M³ DAY

10000 DIA APATITE THICKENER C/W 37 kW RAKE DRIVE

2 - 38 x 25 UNDERFLOW PUMPS C/W 37 kW

A	REVISED & RELEASED FOR INFO.	30 APR 1981	SP
B	RELEASED FOR INFORMATION	1 APR 1981	SP
NO.	DESCRIPTION	DATE	BY

REVISIONS

DRAWING DESCRIPTION

REFERENCE DRAWINGS

CLIENT: PIMAS

LOCATION: ANDRIJA ISLAND NORWAY

DESIGN: GENERAL LAYOUT

DRAWN: RONE

APPROVED: K. DALTON

APPROVED: L. PARKER A.R.A.

KILBORN

TITLE

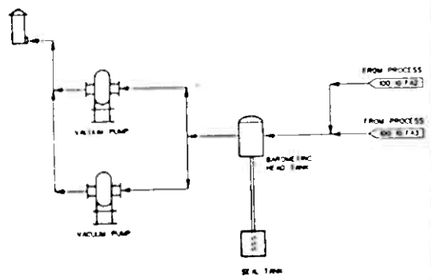
ANDRIJA PROJECT
1,360000 t/a MAGNETITE PLANT
MINPRO A.B PILOT PLANT
SCHEMATIC FLOWSHEET
FOR TESTING ANDRIJA ORE

PROJECT NO. 3784

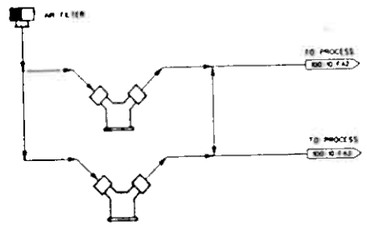
DRAWING NUMBER 100-10-FA3

REV. B

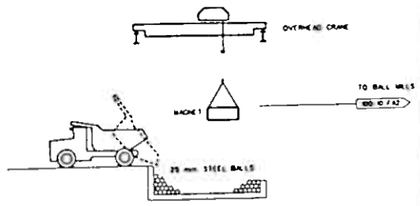
Wed Jul 31 10:55:11 1981 3CDN U:\PLOTS\V85361\001OFA3.MPI



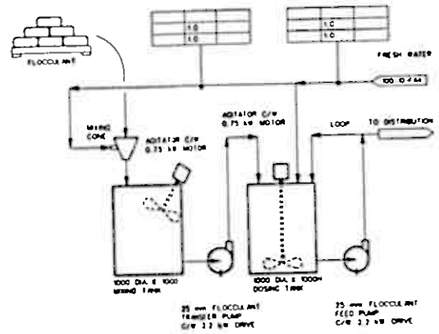
VACUUM SYSTEM



L.P. AIR



BALL STORAGE & HANDLING

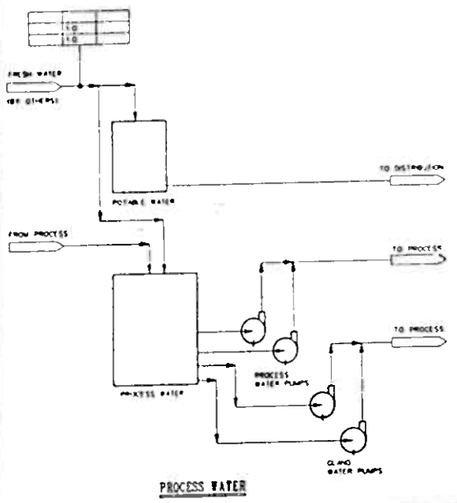


FLOCCULANT

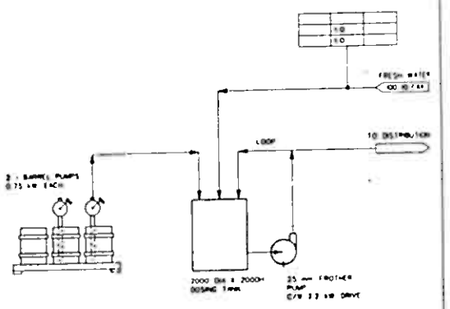
NOTES

LEGEND

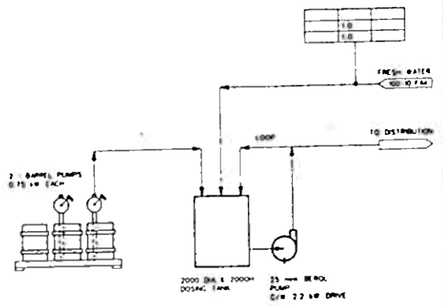
% SOLIDS	S/S 50.0%	S.G. 50.0%	m³/h 50.0%
	S/S 0.0%	S.G. 1.0	m³/h 0.0%
	S/S 0.0%	S.G. 1.0	m³/h 0.0%



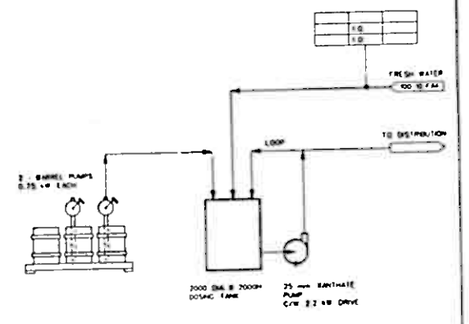
PROCESS WATER



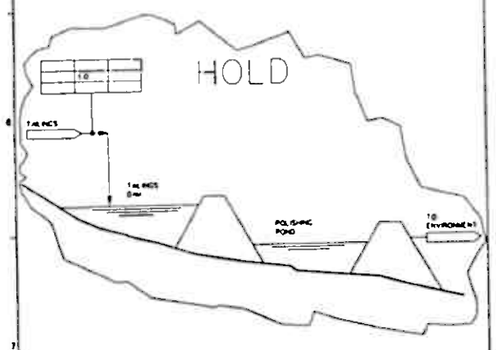
DOW 250 (FROTHER)



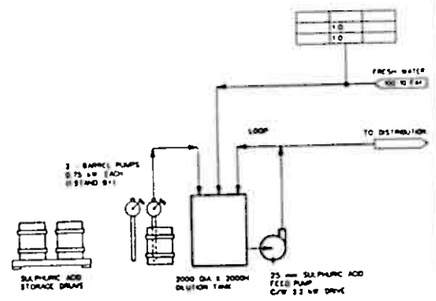
BEROL ATRAC 857 (APATITE COLLECTOR)



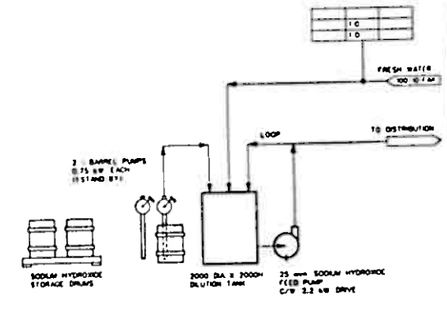
XANTHATE (SULPHIDE COLLECTOR)



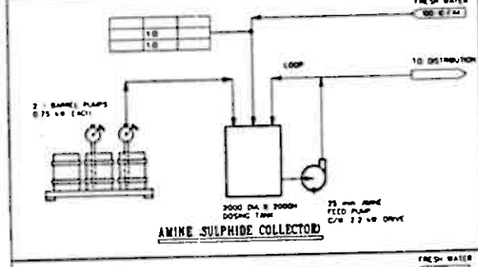
TAILINGS DAM



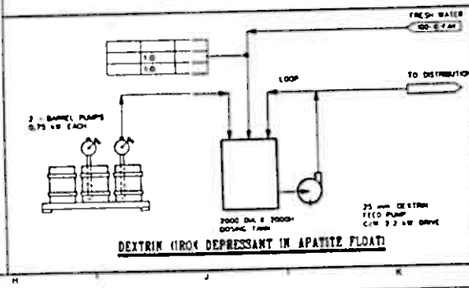
SULPHURIC ACID (SULPHIDE FLOAT pH CONTROL)



SODIUM HYDROXIDE (APATITE FLOAT pH CONTROL)



AMINE SULPHIDE COLLECTOR



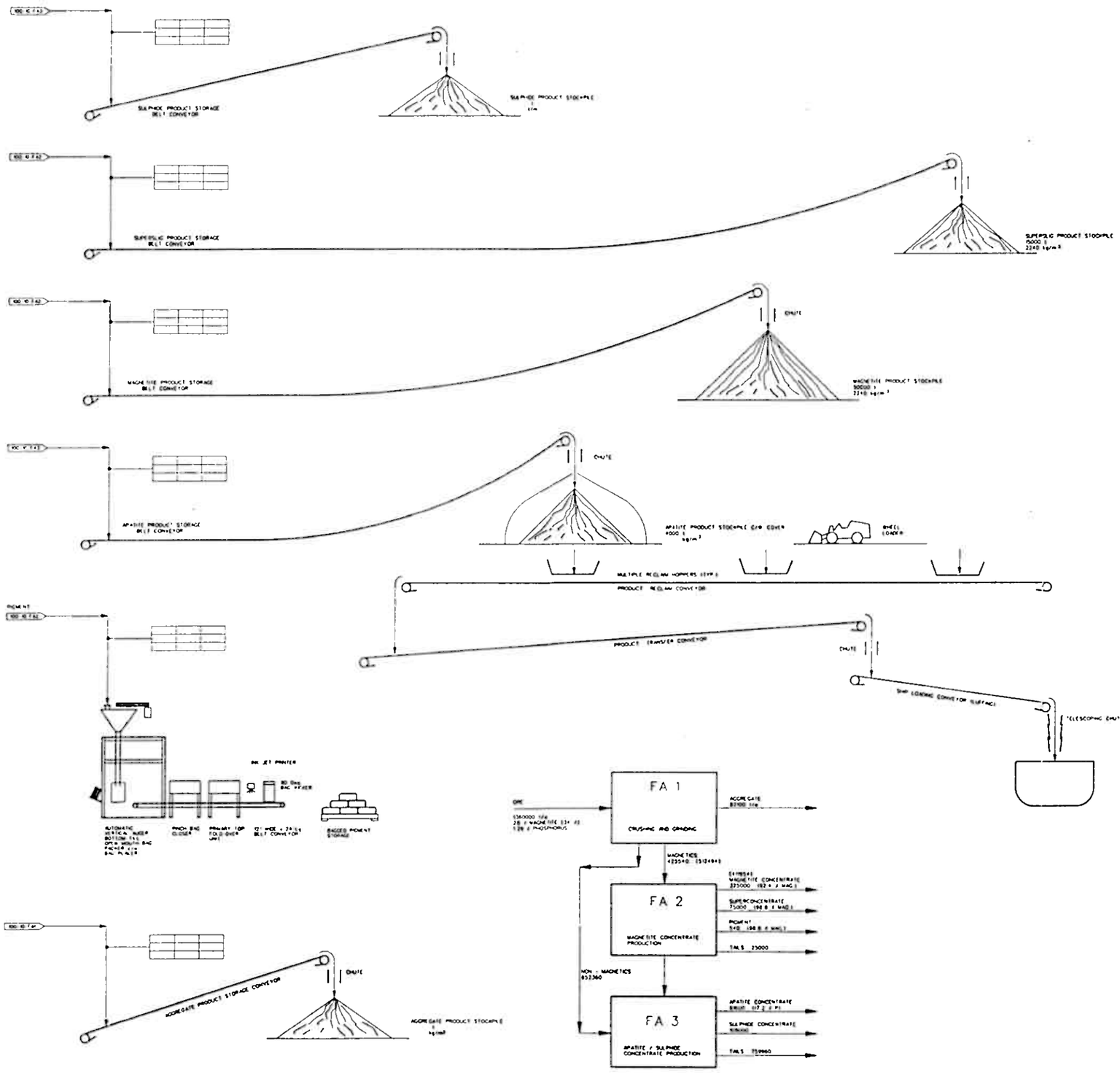
DEXTRIN (IRON DEPRESSANT IN APATITE FLOAT)

REVISIONS							
B	REVISED & RELEASED FOR INFO	23 JUL 91	S.A.				
A	RELEASED FOR INFORMATION	23 JUL 91	S.A.				
NO.	DESCRIPTION	DATE	BY				

REFERENCE DRAWINGS

SYSTEM	GENERAL LAYOUT
MECH.	NONE
ELECTR.	R. WALTON
CIVIL/STRUCT.	S. FARRAR A.R.I.B.A.
CHECKED	
APPROVED	
DRAWING NO.	
PROJECT NO.	2754
DRAWING NUMBER	100-10-FA4
REV.	B

CLIENT: FIMAS
LOCATION: ANDØYA ISLAND NORWAY
KILBORN
TITLE
ANDØYA PROJECT
1360000 t/a MAGNETITE PLANT
ANCILLARIES & REAGENTS
FLOWSHEET



NOTES

LEGEND

SOLIDS	t/h	t/h	m³/h
	SOLIDS	SOLIDS	SOLIDS
	t/h	t/h	m³/h
	WATER	WATER	WATER
	t/h	t/h	m³/h
	SLURRY	SLURRY	SLURRY

REVISIONS					
NO	DESCRIPTION	DATE	BY	CHK	APP
A	RELEASED FOR INFORMATION	13 MAY 1991			

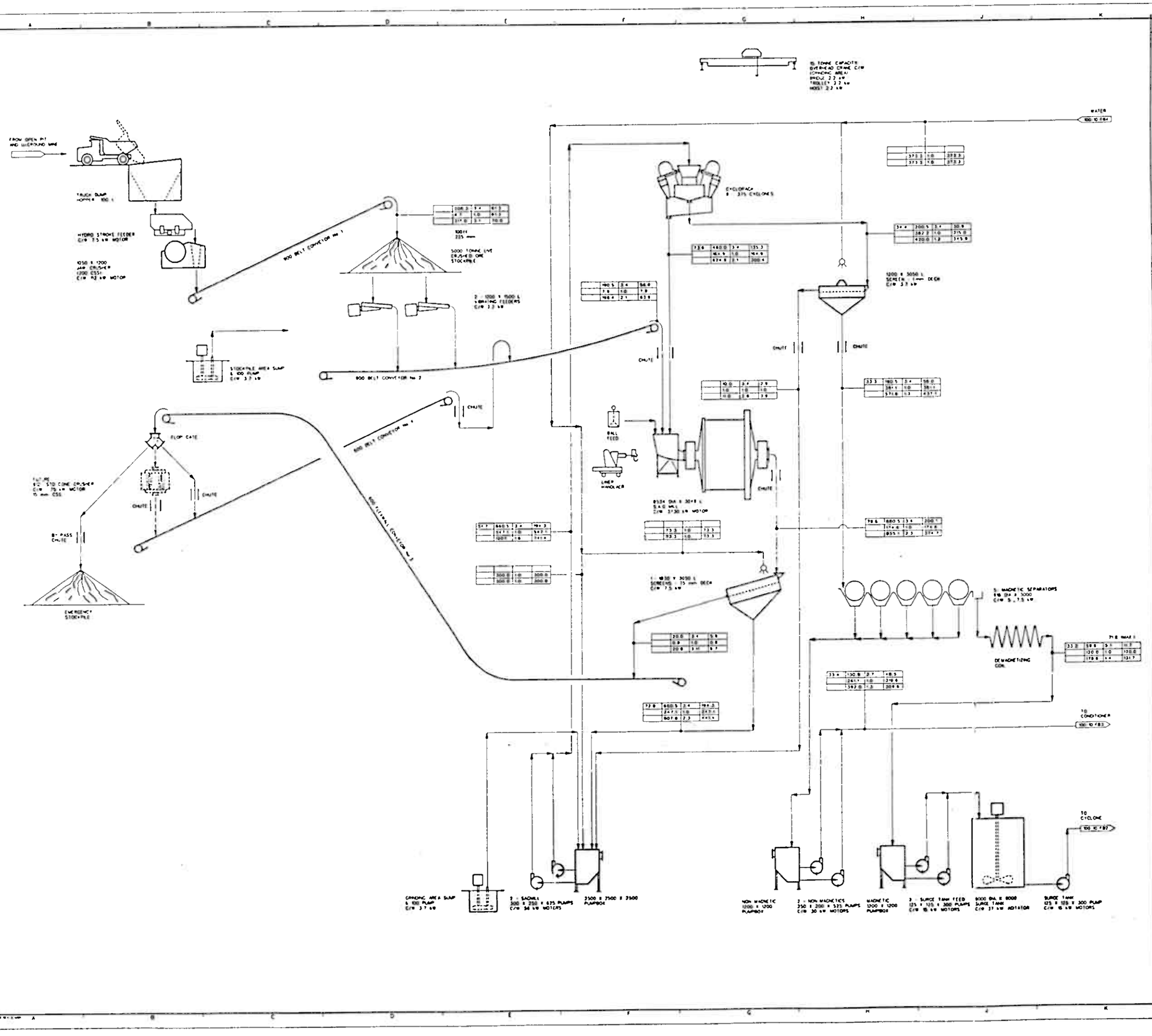
REFERENCE DRAWINGS

CLIENT: FIMAS
LOCATION: ANDØYA ISLAND NORWAY
KILBORN
DESIGN: GENERAL LAYOUT
DRAWN: P. TUCKER
CHECKED:
APPROVED:

TITLE
ANDØYA PROJECT
1360000 t/d MAGNETITE PLANT
PRODUCT HANDLING AND STORAGE
FLOWSHEET

PROJECT NO. 2754
DRAWING NUMBER 100-10-FA5
REV. A

Wed Jul 31 11:03:48 1991 3CON U:\PLOTDIR\2754\100FA5.MP1


FROM OPEN PIT AND UNDERGROUND MINE
TRUCK DUMP HOPPER 100 t
HYDRO STROPE FEEDER C/W 75 kW MOTOR
1050 X 1200 JAW CRUSHER 1200 CSS C/W 112 kW MOTOR
900 BELT CONVEYOR No 1
100 t/h 225 mm
5000 TONNE LIVE CRUSHED ORE STOCKPILE
2 - 1200 X 1500 L VIBRATING FEEDERS C/W 7.5 kW
STOCKPILE AREA SUMP & 100 PUMP C/W 3.7 kW
900 BELT CONVEYOR No 2
FLOP GATE
FIXED 42" STD CONE CRUSHER C/W 75 kW MOTOR 15 mm CSS
CHUTE
BY PASS CHUTE
EMERGENCY STOCKPILE
900 BELT CONVEYOR No 3
900 CLEANING CONVEYOR No 3
15 TONNE CAPACITY OVERHEAD CRANE C/W CHARGING AREA: BRIDGE 2.2 kW TROLLEY 2.2 kW HOIST 22 kW
WATER 100-10-FB4
CYCLOPAC 8 - 375 CYCLONES
5200 X 5050 L SCREEN 1 mm DEW C/W 33 kW
BALL FEED
LINER HANDLER
8534 DIA X 30+8 L SAG MILL C/W 3730 kW MOTOR
1 - 1830 X 3050 L SCREENS 15 mm DEW C/W 7.5 kW
5 - MAGNETIC SEPARATORS 916 DIA X 3000 C/W 5 - 7.5 kW
DEMAGNETIZING COIL
TO CONDITIONER 100-10-FB3
TO CYCLONE 100-10-FB7
CRUSHING AREA SUMP & 100 PUMP C/W 3.7 kW
3 - SADMILL 300 X 350 X 875 PUMPS C/W 56 kW MOTORS
2500 X 2500 X 2500 PUMPBOX
NON MAGNETIC 1000 X 1200 PUMPBOX
2 - NON MAGNETICS 250 X 200 X 525 PUMPS C/W 30 kW MOTORS
MAGNETIC 1200 X 1200 PUMPBOX
3 - SURGE TANK FEED 125 X 125 X 300 PUMPS C/W 15 kW MOTORS
8000 DIA X 8000 SURGE TANK C/W 37 kW AGITATOR
SURGE TANK 125 X 125 X 300 PUMP C/W 15 kW MOTORS
NOTES
LEGEND
SOLIDS
WATER
SLURRY
B RELEASED FOR REPORT
A RELEASED FOR INFORMATION
REVISIONS
REFERENCE DRAWINGS
CLIENT: FIMAS
LOCATION: ANDØYA ISLAND NORWAY
KILBORN
TITLE
ANDØYA PROJECT 1,360000 t/a MAGNETITE PLANT CRUSHING AND GRINDING FLOWSHEET CASE 2
GENERAL LAYOUT
2154
100-10-FB1
B

NOTES

LEGEND

WATER

TAILINGS

SUPER CONCENTRATE

MAGNETITE CONCENTRATE

PIGMENT

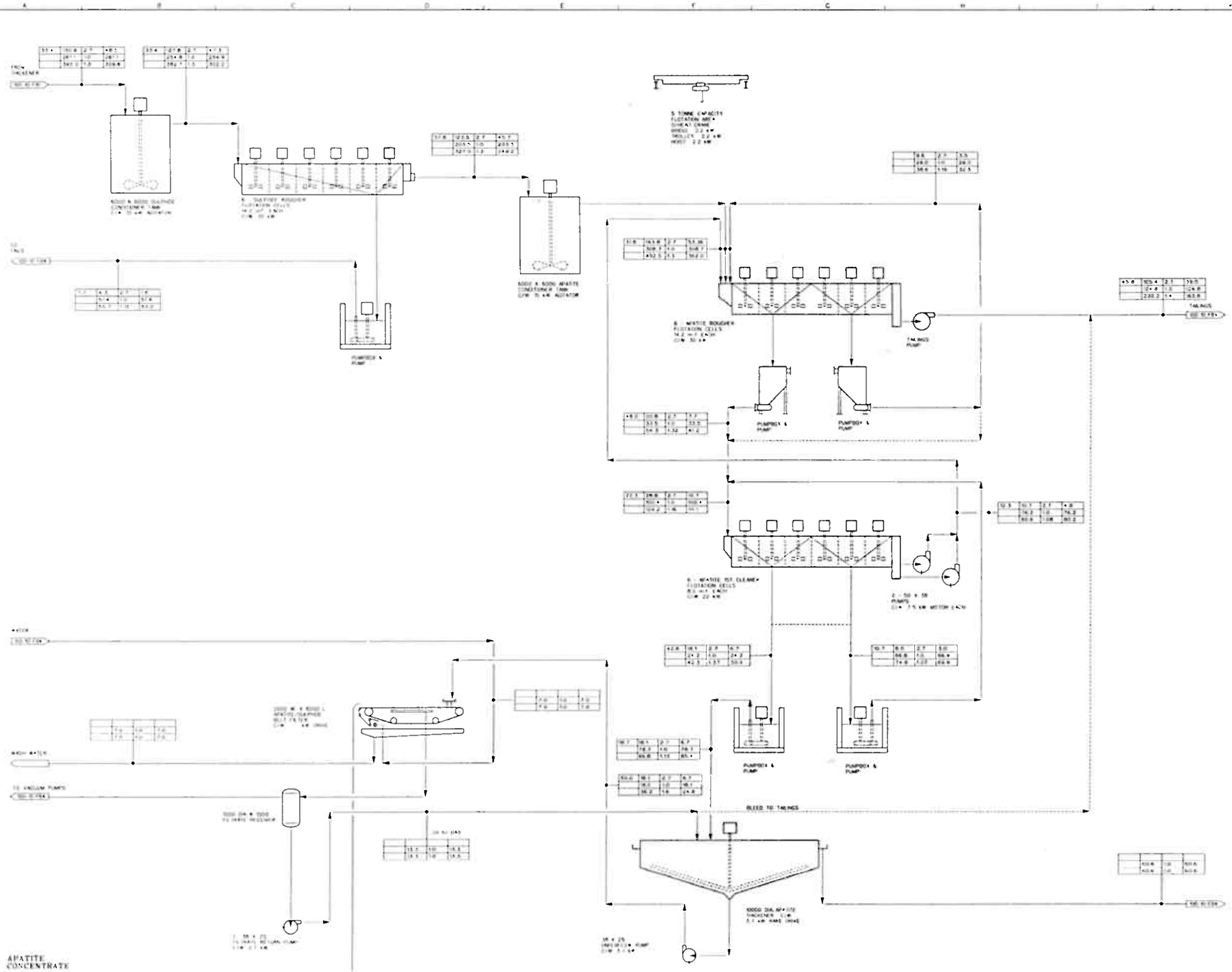
FIMAS

LOCATION: ANDØYA ISLAND, NORWAY

KILBORN

ANDØYA PROJECT
1500000 t/a MAGNETITE PLANT
MAGNETITE/SUPERSLIG
CONCENTRATION & THICKENING
FLOWSHEET CASE 2

100-10-F02



NOTES

LEGEND

SOLIDS	t/h	t/d	m³/h
	% SOLIDS	% SOLIDS	% SOLIDS
	m³/h	t/h	m³/h
	● PULP	● PULP	● PULP
	m³/h	m³/h	m³/h
	% _WWV	% _WWV	% _WWV

REVISIONS

REFERENCE DRAWINGS

CLIENT: FIMAS

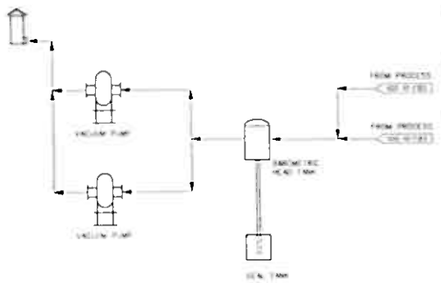
LOCATION: ANDERJA ISLAND NORWAY

KILBORN

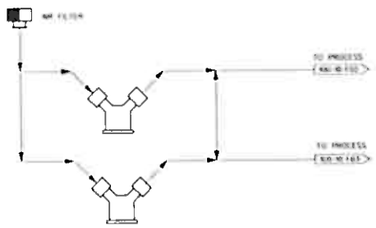
TITLE

ANDERJA PROJECT
1360000 t/a MAGNETITE PLANT
FLOTATION
FLOWSHEET
CASE 2

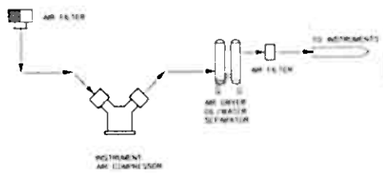
100-10-F03



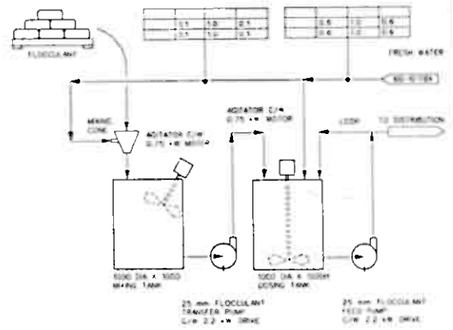
VACUUM SYSTEM



L.P. AIR



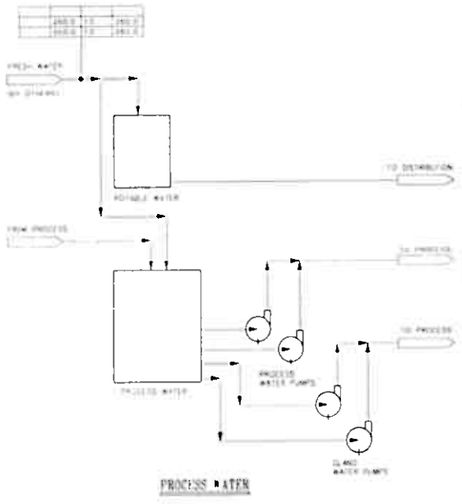
H.P. AIR



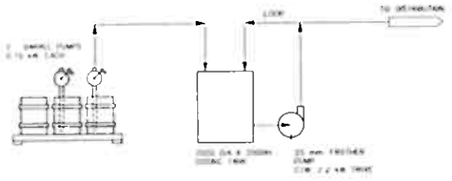
FLOCCULANT

NOTES

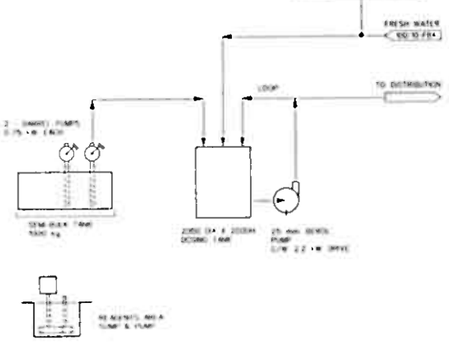
LEGEND



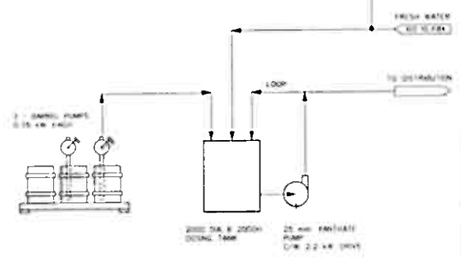
PROCESS WATER



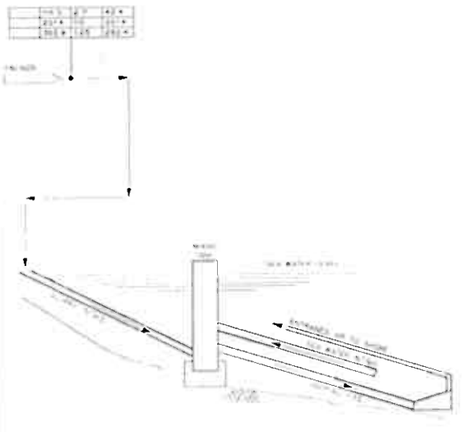
DOW 250 (FROTHER)



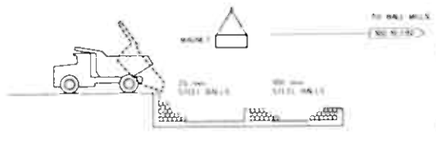
BEROL ATRAC 857 (APATITE COLLECTOR)



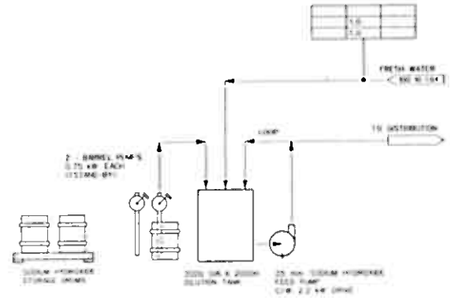
XANTHATE (SULPHIDE COLLECTOR)



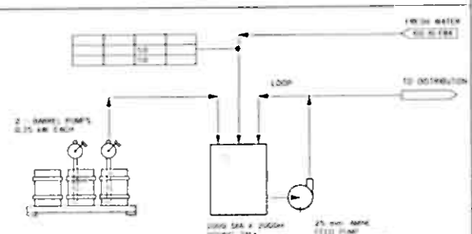
TAILINGS



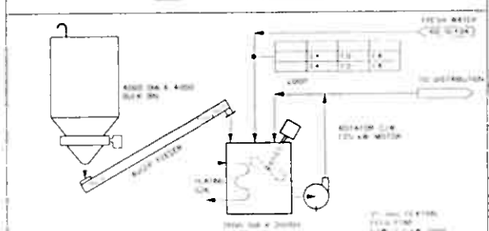
BALL STORAGE & HANDLING



SODIUM HYDROXIDE (APATITE FLOAT pH CONTROL)



AMINE (SILICATE COLLECTOR)



DEXTRIN (IRON DEPRESSANT IN APATITE FLOAT)

REVISIONS

REFERENCE DRAWINGS

CLIENT: FIMAS

LOCATION: ANDØYA ISLAND, NORWAY

KILBORN

TITLE

ANDØYA PROJECT
(3500000 t/a MAGNETITE PLANT)
ANCILLARIES & REAGENTS
FLOWSHEET
CASE 2

100-10-F134

NOTES

LEGEND

SOLIDS	t/h SOLIDS	t/t SOLIDS	m³/h SOLIDS
	t/h WATER	t/t WATER	m³/h WATER
	t/h SLURRY	t/t SLURRY	m³/h SLURRY

SUPER CONCENTRATE

MAGNETITE CONCENTRATE

CLEAN STORAGE BELT CONVEYOR

CLAM GATE

CHUTE

SUPERCLEAN PRODUCT STORAGE BELT CONVEYOR

SUPERCLEAN PRODUCT STOCKPILE
CAP. 120KTE
ANGLE OF REPOSE
2240 kg/m³

MAGNETITE PRODUCT STORAGE BELT CONVEYOR

MAGNETITE PRODUCT STOCK-PILE
CAP. 120KTE
ANGLE OF REPOSE
2240 kg/m³

APATITE PRODUCT STORAGE BELT CONVEYOR

APATITE PRODUCT STOCK-PILE CAP. 120KTE
ANGLE OF REPOSE
2240 kg/m³

WHEEL LOADER

MULTI USE RECLAIM HOPPER

PRODUCT RECLAIM CONVEYOR

SHIP LOADING CONVEYOR (LUFFING)

TELESCOPIC CHUTE

BAGGING PLANT

BULK BAG HOPPER

FB 1
CRUSHING AND GRINDING

FB 2
MAGNETITE CONCENTRATE PRODUCTION

FB 3
APATITE CONCENTRATE PRODUCTION

REVISIONS

REFERENCE DRAWINGS

CLIENT: FIMAS

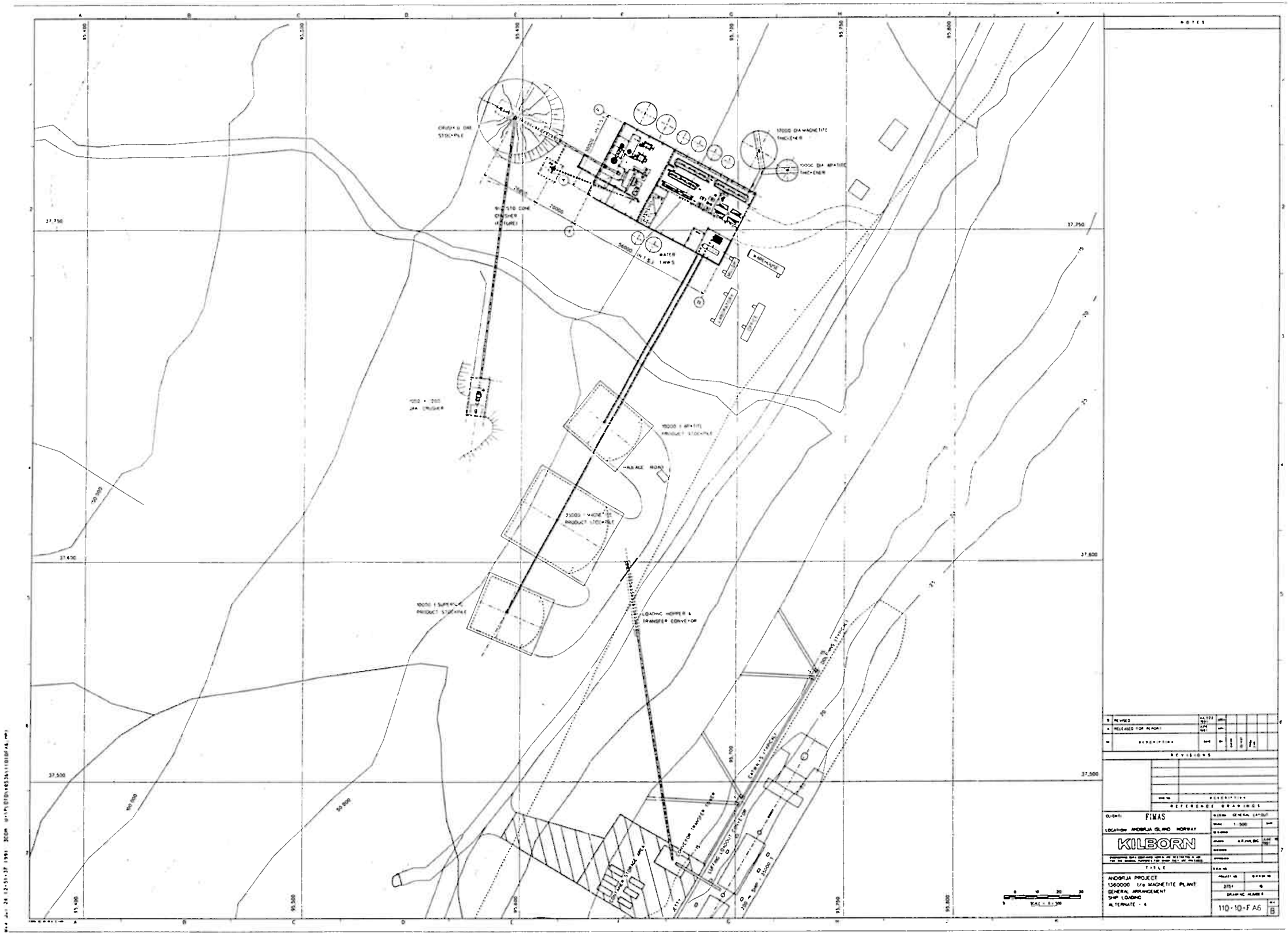
LOCATION: ANDØYA ISLAND, NORWAY

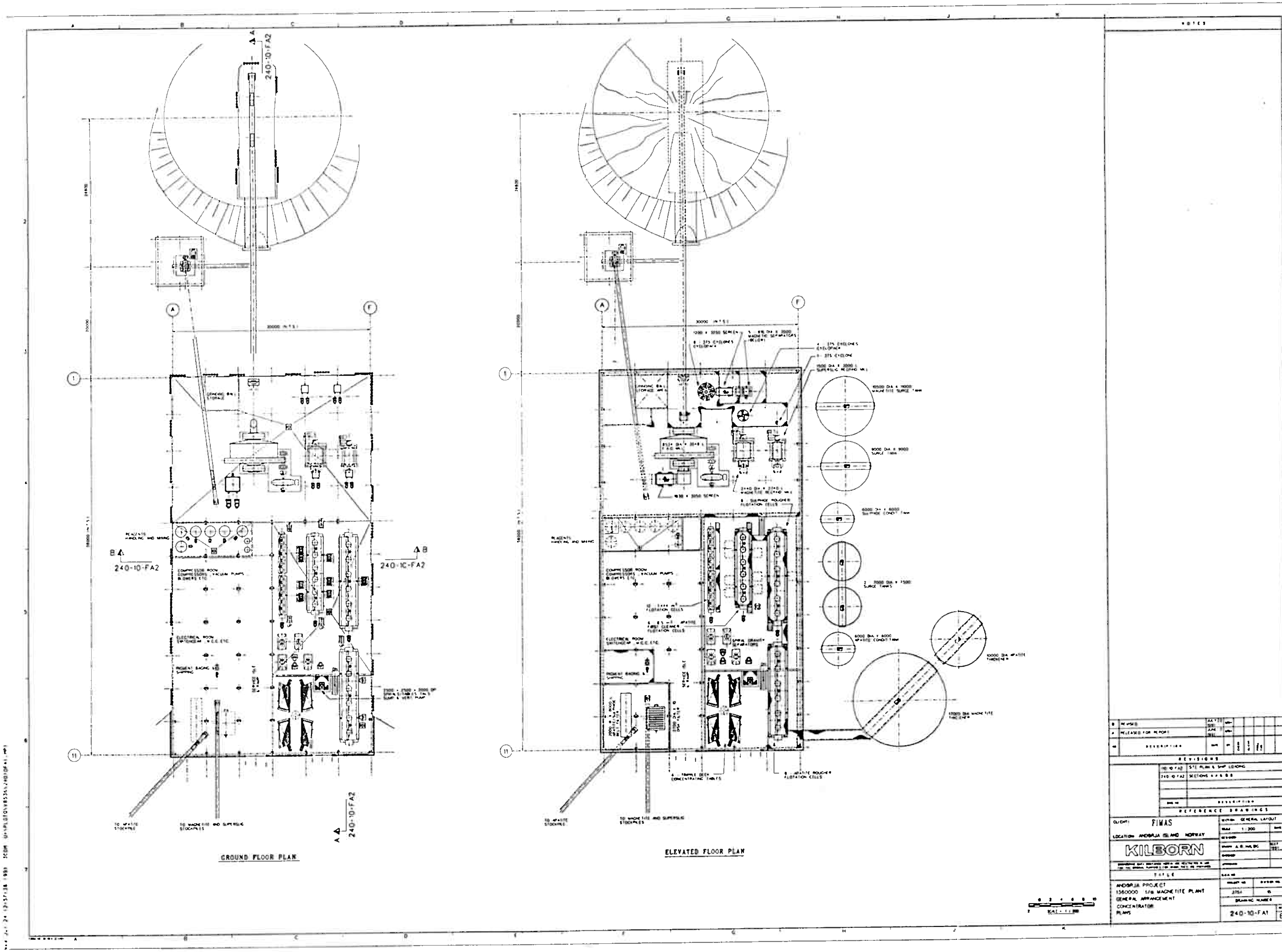
KILBORN

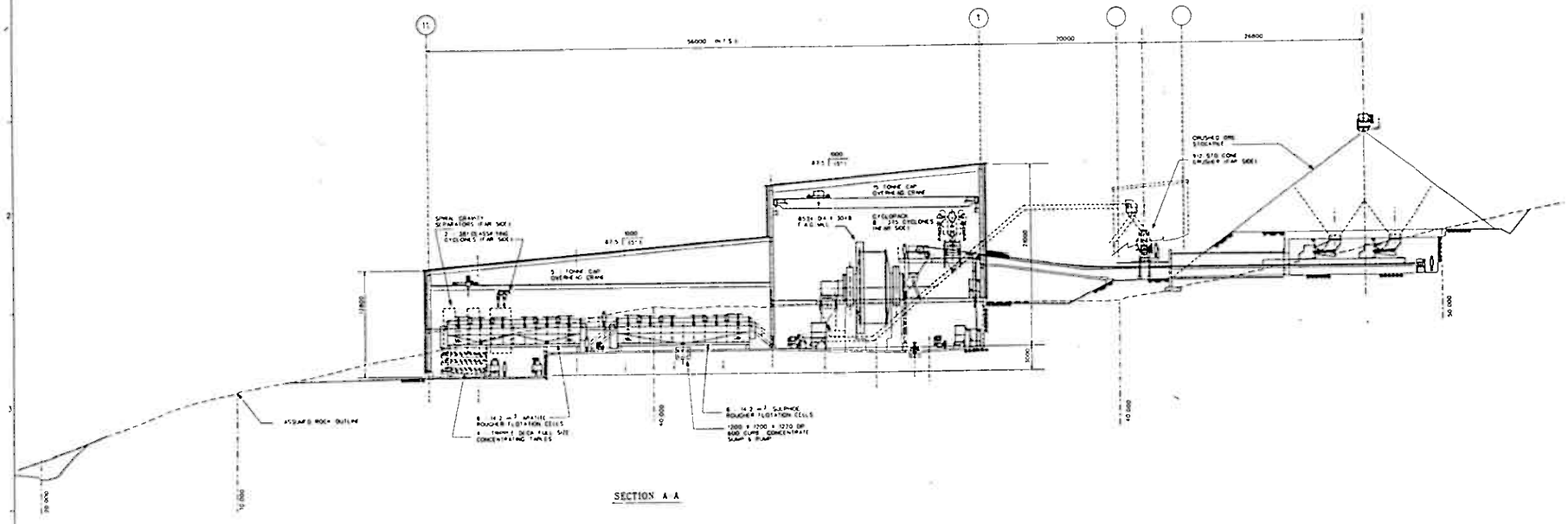
TITLE

ANDØYA PROJECT
1360000 t/a MAGNETITE PLANT
PRODUCT HANDLING AND STORAGE
FLOWSHEET
CASE 2

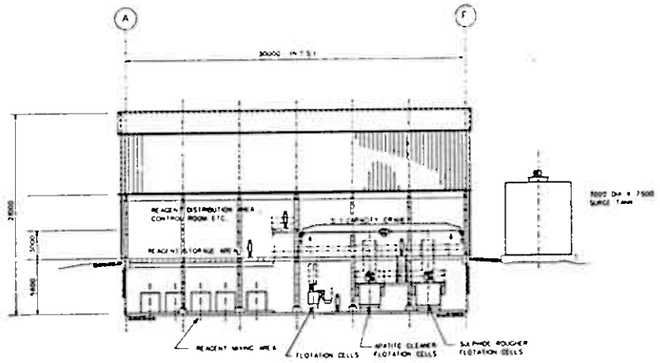
DRAWING NUMBER
100-10-FS5


NOTES
CRUSH'D ORE STOCKPILE
9'-0" STD CONE CRUSHER (FUTURE)
17000 DIA MAGNETITE THICKENER
10000 DIA APATITE THICKENER
WATER INTAKE & PUMPS
WAREHOUSE
WORKSHOP
OFFICE
1200 x 2100 JAW CRUSHER
15000 t APATITE PRODUCT STOCKPILE
HAULAGE ROAD
37000 t MAGNETITE PRODUCT STOCKPILE
10000 t SUPERFLUX PRODUCT STOCKPILE
LOADING HOPPER & TRANSFER CONVEYOR
CONVEYOR TRANSFER TOWER
LAYDOWN AREA
37,750
37,700
37,650
37,600
37,550
37,500
95,450
95,500
95,550
95,600
95,650
95,700
95,750
95,800
95,850
A
B
C
D
E
F
G
H
J
K
REVISIONS
REFERENCE DRAWINGS
CLIENT: FIMAS
LOCATION: ANDØYA ISLAND NORWAY
KILBORN
TITLE
ANDØYA PROJECT
1360000 t/a MAGNETITE PLANT
GENERAL ARRANGEMENT
SHIP LOADING
ALTERNATE - 4
110-10-F A6
B


GROUND FLOOR PLAN
ELEVATED FLOOR PLAN
240-10-FA2
REAGENTS HANDLING AND MIXING
COMPRESSOR ROOM COMPRESSORS, VACUUM PUMPS, BLOWERS ETC.
ELECTRICAL ROOM SWITCHGEAR, M.C.C. ETC.
TO APATITE STOCKPILES
TO MAGNETITE AND SUPERSILIC STOCKPILES
REVISIONS
B REVISED
A RELEASED FOR REPORT
REFERENCE DRAWINGS
SECTIONS A-A & B-B
CLIENT: FIMAS
LOCATION: ANDØRJA ISLAND NORWAY
KILBORN
GENERAL LAYOUT
SCALE 1:300
DRAWN A.B. HALBIG
ANDØRJA PROJECT
1360000 t/a MAGNETITE PLANT
GENERAL ARRANGEMENT
CONCENTRATOR
PLANS
2754
DRAWING NUMBER
240-10-FA1
B



SECTION A A



SECTION B B

NOTES

B	REVISED	88/7/27	APPD				
A	RELEASED FOR REPORT	88/7/7	APPD				
NO	DESCRIPTION	DATE	BY				

REVISIONS

NO 10 FA2	SITE PLAN & SHIP LOADING
240 10 FA1	GROUND FLOOR & ELEVATED FLOOR PLAN
DWG NO	DESCRIPTION

REFERENCE DRAWINGS

CLIENT: FIMAS

LOCATION ANDBRIJA ISLAND NORWAY

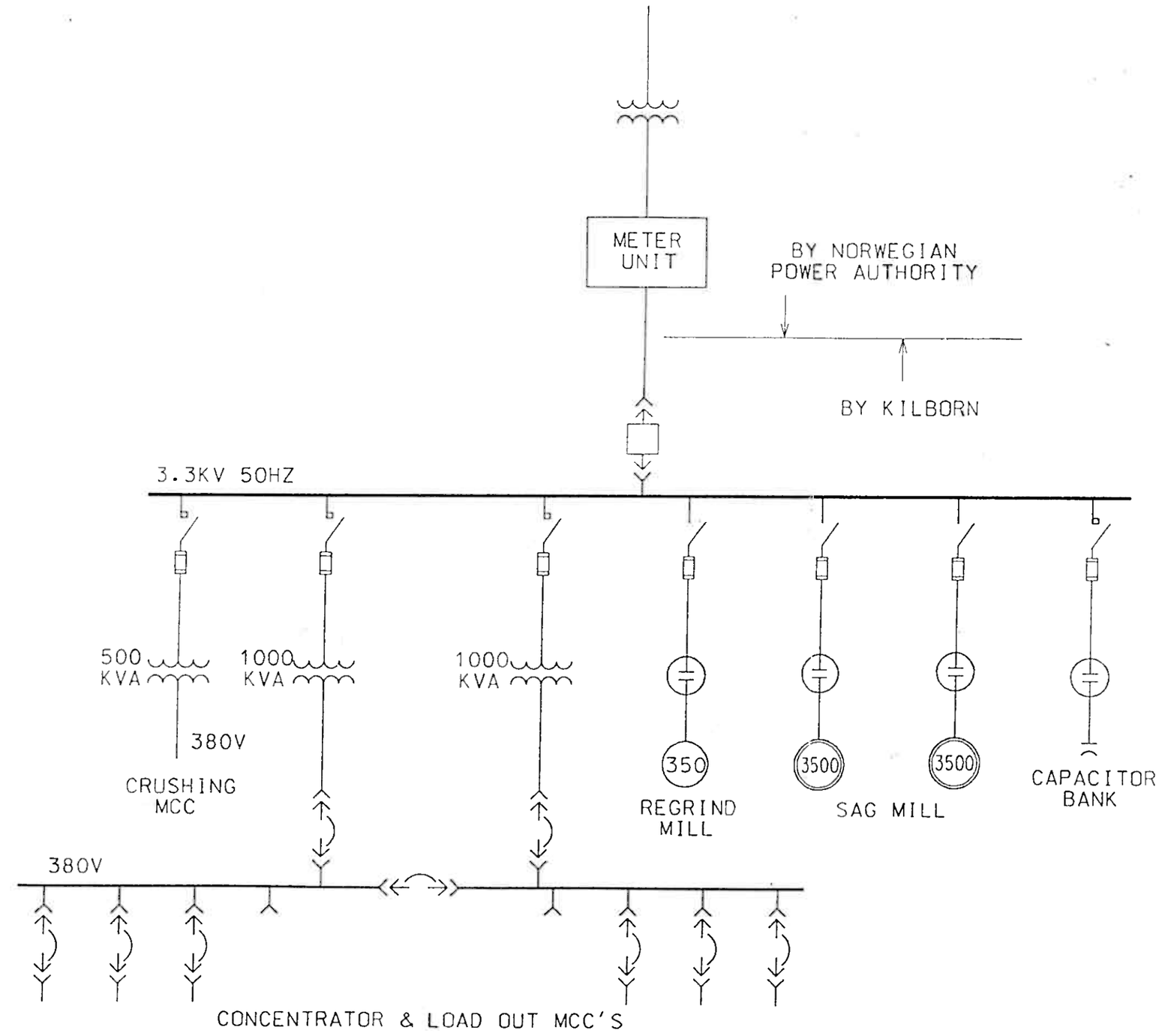
KILBORN

TITLE

ANDBRIJA PROJECT
1360000 t/a MAGNETITE PLANT
GENERAL ARRANGEMENT
CONCENTRATOR
SECTION A-A AND B-B

SECTION	GENERAL LAYOUT
SCALE	1:200
DRAWN	A.R. HALBIG
CHECKED	
APPROVED	
DATE	88/7/15
PROJECT NO.	3751
DIVISION NO.	15
DRAWING NUMBER	240-10-FA2
REV.	B

0 2 4 6 8 10
SCALE 1:200



NOTES

NO.	DESCRIPTION	DATE	BY	CHECK	CLIENT	PROJ. ENG.
A	RELEASED FOR INFORMATION	JUNE 1991	VGH			

REVISIONS

DWG. NO.	DESCRIPTION

REFERENCE DRAWINGS

CLIENT: FIMAS

LOCATION: ANDØRJA ISLAND NORWAY

KILBORN

TITLE

ANDØRJA PROJECT
1360000 t/a MAGNETITE PLANT
MAIN SINGLE LINE

SECTION: ELECTRICAL
SCALE: NTS
DATE
DESIGNED:
DRAWN: K.THIRAKUL JUNE 1991
CHECKED:
APPROVED:
B.O.M. NO.

PROJECT NO.	DIVISION NO.
3754	15

DRAWING NUMBER

130-19-FA1 REV. A

APPENDIX F

BUDGET QUOTATIONS

TRANSCONTINENTAL ENGINEERED PRODUCTS LTD.

FACSIMILE COVER SHEET

FROM: TRANSCONTINENTAL ENGINEERED PRODUCTS LTD. DATE: JUNE 5, 1991

NO. OF PAGES (INCLUDING THIS COVER SHEET): (4)

TO: KILBORN INC.

ATTENTION: PAUL TUCKER

FROM: STEVE ROBINSON

SUBJECT: BUDGET QUOTE

COMMENTS:

PLEASE FIND ATTACHED YOUR BUDGET QUOTE COVERING TWO (2) HIGH ANGLE CONVEYORS AND TWO (2) HORIZONTAL CONVEYORS.

AS DISCUSSED EARLIER, CONTINENTAL HAC SYSTEM IS NOT VERY PRICE COMPETITIVE ON SMALLER BELT WIDTHS. BASED ON INFORMATION RECEIVED BY YOURSELF THERE WOULD BE NO PROBLEM GOING WITH A SMALLER BELT WIDTH, HOWEVER 30" IS THE SMALLEST THAT CONTINENTAL SUPPLY IN A HAC SYSTEM.

BUDGET PRICE (HORIZONTAL CNVRS)

FINISHED PRODUCT TRANSFER

56M LONG @ 71.7 t/H (24"BW) # 54,000. U.S. DLLRS

RECLAIM CONVEYOR TO SHIPLOADER

137M LONG @ 800 t/H (36"BW) # 153,000. U.S. DLLRS

PLEASE ADVISE IF ILLEGIBLE OR IF RECEIVED BY THE WRONG COMPANY.

#1 - 7449 HUME AVE., DELTA, B.C. V4G 1C3
Tel: (604) 946-1167 Fax: (604) 946-1899 Telex: 04-357738

TRANSCONTINENTAL
ENGINEERED
PRODUCTS LTD.

FACSIMILE COVER SHEET

FROM: TRANSCONTINENTAL ENGINEERED PRODUCTS LTD. DATE: _____

NO. OF PAGES (INCLUDING THIS COVER SHEET): _____

TO: _____

ATTENTION: _____

FROM: _____

SUBJECT: _____

COMMENTS:

HORIZONTAL CNVRS ARE ASSUMED TO BE 100% STRINGER. PRICES INCLUDE

- ENGINEERING
- CNVR HARDWARE INC. BELTS, PULLEYS, IDLERS, SCRAPERS, PLOWS AND CHUTES.
- PULL CHORD SWITCHES.
- DRIVES INC. MOTORS, REDUCERS, COUPLINGS, SAFETY GUARDS
- CNVR STRINGER AND TERMINAL FRAMING.

WE TRUST THIS MEETS WITH YOUR SATISFACTION. SHOULD YOU REQUIRE ADDITIONAL INFORMATION PLEASE CALL. I WILL BE IN THE VCR. OFFICE UNTIL FRIDAY JUNE 7/91.

REGARDS
STEVE

PLEASE ADVISE IF ILLEGIBLE OR IF RECEIVED BY THE WRONG COMPANY.

#1 - 7449 HUME AVE., DELTA, B.C. V4G 1C3
Tel: (604) 946-1167 Fax: (604) 946-1899 Telex: 04-357738

FOR C. PENFOLD/S. ROBINSON
TRANSCONTINENTAL
NO. [redacted]
NUMBER OF PAGES 2 (INCLUDING COVER)
DATE JUNE 5, 1991
FROM J. A. DOS SANTOS
CONTINENTAL CONVEYOR FAX NO: 205/487-4233

CONTINENTAL CONVEYOR & EQUIPMENT COMPANY
P.O. Box 400 • Winfield, AL 35594 • 205/487-4492
FAX: 205/487-4233 • TELEX: 59788
A NESCO COMPANY

Equipment preferred worldwide made here every working day

SUBJECT: HAC® Budget Proposal For Kilborn Engineering

TO HANDLE APATITE AND MAGNETITE SUPERSLIG

Continental Conveyor is pleased to provide a budgetary price for two (2) High Angle Conveyors-HACs of nearly identical design and arrangement.

The HAC conforms generally to the following:

General:	BELT FILTER DISCHARGE HAC® 1	DISC. FILTER DISCHARGE HAC® 2
Material	- Apatite	- Magnetite/Superslig
-Density	- 2000 KG/M³	- 2240 KG/M³
-Lump Size	- Max 115 MM	- Max 115 MM
Design Rate	- 197 MTPH	- 71.7 MTPH
Conveying Angle	- 26°	- 26°
Lift	- 21.5 M	- 21.5 M
Approximate Length	- 64 M	- 61 M
Belt Width	- 762 MM (30")	- 762 MM (30")
Belt Speed	- .76 M/S (150 FPM)	- .76 M/S (150 FPM)
Drive Power	- 15 HP	- 20 HP

$4400/m

Your budget price FOB factory for each HAC is .....U.S. Dollars..... $272,000

If both HACs are purchased under same P.O., then your budget price FOB Factory, for two (2) HACs of nearly identical design is, ...U.S. Dollars $320,000.

Scope of supply by Continental Conveyor:

- Engineering of HACs®
- Start-up supervision (one (1) man, two (2) weeks at jobsite).
- All conveyor hardware including belts, pulleys, idlers, fully equalized pressing rolls, belt scrapers, plows and chutes

136/mjg

- Drives including motors, reducers, couplings, safety guards, backstops
- Truss structure, conveyor stringers, end terminal framing
- Access to one side of HAC®, full length, and at all machinery
- Covers, over top return belt, windguards at return top and bottom belts, full length
- Safety controls such as: plugged chute, zero speed, belt alignment, emergency stop switches, and pull cord

By Others:

- Motor controls and starters
- Electrical wiring and conduit
- Civil work and foundations
- Support points for HAC® structure
- Erection and start-up

I hope this information is helpful. I look forward to the opportunity to work with you on this important project.

If we can be of further service, please call us.

Very truly yours,

CONTINENTAL CONVEYOR & EQUIPMENT COMPANY

Joe Dos Santos, r

Joseph A. Dos Santos
Manager/Engineered Systems

136/njg

cc: C. E. Bryant, Jr.
R. McGaha
D. Colburn
S. Robinson
C. Penfold

KILBORN

TELEPHONE : (416) 252-5311
TELECOPIER : (416) 231-5356

TELECOPIER TRANSMITTAL

MAY 3 1 1991

SENT :

TO NAME : STEPHEN C. ROBINSON

DATE : 91 05 31

COMPANY: Transcontinental

TOTAL NO. OF PAGES: 2

TELECOPIER NO: 842 5977

COPY TO :

FROM NAME: PAUL V. TUCKER, P.Eng. SENIOR CONCENTRATION ENGINEER

SUBJECT : ANDØRJA MAGNETITE - NORWAY PROJECT : 3754 DIV.: 15

PURPOSE:

FOR YOUR INFO. _____ PLEASE FOLLOW UP ✓ PLEASE CALL OR TELECOPY _____

MESSAGE: Steve, As we discussed, we need budget pricing on high angle conveyors for our Norway Feasibility study. The sketch attached is the best I can do right now. We need pricing on 2 HAC's viz

HAC #1 - Apatite Load elevation 30.5m
Horizontal Run 57m (19.7 t/h) Disch elevation 52 m

HAC # 2 Magnetite/Supersig Load 30.5 m
Horizontal Run 54m (71.7 t/h) Disch 52 m

Also, could you price 2 horizontal conveyors. Superstig Xfer 56 m long (71.7 t/
Shiploading Xfer 137 m long (800 t/

Apatite Bulk Density = 2000 kg/m³
Magnetite " " = 2240 kg/m³

Regards Paul Tucker

PLEASE CALL BACK AS SOON AS POSSIBLE IF ALL PAGES ARE NOT RECEIVED

TELECOPIER OPERATOR: _____

TELEFAX

aisco

AISCO SYSTEMS INC.
P.O. Box 655 Telephone (416) 335-0002
Burlington, Ontario Telefax (416) 332-3719
L7R 3Y5

TO: KILBORN INC. TELEFAX NO: (416) 231-5356

ATTENTION: DENNIS KEAY DATE: MAY 27, 1991

PAGE NO: 1/1 FROM: ROB RANDALL

DENNIS,

THIS IS A BUDGET PRICE FOR FIMAS' ANDORIA MAGNETITE PROJECT VIBRATORY FEEDERS

(1) ONLY GENERAL KINEMATICS MODEL ARC 84-10 HS PARA-MOUNT II ADJUSTABLE RATE FEEDER. 84" WIDE BY 10'-0" LONG WITH DRIVE MOUNTED BELOW DECK. UNIT WILL COME COMPLETE WITH ½" THICK AR PLATE DECK AND SIDE LINERS, 15 HP ADJUSTABLE RATE DRIVE, MANUAL PNEUMATIC CONTROLLER. AND REQUIRED ISOLATION SPRINGS WITH SEATS

BUDGET PRICE ..... $ 60,000.00

(1) ONLY GENERAL KINEMATICS MODEL ARC 42-10 PARA-MOUNT II ADJUSTABLE RATE FEEDER 1050 mm WIDE BY 3000 mm LONG WITH DRIVE MOUNTED BELOW DECK. UNIT WILL COME COMPLETE WITH ½" THICK AR PLATE DECK AND SIDE LINERS, 5 HP ADJUSTABLE RATE DRIVE, MANUAL PNEUMATIC CONTROLLER AND REQUIRED ISOLATION SPRINGS WITH SEATS

BUDGET PRICE ..... $ 20,000.00

4316

ALLIS
MINERAL SYSTEMS

TELEFAX COMMUNICATION SHEET

Date : June 4, 1991

SEND TO: Kilborn Inc, Toronto
Attn: Mr. Paul Tucker

Telefax No: 416-231-5356

SENT FROM : Mary Fu
Allis Mineral Systems
Kirkland (Montreal)

SUBJECT: Andorja Magnetite Project, Norway
Budget Pricing on
(1) VTM-100 Vertimill

MESSAGE: In response to your request for budget pricing on subject mill, we are pleased to quote, based on your preliminary information, budgetary prices as follows:

Item 1 - One (1) only VTM100 Vertimill complete with splitter box, reducer drive, motor and couplings, excluding, piping, installation and motor starter and controls.

Budget Price.....U$ 177,900.00
F.C.A. York

Item 2 - One (1) only recycle tank pump assembly, unlined steel tank, flanged inlet port, fixed ratio v-belt drive and SCI motor.

Budget Price.....U$ 14,000.00
F.C.A. York/Toronto

We currently have a new VTM150 in stock which is available for shipment in less than two months, subject to prior sale.

Price.....U$ 190,000.00
F.C.A. York

320hs

.../2

ALLIS MINERAL SYSTEMS
(DIVISION OF SVEDALA INDUSTRIES CANADA INC.)
16777 HYMUS, KIRKLAND, QUEBEC H9H 3L4

TEL.: (514) 694-9400
FAX: (514) 694-9413

ALLIS
MINERAL SYSTEMS

NOTE:

1. All prices are in US funds, duty and taxes extra where applicable.
2. Delivery approximately six months.

We trust that this is satisfactory for your current requirements.

Yours very truly,

Mary Fu,
Application Specialist

BS/ah

cc: B. See Hoye

AL: IF YOU HAVE QUESTIONS PLEASE CALL ME 458 Jim

BAKER HUGHES

PUMPS CANADA

A Division of Baker Hughes Canada Inc.
20 TIMBERLEA BLVD., MISSISSAUGA, ONTARIO L4W 2T7

FAX TRANSMISSION COVER SHEET

ATTN AL WILLIAMS FAX NO. 231-5356

COMPANY KLEBORN DATE JUNE 1/91

CITY TORONTO REP. NO. NORANDA LYMME OUR E-477

FROM JIM CUSHMAN PAGE 1 OF 1

BUDGET COSTS ARE PER YOUR SELECTIONS
EXCEPT BGA. SALT LAKE CHANGED TWO MOTOR
SIZES. I CAN ONLY ASSUME MINIMUM H.P. ON
DRIVES SUGGESTED GREATER HORSEPOWERS AND
SO I AM DOING THIS ON A SATURDAY I
CAN NOT QUESTION B.G.A. I WILL DO SO ON
MY RETURN NEXT FRIDAY. PRICES ARE 1 OFF.

SIZE (SUMPS)	PUMP #	MOTOR #		V-DRIVE	TOTAL
SN2-5100 x 48"	5736	287	10HP	110	6133
SN1-5100 x 48"	5068	170	5HP	80	5318
SN1-5100 x 36"	4828	170	5HP 3HP	80	5078
FROTH					
SN4-5100 x 72"	10680	915	40HP	325	11920
SN4-5100 x 72"	9101	464	20HP	200	9765
SN3-5100 x 72"	6921	235	7½HP	95	7251
SN5-5100 x 72"	13598	2053	75HP	550	16201
SN4-5100 x 72"	10680	694	30HP	300	11674
SN3-5100 x 72"	6921	287	10HP	110	7318
Vertical with foots					
TPNB-9000	4721	170	5HP	80	4971
TPNB-9000	7013	235	7½HP 5HP	95	7343

TOTAL F.O.B. SALT LAKE CITY $92,972.00

U.S. PUMPS

SCAN'D

MANUFACTURER OF PUMPS & PUMPING EQUIPMENT
Galigher / ASH / Wemco / Hidrostal / Mandflow / Hydrogritter
Phone: (416) 625-1637 Fax: (416) 625-8170

4316

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Sala Machine Works

TELEFAX REFERENCE # 2346
(5 pages total)

Mississauga, May 10th, 1991

Kilborn Inc. 231-5356
2200 Lakeshore Blvd. West
Toronto, Ontario
M8V 1A4

Attention: Mr. P. V. Tucker
Senior Coal Prep. Eng.

Subject: AMDORJA MAGNETITE PROJECT
Your Ref. #3754, Div.: 15
Our Ref. #91/4794 - Preliminary Pricing

Dear Paul:

Following my telefax #2304 of May 6th, 1991 showing the budgetary price based on your equipment list, attached please find a copy of the budget quotation dated May 3rd, 1991 for the SAG mill, as discussed today. This bid was prepared by our Kirkland office and prices are expressed in Canadian Funds.

Yours truly

Milos J. Pospisil
Manager, Mineral Processing

MJP/sb

Encls.

VIA TELEFAX

Member of the Trelleborg Group
Boliden Allis Canada Inc.
Sala Machine Works Division
3136 Mavis Road, Mississauga, Ontario L5C 1T8 Telephone: (416) 270-2170 Telex: 06-961182 Fax: (416) 270-6008

boliden allis

TELEFAX COMMUNICATION SHEET

SEND TO: SALA MACHINE WORKS
ATTN: MILOS POSPISIL
TELEFAX NO: (416) 270-9996
SENT FROM: MARY FU
SUBJECT: ANDORIA PROJECT, NORWAY
MESSAGE:

DATE: MAY 6/91.

URGENCY: NORMAL:
URGENT:
VERY URGENT: X

ENCLOSED PLS FIND BUDGET PRICES ON ANDORIA PROJECT AS REQUESTED BY KILBORN.

Bob Loomis

4 SHEETS INCLUDING COVER SHEET

Member of the Trelleborg Group
BOLIDEN ALLIS CANADA INC.
16777 HYMUS,
KIRKLAND, QUEBEC
H9H 5L4
TEL.: (514) 694-8410
FAX: (514) 694-4108

boliden allis

TELEFAX COMMUNICATION SHEET

Date : May 3, 1991

SEND TO: Kilborn Inc.
Attn: Mr. Paul Tucker

Telefax No: 416-231-5356

SENT FROM : Mary Fu
Boliden Allis Canada

SUBJECT: Andorja Magnetite Project, Norway
Budget Pricing on
(1) 28' dia. x 10' (EGL) SAG Mill
(1) 8' dia. x 10' O/F Ball Mill

MESSAGE: In response to your request for budget pricing on subject mills, we are pleased to quote, based on your preliminary information; budgetary pricing as follows:

Item 1.0 - One (1) only 28' dia. x 10' (E.G.L.) semi-autogenous mill arranged for 5000 HP/200 RPM synchronous motor complete with fabricated steel shell, cast iron heads, retractable feed chute, steel fabricated discharge trunnion liner, trommel screen, steel gear and forged alloy steel pinion, trunnion bearings, trunnion bearing and pinionshaft bearing RTDs, trunnion bearing soleplates, pinion bearing soleplates, pinion bearings, main bearing and pinionshaft bearing lubrication system and automatic gear spray.
Excluded:

Motor	calculated from ballmill quote	450.000
Liners & Hardware		3.080.000
Grinding Media		366.000
Installation and Field Assembly		3.896.000 + 1.10 (FRT & Stor)
Foundation Bolts		4.286.000 x 0.86 =
Interconnecting Piping		3.686,000 US

Budget Price.....$ 3,079,880

Item 1.1 - One (1) set only of Cr-Moly steel head liners, shell liners and discharge end grates and wear plates, complete with necessary hardware for item 1.0.

Budget Price.....$ 268,860

BOLIDEN ALLIS CANADA INC.
16777 HYMUS,
KIRKLAND, QUEBEC
H9H 3L4
TEL.: (514) 694-9400
FAX: (514) 694-6613

boliden allis
BOLIDEN ALLIS CANADA INC.

We have based the mill size on ore S.G. of 3.4, ball charge of 6% and your requirement for a 5000 HP SAG Mill.

For a 28 Ft. Dia. fully Autogenous Mill, a shell length of 14'-2" (F/F) will be required with price addition on shell liners and shell assembly.

Item 2.0 - One (1) only 8' x 10' long overflow ball mill arranged for 300HP/1200 RPM induction motor complete with fabricated steel shell, cast iron heads, steel gear and forged alloy steel pinion, feed spout, feed and discharge trunnion liners, trunnion bearings, trunnion bearing RTDS, trunnion bearing soleplates, pinion bearing soleplates and automatic gear spray system.

Excluded:

Motor
Liners and Hardware
Grinding Media
Installation & Field assembly
Foundation Bolts
Interconnecting Piping

Budget Price.....$ 372,240

Mill 372,240
Liners 56,390
Lube System 11,500
Motor 26,300
466430 + 1.10 FET
= 513,073
= 441,000 US

Item 2.1 - One (1) only set of Ni-Hard liners for feed end, discharge end and shell for item 2.0.

Budget Price.....$ 56,390

NOTE:

1. Above prices are in Canadian funds. Today's budget. Duty and taxes extra.
2. Delivery: 12-14 months.
3. F.C.A. shipping points.

.../3

boliden allis

We trust this is satisfactory for your present requirements.

Yours very truly,

Mary Fu
Application Specialist

MF/ah

cc: B. See Hoye

Member of the Trelleborg Group

BOLIDEN ALLIS CANADA INC.
16777 HYMUS,
KIRKLAND, QUEBEC
H9H 3L4

TEL.: (514) 694-6400
FAX: (514) 694-6418

SALA	PRICE LIST Electromotors for SALA Pumps 3-phase squirrel cage IP 54	10010219 Date 05/90 1/2

Substitutes: 10010219 of 08/89

The prices are NET, ex works SALA, including assembly, including packing, and valid 1990-05-15 — 1990-12-31.

1500 rpm, 50 Hz

Rated kW	Type IEC	Rated speed	Foot mounted	# US	Flange mounted
1,1	MT 90 S	1410	1.140	-200	1.245
1,5	MT 90 L	1420	1.350	-238	1.495
2,2	MT 100 LA	1430	1.610	-272	1.695
3,0	MT 100 LB	1430	1.945	-328	2.035
4,0	MBT 112 M	1425	2.325	-393	2.480
5,5	MBT 132 S	1425	2.995	-506	3.180
7,5	MBT 132 M	1430	3.775	-637	3.970
11,0	MBT 160 M	1430	5.135	-867	5.360
15,0	MBT 160 L	1455	6.625	-1119	7.075
18,5	MBT 180 M	1470	7.915	-1337	8.390
22	MBT 180 L	1470	9.385	-1567	9.970
30	MBT 200 L	1470	12.480	-2108	13.250
37	MBT 225 S	1475	15.310	-2587	15.760
45	MBT 225 M	1470	18.525	-3130	19.170
55	MBT 250 M	1475	22.380	-3774	23.480
75	MBV 280 S	1480	30.040	-5075	31.370
90	MBV 280 M	1480	35.380	-5977	36.795
110	MBV 315 S	1480	43.355	-7324	47.925
132	MBV 315 MA	1480	51.845	-8755	56.415
160	MBV 315 MB	1480	63.955	-10704	68.785
200	MBV 355 S	1485	76.345	-12932	81.890
250	MBV 355 MA	1485	98.420	-16628	103.365
315	MBV 355 LA	1485	117.715	-19,888	122.360

The prices above are valid for ABB-motors. Other motors by request.

$CAN = 0.1871 \times SE$

$CAN = 0.1718 \times NC$

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Sala International

PES/AE
1991-05-03

4

Equipment	Total price	
Phosphate/silica froth pump	SEK 37.100	- 6.000 +
Fine superslig mag sep 909	SEK 200.000	- 34.000
Superslig surge tank 7000 Ø x 7500 H	SEK 580.000	- 98.000
Superslig surge tank agitator	SEK 230.000	- 39.000
Superslig agitated mill	SEK 165.000	- 28.000
Superslig surge tank pump	SEK 32.700	- 6.000 +
Superslig magnetite disc filter	SEK 1.900.000	- 321.000
Pigment surge tank	SEK 250.000	- 42,000
Pigment surge tank agitator	SEK 103.000	- 17,000
Pigment surge tank pump	SEK 27.200	- 5,000 +
Pigment filter press	SEK 2.400.000	- 405.000

Magnetite Concentration

Spiral table tails pump box 2500Ø x 2500H	Not quoted	
Spirals table tails pump (2)	SEK 693.600	- 117.000 +
Magnetite thickener and rake 17000 Ø	SEK 800.000	- 135.000
Magnetite thickener lift	Included above	
Magnetite thickener underflow pumps (2)	SEK 54.400	- 9.000 +
Classifying cyclones 254 Ø	Not quoted	
Magnetite regrinding mill Ø 2400x L3000	SEK 2.000.000	- 338.000
Pump box 1500 Ø x 1500 H	Not quoted	
Magnetite regrind pumps (2)	SEK 145.000	- 24.000 +
Ground magnetite mag. sep. (3)	SEK 654.000	- 110.000
Ground magnetite surge tank and agitator Ø 10500	SEK 1.010.000	- 171,000
Ground magnetite surge tank pump	SEK 65.200	- 11,000 +
Magnetite area sump pump	SEK 54.500	- 9.000 +
Reversing screw conveyor 900 mm Ø	Not quoted	

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Sala International

PES/AE
1991-05-03

3

Equipment	Total price	
Apatite conditioner tank agitator	SEK 165.000	- 28.000
Apatite rougher float cells (6)	SEK 1.300.000	- 220.000
Apatite rougher froth pump and box	SEK 70.000	- 12,000 +
Apatite scavenger flotation cell	SEK 1.500.000	- 254.000
Apatite scavenger froth pump and box	SEK 70.000	- 12.000 +
Apatite first cleaner flotation cells	SEK 1.250.000	- 211,000
Apatite first cleaner froth pump and box	SEK 70.000	- 12,000 +
Apatite first cleaner tails pump(2)	SEK 65.400	- 11,000 +
Apatite second cleaner float cell	SEK 1.250.000	- 208.000
Apatite second cleaner froth pump and box	SEK 37.100	- 6.000 +
Apatite second cleaner tails pump (2)	SEK 140.000	- 24,000 +
Apatite thickener drive and rake 10.000 Ø	SEK 400.000	- 68.000
Apatite thickener lift (incl. in price above)		
Apatite thickener underflow pumps (2)	SEK 54.400	- 9,000 +
Reversing screw conveyor 600 Ø	Not quoted	

Superslig Concentration

Classifying cyclones 375 mm Ø	Not quoted	
Primary spiral gravity separators (20)	SEK 470.000	- 79.000
Secondary spiral gravity separators (20)	SEK 470.000	- 79.000
Double deck gravity concentrating tables(8)	SEK 1.344.000	- 227.000
Table conc. pump box 1200 Ø x 1500 H	Not quoted	
Table conc. pumps (2)	SEK 54.400	- 9,000 +
Coarse superslig mag.sep. 909	SEK 200.000	- 34,000
Classifying cyclone 254 Ø	Not quoted	
Superslig regrind mill 1500 Ø x 3000 L	SEK 925.000	- 156.000
Pump box 1200 mm Ø	Not quoted	
Superslig regrind mill pumps (2)	SEK 54.400	- 9,000 +
Phosphate flotation cells (6)	SEK 500.000	- 84.000
Silicate flotation cells (6)	SEK 500.000	- 84.000

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Sale International

PES/AE
1991-05-03

Equipment	Total price	
Pump box (2)	Not quoted	
SAG mill pumps (2)	SEK 110.400	— 19.000 + 6 000 = 24
Mill sump pump	SEK 54.300	— 9.000 +
O/H crane vertical	Not quoted	
O/H crane horizontal	" "	
O/H crane travelling	" "	
Mag sep 916 Ø x 3000 W (5)	SEK 1.715.000	— 290.000
Demagnetizing Coil	Not quoted	
Thickener drive and rake 30 000 Ø	SEK 3.900.000	— 659.000
Thickener lift motor (incl. above)		
Thickener underflow pump (2)	SEK 130.400	— 22.000 +
Pump box 1200 Ø x 1200 H	Not quoted	
Surge tank feed pumps (2)	SEK 81.000	~~— 8~~ — 14.000 + 2
Surge tank pumps (2)	SEK 145.000	— 25,000 + 2
Surge tank 9000 Ø x 9000 H	SEK 760.000	— 129.000
Surge tank agitator	SEK 341.000	— 56.000
Belt conveyor width 900 mm	NOK 6.000/m	
Belt conveyor width 600 mm	NOK 5.000/m	

Apatite Concentration		
Sulphide conditioner tank 6000 Ø x 6000 H	SEK 375.000	— 63,000
Agitator for ditto	SEK 165.000	— 28,000
Sulphide rougher float cell (six)	SEK 1.500.000	— 253.000
Sulphide rougher froth pump	SEK 70.000	— 12,000 +
Sulphide cleaner flotation cells (six)	SEK 1.000.000	— 169,000
Sulphide cleaner froth pump	SEK 37.100	— 6.000 +
Sulphide thickener drive and rake 83000mm	SEK 250.000	— 42,000
Sulphide thickener lift (incl. in price above)		
Sulphide thickener underflow pumps (two)	SEK 54.400	— 9,000 +
Sulphide apatite drum filter	SEK 1.000.000	— 169,000
Apatite conditioner tank 6000 Ø x 6000 H	SEK 375.000	— 63.000

boliden allis
Sala International

P E Sandgren/AE
1991-05-03

ANDERJA PROJECT NORWAY

Crushing and Grinding

	Total price
100 ton deep hopper	NOK 1.600.000 – 249.000
Belt Feeder 1200 W	
Jaw Crusher 1050 x 1200	NOK 2.350.000 – 365.000
Belt Conveyor, see below	NOK 350.000 – 54000
Vibrating Feeder (2)	SEK 54.000 – 9.000 + 1.000 = 10.00
Crusher Sump Pump 100 Ø	
Belt conveyor No. 2, see below	NOK 300.000 – 47.000
Belt conveyor No. 3, "	NOK 1.700.000 – 264.000
Double deck screen	
Cone crusher	
Belt conveyor, see below	NOK 150.000 (circular motion screen) – 23.000
Screen 1220 W x 3050 L	SEK 200.000 – 34.000
	Not quoted
Mag. Sep. 916 Ø x 900 W	SEK 54.400 – 9.000 +
Pump box 900 Ø x 1200 H	SEK 140.000 – 24.000
Non mag pumps (2)	
Dry mag sep	
Belt conveyor No. 5, see below	Not quoted
Flex wall belt conveyor, see below	Not quoted
SAG mill	SEK 175.000 (Circular motion screen) – 30000
Cyclopac	
Screen 1220 W x 3050 L	SEK 650.000 (Linear motion screen) – 110.000
Screen 1830 W x 3050 L (two)	SEK 460.000 – 78.000
Mag sep 1200 Ø x 3000 W	Not quoted
Demagnetizing coil	

Boliden allis
Sala Machine Works

TELEFAX REFERENCE # 2304
(6 pages total)

Mississauga, May 6th, 1991

Kilborn Inc. (Fax 231-5356)
2200 Lakeshore Blvd. West
Toronto, Ontario
M8V 1A4

Attention: Mr. P. V. Tucker
Senior Coal Prep. Eng.

Subject: ANDORJA MAGNETITE PROJECT
Your Ref. #3754, Div.: 15
Our Ref. #91/4794 - Preliminary Pricing

Dear Paul:

Further to our meeting and subsequent telephone discussion, enclosed please find a copy of our budgetary prices, based on the equipment list you furnished us with by a telefax, on April 25, 1991.

Although all prices are from our Swedish offices, the equipment quoted by our Sala office is expressed in SEK (Swedish Crowns), ex. Works Sweden, whilst the crushing and screening portion of the quote is in NOK (Norwegian Crowns), ex. Works Svedala, Sweden. For CIF site, please add 5% to these prices

The pump prices are exclusive of electrical motors - for applicable price please refer to the attached price list showing prices for 3 phase squirrel cage motors. All other equipment prices are inclusive of the electric drive motors.

We trust that you find the attached information to your satisfaction and we look forward to being of service.

Yours truly

Milos J. Popovic
Manager, Mineral Processing

MJP/sb

Encls.

VIA TELEFAX

4:1 1/5

Carpco, Inc. **HUMPHREYS**

FAX FROM CARPCO, INC.
Postal Address: 4120 Haines Street, Jacksonville, Florida 32206 U.S.A.
Telephone (904)353-3681 Telex 5-6367
CARPCO FACSIMILE NO. (904)353-8705

FAX REF. NO. 1441 DATE TRANSMITTED: May 22, 1991
NUMBER OF PAGES (INCLUDING THIS PAGE): 5

TO: Mr. Paul Tucker - KILBORN ENGINEERING
FAX NO. (416)231-

FROM: Steve Hearn

Subject: ANDORIA MAGNETITE

- We are pleased to advise our recommendations for the gravity circuit for making a super concentrate magnetite based on the test work carried out by Minpro A/B. In the absence of a sample, we have assumed normal feed rates for the spirals and tables but would be glad to confirm these after testing representative samples of circuit feed in our laboratory.

We offer an option using the Mozley MGS to produce the high grade iron (less than 0.3% SiO2) that is demanded here. We have utilized the MGS extensively for this duty as well as Mozley's having tested other iron ore from Scandinavia to make super concentrates.

The spirals and the tables are all manufactured in the U.S.A. and would be shipped manually from Southeast U.S. port to Scandinavia. The spirals would be shipped in a 'knocked-down' condition to permit containerization (for a reduced shipping charge). Site supervision of spiral erection would be provided by Carpco. Travelling expenses, meals and accommodations at site would be for the client's account.

- The Mozley MGS would be shipped directly from the U.K.

Regards.

SBH/jas

Attachments: Quotation No. HQ-383
Data Sheets

PROFORMA INVOICE
& QUOTATION FORM

Carpco, Inc. Humphreys®

A DIVISION OF CARPCO, INC.

4120 Haines Street • Jacksonville, Florida U.S.A. 32206 • Phone (904) 353-3681 • Fax: (904) 353-8706 Telex: 5-6367

TO KILBORN LIMITED
2200 Lake Shore Blvd. West
Toronto, Ontario M8V 1A4
Canada

ATTENTION OF Mr. Paul Tucker

Quotation No. HQ-383
Date: May 22, 1991
Ship Via: Ocean Freight Collect
F.O.B.: Southeast U.S. Port
Terms: 20% with order
80% upon shipment

DESCRIPTION

Project: ANDORJA MAGNETITE

1) ROUGHER SPIRALS

We offer two banks of each consisting of eight double-start HUMPHREYS MODEL HC1750 WASHWATER SPIRAL CONCENTRATORS in a seven-turn configuration. Each bank of spirals is complete with 16-way slurry distributor, washwater distributors, product collection launders and all interconnecting piping between distributor and spirals, spirals to launders.

Price per bank ..... US$ 47,880.00
Total price, two banks (total 32 starts) ..... US$ 95,760.00

2) CLEANER SPIRALS

One bank of seven double-start HUMPHREYS MODEL HC1750 SPIRALS complete as above.

Price per bank (total 14 starts) ..... US$ 43,920.00

3) RECLEANER CLEANING

One bank of five double-start HUMPHREYS MODEL HC1750 SPIRALS complete as above.

Price per bank (total 10 starts) ..... US$ 31,730.00

TOTAL PRICE ..... US$171,410.00

SHIPPING SCHEDULE: 14-16 weeks from receipt of firm order.

This proposal may be considered void at our option unless accepted within 90 days from date hereof.

Respectfully submitted,

Carpco, Inc.

By _____
Signature of Authorized Individual

The Conditions of Sale printed on reverse side of this form constitute a part of this quotation.

4) CONCENTRATING TABLES
(For 11.7 TPH Spiral Concentrate)

We offer twelve Wilfley Model 6A Concentrating Tables with 6' x 15', right or left hand rubber covered wood decks (with wooden riffles). Feed boxes and washwater boxes are fiberglass with urethane lining. Head motion is driven with 2 HP/1.5 kW motor. Tables are designed to be floor mounted.

Price, per deck ..... US$ 13,900.00

Total, 12 decks ..... US$ 166,800.00

STACKING DECKS

We have supplied the Wilfley Table in stacked configurations up to triple deck in the past leading to considerable space savings. Preliminary discussions with the structural engineers who designed the supports for this system indicate that the tables could be operated four high. However, a detailed study would be required before this could be confirmed; and we would be pleased to advise the engineering cost of carrying this out on request.

5) LAUNDERS

Steel, rubber or urethane lined collection launders for concentrate and tailings.

Price, per set ..... US$ 3,250.00

Total, 12 sets ..... US$ 39,000.00

Estimated shipping charge to Norway (port of Oslo) – we estimate 5 x 20' containers would be required.

Estimated cost, FAS Oslo ..... US$ 15,000.00

4/5

ANDORJA MAGNETITE
HUMPHREYS SPIRALS
DATA SHEET

			ROUGHERS	CLEANERS	RECLEANERS
1.	**PROCESS DATA**				
1.1	Material		Classified Chromite	Chromite Fines	Chromite Fines
1.2	Max. Size	(mm)	0.6	0.149	0.149
1.3	S.G. of Solids		5.1	5.1	5.1
1.4	% Solids (by wt.)		30	30	30
1.5	Feed Rate	TPH	51.4	23.6	16.6
1.6	Grain Size	(microns)	1% +592 95% +142	1% +149 95% +44	1% +149 95% +44
1.7	Spiral Product Concentrate 1. Tailings/Reject	 tph tph	 23.6 27.8	 16.6 —	 11.7 —
	Washwater Required $3m^3/hr$/Spiral Start Pressure (Gravity flow only required)		3	3	3

		ROUGHERS	CLEANERS	RECLEANERS
2.	**EQUIPMENT DATA**			
2.1	Manufacturer	Humphreys	Humphreys	Humphreys
2.2	Model No.	HC1750/7	HC1750/7	HC1750/7
2.3	Quantity (No. of Spirals)	Two modules each containing 8 double starts	One module each containing 7 double starts	One module each containing 5 double starts
2.4	No. of Turns	7	7	7
2.5	Total No. of Starts	32	14	10
2.6	Weight Assy. (kgs)	5500	2500	1850
2.7	Life of Lining	+20 years	+20 years	+20 years
2.8	Material of Construction			
	Spiral	Fiberglass	Fiberglass	Fiberglass
	Distributor	Fiberglass	Fiberglass	Fiberglass
	Launder	Steel	Steel	Steel
2.9	Lining			
	Spiral	Rubber	Rubber	Rubber
	Distributor	Urethane	Urethane	Urethane
	Launder	Rubber or Urethane	Rubber or Urethane	Rubber or Urethane

4316

J. F. COMER INC.
ENGINEERING EQUIPMENT

PHONE (416) 868-1164
F 966858
868-1659

P.O. BOX 649
CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

THIS TRANSMISSION CONSISTS OF 5 PAGES (INCLUDING THIS PAGE)

TO: Kilborn inc

FROM: Mike Tacey

FAX NO.: 416-231-5356

ATTN: Mr Paul Tucker

DATE: June 4/91

TRANSMISSION NO. 06025 TIME 2:05 OPERATOR MD

SUBJECT:

Paul, here is what I have to date:

- Hydrocyclone Clusters
- Horizontal Belt Vacuum Filter
- Thickeners
- Concentrating Tables
- Wet Drum Separators

Later Today.

- AGITATORS
- PUMPS

J. F. COMER INC.
ENGINEERING EQUIPMENT

P.O. BOX 649
10 CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

(416) 888-1164
888-1650

One (1) only, 8 x 15" Series "C" Hydrocyclone Cluster.

PRICE----------$74,994.00 Cdn Funds

One (1) only, 2 x 15" Series "C" Hydrocyclone Cluster.

PRICE----------$22,986.00 Cdn Funds

One (1) only, 4 x 10" Series "C" Hydrocyclone Cluster.

PRICE----------$13,204.00 Cdn Funds

One (1) only, Single 10" Series "C" Hydrocyclone c/w Rubber Liner.

PRICE----------$ 2,562.00 Cdn Funds

Estimated Export Packing $1,900.00 Cdn.

F.O.B. Madison, Wisconsin.

Estimated Freight to N.Y. Harbour is $2,200.00 Cdn.

J. F. COMER INC.
ENGINEERING EQUIPMENT

416) 888-1164
6858
888-1659

P.O. BOX 649
10 CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

One (1) only, 16 Sq. M. Horizontal Belt Vacuum Filter including Filtrate Receiver and Pumps.

PRICE----------$408,000.00 Cdn Funds

Estimate Export Crating $2,400.00 Cdn.

F.O.B. High Bridge, New Jersey.

Estimated Freight to N.Y. Harbour to be advised.

Delivery: 26 to 30 weeks.

One (1) only, 57 Ft diameter Conventional Thickener including free standing tank, internal mechanism, feed well, rakes, bridge, rake drive mechanism and center well support in Carbon steel construction. Peripheral support column by others.

PRICE----------$324,000.00 Cdn Funds

Same w/o tank and supports-------$144,000.00 Cdn Funds

One (1) only, 37 Ft diameter Conventional Thickener including free standing tank, internal mechanism, fuel well, rakes, bridge, rake drive mechanism and center well support in Carbon steel construction. Peripheral support column by others.

PRICE----------$108,000.00 Cdn Funds

Same w/o tank and supports-------$ 68,400.00 Cdn Funds

Estimated Export Crating to be advised.

F.O.B. High Bridge, New Jersey.

Estimated Freight to N.Y. Harbour is to be advised.

Delivery 20 to 22 weeks.

Canadian Funds.

J. F. COMER INC.
ENGINEERING EQUIPMENT

(416) 888-1164
6858
888-1659

P.O. BOX 649
10 CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

Five (5) only, Dings 916 0 x 3000 L Permanent Magnetic Wet Drum Separators.

PRICE----------$16,242.00 Each Cdn Funds

Two (2) only, Dings 916 0 x 900 L Permanent Magnetic Wet Drum Separators.

PRICE----------$ 8,153.00 Each Cdn Funds

One (1) only, Dings 916 0 x 900 L Permanent Magnetic Wet Drum separator.

PRICE----------$ 8,153.00 Each Cdn Funds

Three (3) only, Dings 916 0 x 1200 L Permanent Magnetic Wet Drum Separators.

PRICE----------$ 9,886.00 Each Cdn Funds

→ Packed for Export.

F.O.B. Milwaukee, Wisconsin.

Estimated Freight to New York Harbour $3,500.00 Cdn.

(416) 888-1164
6858
888-1659

J. F. COMER INC.
ENGINEERING EQUIPMENT

P.O. BOX 649
10 CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

Four (4) only, Concenco Model "999" Diagonal-Check Ore concentrating tables c/w 3 HP - 360 V 50 Hz motors.

PRICE----------$43,823.00 Cdn Funds Each

Packed for Export.

F.O.B. Ft. Wayne, Indiana.

Freight to be advised.

add $10,000 per table for laundeas
See Carpco quote

39,000
+10,000
49,000 pay 50,000

J. F. COMER INC.

ENGINEERING EQUIPMENT

LEPHONE (416) 888-1164
LEX 06-966858
X (416) 888-1659

P.O. BOX 649
CARDICO DRIVE
GORMLEY, ONTARIO L0H 1G0

THIS TRANSMISSION CONSISTS OF _____ PAGES (INCLUDING THIS PAGE)

TO: KILBORN INC. FROM: MIKE DARCY

FAX NO.: 231-5356

ATTN: PAUL TUCKER DATE: JUNE 4/91

TRANSMISSION NO. 06038 TIME 4:50. OPERATOR MD

SUBJECT: Warman Pumps

Paul - Pump prices as promised

I have not heard from Warman Re the agitators yet will advise

WARMAN PUMP PRICES

Prices include pumps, flanges, motors, constant speed V-belt drives, motor bases, belt guards.

Two (2) only, Model 12/10 FAH (CCCG) Sagmill Pumps, 75 HP.

PRICE----------$39,803.00 Each Cdn Funds

Two (2) only, Model 10/8 FAH (CCCG) Non-mag Pumps, 40 HP.

PRICE----------$32,606.00 Each Cdn Funds

Four (4) only, Model 6/4 DAH (CCCG) Surge Tank Pumps, 20 HP.

PRICE----------$10,504.00 Each Cdn Funds

Two (2) only, Model 14/12 STAH (RRRG) Tails Pumps, 200 HP.

PRICE----------$58,326.00 Each Cdn Funds

Two (2) only, Model 2/1.5 BAH (RRRG) Underflow Pumps, 7.5 HP.

PRICE----------$ 4,966.00 Each Cdn Funds

Three (3) only, Model 4/3 CAH (RRRG) Transfer Pumps, 20 HP.

PRICE----------$ 6,008.00 Each Cdn Funds

Two (2) only, Model 2/1.5 BAH (RRRG) Con Tables Pumps, 7.5 HP.

PRICE----------$ 4,966.00 Each Cdn Funds

Two (2) only, Model 2/1.5 BAH (RRRG) Superslig Regrind Pumps, 25 HP.

PRICE----------$ 6,371.00 Each Cdn Funds

Two (2) only, Model 6/4 EAH (RRRG) Magnetite Regrind Pumps, 75 HP

PRICE----------$13,938.00 Each Cdn Funds

Four(4) only, Model 1.5/1 BAH (RRRG) Filtrate Return Pumps and Apatite Underflow Pumps, 5 HP.

PRICE----------$ 4,554.00 Each Cdn Funds

Two (2) only, Model 2/1.5 BAH (RRRG) Flowtation Cell Pumps, 10 HP.

PRICE----------$ 5,059.00 Each Cdn Funds

Prices are F.O.B. Madison, Wisconsin, Canadian Funds.

EIMCO Fluid Process International
A Division of Baker Hughes Canada Inc.
5155 Creekbank Road
Mississauga, Ontario, Canada L4W 1X2
(416) 625-6070 Fax 625-3519 Tlx 06-961455

FAX NO: 416/231-5356

DATE: June 3,1991

COMPANY: Kilborn

LOCATION: Toronto

ATTENTION: Paul Tucker

COPIES: M< Androja
Magnitite Proj.
Norway

FROM: W.W. STONE, WASHAGO OFFICE
Ph # 705/689-8933
Fax # 705/689-8940

NBR of P6S: 2

B.F.:

REFERENCE: Androja Magnetite Project - Norway
Kilborn Limited - Toronto
Feasibility Study
Thickeners & Filters Budget Pricing

We are pleased to provide the following budget pricing covering the supply of the following equipment:

I) MAGNETITE CONCENTRATE

a) One (1) Eimco Type B Heavy Duty thickener mechanism designed for installation in Purchaser's 17 meter diameter by 3 meter swd mild steel tank and supplied complete with:

B40L rake drive complete with drive assembly and 3.0 hp motor.
24" semi-automatic rake lift mechanism with 3/4 hp drive.
Two long and two stub arms
1829 mm dia x 762 mm deep feedwell
cone scrapers
bridge with walkway to the mechanism centre
all wetted components in mild steel construction.

Full Price ..... $ 140,000.

b) One (1) Eimco 2700 mm, (8'-10") diameter x 10 disc metallurgical agidisc filter providing 102 square meter, (1100 ft²) of effective filtration area and supplied complete with the following:

varispeed 7.5 horsepower disc drive
7.5 hp agitator drive
polypropylene sectors with radial rods and clamps

One (1) 48 " diameter x 84" high mild steel filtrate receiver complete with inlet and outlet flanged nozzles.

One (1) Eimco-Krogh model 550H 2 1/2 x 9 filtrate pump complete with 5.0 hp motor.

I) MAGNETITE CONCENTRATE

b) One Nash model 904L2 vacuum pump supplied with all basic accessories and a 200 hp motor.

Full Budget Price ..... $ 285,000.

II) APPATITE CONCENTRATE

a) One (1) Eimco Type B Heavy Duty thickener mechism for installation in Purchaser's 10 meter diameter x 3 meter swd mild steel tank and supplied complete with:

W24PL rake drive complete with 3.0 hp motor
24" semi-automatic rake lift mechanism with 3/4 hp drive.
Two long and two stub arms
914 mm dia x 610 mm deep feedwell
cone scrapers
bridge with walkway to the mechanism centre
all wetted components in mild steel construction.

Full Price ..... $ 100,000.

b) One (1) Eimco 3657 mm diameter x 4267 mm face rotary vacuum drum filter, scraper discharge supplied complete with:

all mild steel construction
one (1) 36" dia x 72" high mild steel filtrate receiver
one (1) 2 1/2 x 9 filtrate pump with 5.0 hp motor
one (1) Nash CL 2003 vacuum pump with 100 hp motor.

Full Budget Price ..... $ 260,000.

The budget prices quoted are in Canadian funds, FOB Montreal Dock and included export packing, estimated freight to Hamnvik/Ibestad, Norway and all applicable duty, taxes and exchange are extra.

Should you have any questions please advise.

Regards

Bill Stone

GOULDS PUMPS
CANADA INC.

285 Sheldon Drive
Cambridge, Ontario N1T 1A8
Telephone (519) 622-3600
Telex 06-959475
Fax 1-519-622-3675

TELEFAX

TO: Paul Tucker DATE 5/31/91

LOCATION: Kilborn 416 231 5356

FROM: Gordon Banks FAX # 519-622-4174

NO. OF PAGES (INCLUDING THIS ONE) 2

COMMENTS

- attached are budget nos.
- assume #1500 ea for process water & gland water pumps, so total will increase to 293K Sob ashland Pa. U.S. funds
- I'll have export shipping & shipping costs for you next week.

regards

Gord.

3 - attached are export shipping nos.
- assume #150 ea for process water & gland water pumps, so total will increase to #9111
- freight to an East Coast port will be approx #6000
- ∴ total budget for all would be
  293 + 9.1 + 6 = #308.1 K U.S.

regards Gord

JUN 3 '91 8:58 FROM GOULDS PUMPS TORONTO TO KILBORN PAGE.001

KILBORN - ANDORAN MAGNETITE

No. Of Pumps	Service	Pump Size	Bare Pump Weight	Motor Sk & Stand Weight	Total Weight Pump	Variable V-Belt Drive Weight	Motor Weight	Total Unit Weight	Unit Export Weight	Total Export Weight	Export Volume Cu.Ft.	Export Boxing Cost ($)
1	Ball Mill Pumps	5500 6MB-26 E3	5300	728	6000	288	2134	8450	9784	19467	256	912
1	Surge Tank Feed	5500 6MB-18 E2	2613	258	2873	180	534	3587	3458	6916	167	448
1	Surge Tank Pumps	5500 6MB-19 E2	2513	258	2723	180	548	3451	3664	7249	116	448
1	Non-Magnetics	3500 6MB-19 E2	2513	258	2723	180	548	3451	3664	7891	114	448
1	Table Concentrate	JC 3MX-14	440	305	745	90	101	936	1165	2339	44	158
1	Separatig Regrind Mill	5500 3MX-17 E2	1735	258	1993	180	370	2543	2825	5447	78	158
1	Phosphate/Silicate Froth	JC 2X3-11	345	304	451	90	101	642	765	783	44	158
1	Separatig Surge Tank	JC 4X6-14	475	305	780	50	148	978	1297	1297	44	158
1	Pigment Surge Tank											
1	Pigment Filtrate Return											
1	Spirals/Tables Tails	5500 6K10-21 E2	3125	250	3375	180	285	3758	4332	8443	172	684
1	Mag Thickener U'flow	JC 3X4-14	440	305	745	90	168	963	1252	2304	44	158
1	Magnetics Regrind Mill	3500 4M6-22 E2	3837	500	3937	180	853	4498	5164	10327	167	448
1	Magnetics Surge Tank	JC 4X6-14	475	305	780	50	148	978	1297	1297	44	158
1	2'ndly/Mag Filtrate Return	JC 4X6-14	475	305	780	50	101	931	1218	1218	44	158
1	Sulphide Rougher Froth	JC 4X6-14	475	305	780	50	101	931	1218	1218	44	158
1	Apatite Rougher Froth	JC 3X4-14	440	305	745	50	101	886	1165	1165	44	158
1	Apatite Scav Froth	JC 3X4-14	440	305	745	50	101	886	1165	1165	44	158
1	Apatite Cleaner Froth	JC 3X4-14	440	305	745	50	101	886	1165	1165	44	158
1	Apatite 2nd Clnr Froth	JC 4X6-14	475	305	780	50	148	931	1218	1218	44	158
1	Apatite Cleaner Tails	JC 4X6-14	475	305	780	50	148	931	1218	1218	44	158
1	Apatite Thickener U'flow	JC 3X4-14	440	305	745	50	168	963	1297	2303	44	158
1	Apatite Filtrate Return	JC 2X3-11	345	286	631	50	101	782	1252	2584	88	158
1	Process Water											
1	Gland Water											
1	SUMP PUMPS*											
1	Stockpile Area Sump	VJC 2X3-14 E2	1440	199	1639	50	168	1857	2228	2228	208	772
1	Grinding Area Sump	VJC 2X3-14 E2	1440	199	1639	50	168	1857	2228	2228	208	772
1	Magnetics Area Sump	VJC 2X3-14 E2	1440	199	1639	50	168	1857	2228	2228	208	772
								44799	55973	99975	2174	8461

* Assumes 4 foot setting on vertical sump pumps
All Pumps Quoted in HC600 Construction

GOULDS PUMPS
CANADA INC.

285 Sheldon Drive
Cambridge, Ontario N1T 1A6
Telephone (519) 622-3600
Telex 06-956475
Fax 1-519-622-3675

T E L E F A X

TO: [redacted] DATE 5/31/91

LOCATION: Kitchener 416 231 5356

FROM: Gordon Banks FAX # 519-622-4174

NO. OF PAGES (INCLUDING THIS ONE) 2

COMMENTS

Attached are budget nos. assume #1500 ea for process water & gland water pumps, so total will increase to 293K fob oakland Pa. U.S. funds
I'll have export doping & shipping nos for you next week.

regards

Gord.

KILBORN - ANDORJA MAGNETITE GOULDS, CANADA

No. Pumps	Service	M3/HR	GPM	TDH-M	TDH-FT	SP. GR.	Pump Size	RPM	%Eff	BHP	Motor HP	Net Total
2	SAG Mill Pumps	441.4	1944	30	98.5	2.1	5500 6X8-26 B3	665	72	146.7	200	42439.80
2	Surge Tank Feed	131.7	580	8	26.25	1.4	5500 6X6-18 B2	490	68	8.2	15	17373.04
2	Surge Tank Pumps	302.1	1330	10	32.8	1.1	5500 6X8-19 B2	545	74	17	20	18382.44
2	Non-Magnetics	309.6	1364	15	49.25	1.3	5500 6X8-19 B2	655	75	30.6	40	20316.44
2	Table Concentrate	36.6	161	10	32.8	1.3	JC 3X4-14	665	49	3.7	5	10352.50
2	Supersllg Regrind Mill	45.4	200	30	98.5	1.7	5500 3X4-17 B2	950	42	20.9	25	17513.96
2	Phosphate/Silicate Froth	6.9	31	8	26.25	1.1	JC 2X3-11	745	25	0.94	5	3938.25
2	Supersllg Surge Tank	66.7	294	8	26.25	1.8	JC 4X6-14	620	60	6.1	10	5758.75
1	Pigment Surge Tank											
1	Pigment Filtrate Return											20995.96
2	Spirals/Tables Tails	411.9	1814	7	23	1.1	5500 8X10-21 B2	440	77	15.65	20	10702.50
2	Mag Thickener U'flow	42.4	187	11	36	1.8	JC 3X4-14	700	52	6.1	10	26417.92
2	Magnetite Regrind Mill	162.9	717	30	98.5	1.7	5500 6X6-22 B2	750	59	53.4	75	5758.75
2	Magnetite Surge Tank	57.3	253	8	26.25	1.8	JC 4X6-14	620	58	5.4	10	5564.75
1	S'slig/Mag Filtrate Return	48.3	213	9	29.5	1	JC 4X6-14	650	55	3	5	5583.75
1	Sulphide Rougher Froth	53	234	7	23	1.1	JC 4X6-14	580	59	2.6	5	5195.25
1	Apatite Rougher Froth	41.2	182	7	23	1.3	JC 3X4-14	560	55	2.6	5	5195.25
1	Apatite Scav Froth	32.5	143	7	23	1.2	JC 3X4-14	565	49	2.1	5	5195.25
1	Apatite Cleaner Froth	30.9	136	7	23	1.4	JC 3X4-14	565	48	2.4	5	5583.75
1	Apatite 2nd Clnr Froth	69.9	308	7	23	1.1	JC 4X6-14	580	62	3.3	5	11517.50
1	Apatite Cleaner Tails	80.2	353	10	32.8	1.1	JC 4X6-14	690	62	5.6	10	10702.50
2	Apatite Thickener U'flow	24.8	110	12	39.4	1.5	JC 3X4-14	725	38	4.49	10	3936.25
2	Apatite Filtrate Return	13.3	59	10	32.8	1	JC 2X3-11	830	37	1.4	5	
1	Process Water			30	98.5	1						
1	Gland Water			15	50	1						
	SUMP PUMPS*											
1	Stockpile Area Sump	34	150	12	39.4	1.5	VJC 2X3-14 C2	735	50	4.7	10	9873.75
1	Grinding Area Sump	34	150	12	39.4	1.5	VJC 2X3-14 C2	735	50	4.7	10	9873.75
1	Magnetics Area Sump	34	150	12	39.4	1.5	VJC 2X3-14 C2	735	50	4.7	10	9873.75
												288045.81

* Assumes 4 foot setting on vertical sump pumps

ITT Fluid Technology

ITT A-C Pump Canada
(Formerly Allis-Chalmers Pump)

155 Dawson Road
Guelph, Ontario N1H 1A4
Telephone (519) 824-7750
Telex 069-56524 Fax (519) 824-9543

COPIES TO:

DATE: 21 MAY 91

TO: KILBORN INC

FROM: RICHARD RUDCH

FAX NO. 416 231 5356

4151

ATTENTION AL AILLIAMS

MESSAGE:

Project # 3699
Wynne Project, Wisconsin
OUR REF TO 3355

Al,

Thank you for your fax dated 17 May 91, here are Budget costs for the SRL pumps requested complete unit OMB, V drives, GUARDS and Motors as listed.

Item No	Description		UNIT COST
1	8 x 8 x 25 SRL XT,	75 HP	22,050.00
2	8 x 6 x 18 SRL-C,	15 HP	8,815.00
3	3 x 3 x 10 SRL-C,	5 HP	4,515.00
4	2 x 2 x 10 SRL,	5 HP	3,155.00
5	10 x 8 x 21 SRL-C,	75 HP	15,200.00
6	5 x 4 x 14 SRL-C,	10 HP	5,640.00
7	2 x 2 x 10 SRL	3 HP	3,105.00
8	5 x 4 x 14 SRL-C	30 HP	6,520.00
9	2 x 2 x 10 SRL (MECH SEALS)	5 HP	4,500.00

PRICES are budget, FOB FACTORY. GUELPH ONT, CAN FUNDS, TAXES EXCLUDED.

Regards Richard Rudch

TT:0T TR/TZ/00

JOY TECHNOLOGIES CANADA INC.

41 Ardelt Place
Kitchener, Ontario N2C 2C8
Phone: (519) 745-1307
Telex: 069-55363
Fax: (519) 745-5581

*** FACSIMILE ***

DATE: MAY 30. 91

TO: KILBORN LTD (Company) 416 - 231 - 5356 (Fax No)

ATTENTION: PAUL TUCKER

FROM: GUNTHER PANTHER (Name)

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET: 2

WE ARE PLEASED TO QUOTE BUDGET PRICE ESTIMATES FOR FLOTATION CELLS FOR YOUR ANDORA MAGNETITE – NORWAY PROJECT. OUR REF. # 91/4048-B

PRICES QUOTED ARE IN CANADIAN FUNDS, F.O.B. MONTREAL-QUEBEC ESTIMATED ± 10% INCLUDING PACKAGING, OF 3 - CONTAINERS, FREIGHT TO NORWAY N/INCL.. PRICE INCLUDES STEEL FABRICATED FLOTATION TANKS MANUFACTURED IN SWEDEN, FINLAND OR NORWAY BUT NOT INCLUDING FREIGHT TO JOBSITE.

ITEM 1 PHOSPHATE AND SILICA FLOTATION

2 - BANKS OF 6 CELL Nº 24 D-R (50 CU.FT/CELL) DENVER FLOTATION CELLS INCL. LAUNDERS AND LEVEL CONTROLS LESS 6 - 15 HP. 1500 RPM MOTORS, TOTAL WGT 24,000 LBS
PRICE $ 109,000.

ITEM 2. APATITE CLEANERS

1 - BANK OF 6 CELL Nº 300 D-R DENVER FLOTATION CELLS INCL. LAUNDERS AND LEVEL CONTROLS, LESS 6 - 30 HP. 1000 RPM MOTORS, TOTAL WGT 54,000 LBS.
PRICE $ 182,000.

JOY TECHNOLOGIES CANADA INC.

41 Ardelt Place
Kitchener, Ontario N2C 2C8
Phone: (519) 745-7307
Telex: 069-55363
Fax: (519) 745-5581

*** FACSIMILE ***

DATE: _____

TO: _____ _____
(Company) (Fax No.)

ATTENTION: _____

FROM: _____
(Name)

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET: _____

ITEM 3 SULPHIDE AND APATITE ROUGHER CELLS
2 - BANKS OF 6 CELL No 500 D-R DENVER FLOTATION CELLS INCL. LAUNDERS AND LEVEL CONTROLS, LESS 12 - 40 HP. 1000 RPM MOTORS TOTAL WGT. 120,000 LBS, PRICE $ 39,000.

ITEM 4 BLOWERS
1 - SPENCER MODEL 50202 C1 TURBINE BLOWER RATED 7000 SCFM @ 48 oz/in² PRESSURE LESS 1 - 150 HP. 3000 RPM MOTOR TOTAL WGT 9000 LBS, PRICE $ 26,000.00

KUE-KEN® Corporation

PROCESS TECHNOLOGY GROUP

8383 BALDWIN STREET
OAKLAND, CALIFORNIA 94621 U.S.A.

TELEPHONE: 415/569-8382
TELEX: 171256
FAX: 415/638-7022

4091

To Fax Number: 416-231-5356

Date: 28 MAY 91

Time: 8:40

Page No: 1

File No:

F A X T R A N M I S S I O N

Sent from Fax No. 1-415-569-8694

TO: AL WILLIAMS FROM: MARK C. TJERDSON

COMPANY: KILBORN DEPT:

SUBJECT: LYNNE PROJECT - NORANDA - PROJ. 3755

MESSAGE: AL - ATTACHED BUDGETARY NET PRICING FOR A KUE-KEN 42 x 48 BIG BITE H.D. DOUBLE TOGGLE JAW, AS REQUESTED.

WILL ALSO GET SOME CURRENT LITERATURE TO YOU ILLUSTRATING OUR NEW BIG-BITE STYLE JAWS

GOOD LUCK!

BEST REGARDS,

MT

XC - LOUIS BAYDE

SELCO CORP. - BUFFALO

TOTAL NUMBER OF PAGES IN THIS TRANSMISSION 3

IF YOU HAVE PROBLEMS WITH THIS MESSAGE READING OR UNDERSTANDING ITS CONTENTS, PLEASE CALL 1 415 569 8382

06. 28. 91 08:38AM **KUE-KEN** P01

KUE-KEN® Corporation

PROCESS TECHNOLOGY GROUP

6363 BALDWIN STREET
OAKLAND, CALIFORNIA 94621 U.S.A.

TELEPHONE: 415/569-6362
TELEX: 171206
FAX: 415/635-7022

QUOTATION

TO: KILBORN, INC.
2300 LAKE SHORE BLVD. WEST
TORONTO, CANADA M8V 1A4

Date: 28 MAY 91

Page: 1 of: 2

Proposal Number: I1296

The KUE KEN Corporation is pleased to offer for your consideration, the following item(s):
1 only 42" X 48" KUE KEN "BIG BITE" Jaw Crusher (s) Model 160 to include:
a) SMOOTH jaw dies, b) exclusive, automatic tramp iron release mechanism, c) oil lubrication package with integral oil pump, oil filter, heat and temperature detection devices and alarm horn, and d) heavy duty welded steel frame with strong backs.

EXCLUSIVE FEATURES OF THE KUE KEN STANDARD JAW CRUSHER:

1. Lower horsepower requirements by 30 to 40% over overhead eccentric jaw crushers.
2. Lower drive motor costs because of lower horsepower requirements.
3. Lower energy costs, that can be significant on an annual basis.
4. Lower wear part costs due to "crushing without rubbing" that can extend their life 3 to 5 times that of overhead eccentric crushers
5. Automatic tramp iron release mechanism virtually eliminates broken toggles and the extended, costly down time that results.
6. Totally enclosed, oil bath, filtered lubrication for eccentric shaft, bearings, pitman and toggles that prevents contamination of the oil and substantially increases toggle and toggle seat life.
7. Full dimension, unrestricted feed opening to accept slabby feed.

MOTOR SPECIFICATIONS: (Motor not included in price)
150 H. P. 1200 R.P.M. 60 Hz. 460 Volts 3 Phase
CRUSHER R.P.M. 265 TO 285 CRUSHER WEIGHT 120,000 LBS.

PRICE, F.O.B. OAKLAND, CALIFORNIA	$ 259,500
OPTIONAL ITEMS:	
V-Belt Drive consisting of motor sheave and V Belts	$ 2,800
V-Belt Drive Guard	$ 2,615
Hydraulic Adjustment	$ STANDARD
Portable Pull Back Springs	$ STANDARD
External Lubrication system with 1 1/2 H.P. motor	$ 780
Zero Speed monitor when external lube system is used	$ 535
Oil Immersion heaters	$ 750
Electric Motor, 460 Volt X TEFC ODP 60 Hz 3 Phase... (150 HP @ 1200 RPM, SEVERE DUTY, WITH SLIDE BASE)	$ 6,920
TOTAL PRICE FOR CRUSHER WITH ACCESSORIES	$ 273,920

KUE-KEN® Corporation

QUOTATION

Proposal No. E1296

Price of crusher with accessories from previous page.....$ 273,920

Applicable Sales Taxes.....$ NONE

Freight charges within continental United States.....$ NOT INCLUDED

Export boxing, preparation and documentation charges.....$ N/A

Ocean freight, insurance, from Port of_____..$ N/A

TOTAL PRICE FOR CRUSHER (S).....$ 273,920

DOWN PAYMENT REQUIRED WITH ORDER.....$ 55,000

SHIPMENT:
We estimate shipment of the above crusher(s) can be made 14-16 WEEKS after the receipt of acceptable order documents. It is expressly understood that the foregoing estimated shipping date shall not be deemed a guarantee of shipment on that date and that it is subject to review at the time of order placement.

TERMS OF PAYMENT:
Unless otherwise stated here-in, the terms of payment are net 30 days after date of invoice.

F.O.B. POINT:
Unless otherwise stated here-in, all prices quoted for crushers and their accessories are F.O.B. Oakland, California, U.S.A., no freight allowed.

Prices quoted do not included foundation design, engineering fees, permits or any other item not specifically mentioned as being included.

We thank you for this opportunity to offer our proposal for the foregoing crusher(s) and hope to be selected as the supplier of this equipment. If you have any questions or comments please feel free contact us at 1-800-637-9322 with-in the continental United States or 1-415-569-8382 if you are outside the continental 48 states.

Sincerely

KUE KEN Corporation
Process Technology Group

Signed by:

4316

L/H
LOCHHEAD • HAGGERTY ENGINEERING & MANUFACTURING CO. LTD.
506 EATON PLACE, ANNACIS ISLAND, DELTA, BRITISH COLUMBIA, CANADA V3M 6K9
TELEPHONE (604) 524-9561 FAX (604) 524-9563

TELEFAX DOCUMENT TRANSMITTAL

DATE: June 3, 1991

SEND TO: KILBORN LTD.

FAX NO.: On File

RE: Andorja Magnetite

ATTN: Paul Tucker

FROM: Joerg von Beckmann

PAGE 1 of 2

L/H FAX NO. 604-524-9563

MESSAGE/DOCUMENTS:

Attached is our Quotation No. 2921 for the supply of an indirect fired electric rotary dryer. This is similar to the batch-type gold precipitate dryers we manufacture, except that it is a little smaller and is continuous in operation. It is also similar to a carbon kiln, but operating temperatures are much lower.

The FOB our plant, or FOB port of Vancouver are the same.

Thank-you for keeping us in mind on the used equipment, too. We do not have any of the used components you need on this project, but we do have a 4' x 28' stainless dryer and a 5' x 20' mild steel dryer available for immediate delivery, if the need should arise.

We are at your service for any additional information we may provide.

Regards,

J. von Beckmann

Joerg von Beckmann

L/H
LOCHHEAD • HAGGERTY ENGINEERING & MANUFACTURING CO. LTD.
508 EATON PLACE, ANNACIS ISLAND, DELTA, BRITISH COLUMBIA, CANADA V3M 6K9
TELEPHONE (604) 524-9561 FAX (604) 524-9563

June 3, 1991

KILBORN LIMITED
2200 Lakeshore Boulevard West
Toronto, Ontario
M8V 1A4

Attention: Paul Tucker, P. Eng.

QUOTATION NO. 2921

1 only — 36" diameter x 8'-0" long Electric Indirect Fired Rotary Dryer, 39 KWatt input, to dry 130 lb/hr dry magnetite pigment, from 25% to 5% moisture. Complete with:

Mild steel rotary shell;
Refractory lined furnace;
Trunnion rolls and thrust rolls;
Chain drive, gear reducer, 1 Hp drive;
Feed hood, discharge hood, discharge chute and seals;
Feed screw & 1/2 Hp drive;
Steel common bedframe;
SCR controlled electric elements;
Exhaust fan;
Control panel, CSA approved.

PRICE, FOB our plant.....US$48,100.00
ALL TAXES and DUTY EXTRA

DELIVERY: 12 weeks

LOCHHEAD HAGGERTY ENG. & MFG. CO. LTD.

Joerg von Beckmann, Ph.D., P.Eng.
General Manager

JvB:pc

MINPRO LTD.

TO FAX # 231-5356

FROM FAX # 416-276-1880

OFFICE & PLANT: 3401 WOLFEDALE ROAD, MISSISSAUGA, ONTARIO, CANADA L5C 1V8
FAX: (416) 276-1880 TEL: (416) 276-8377

DATE: JUNE 3/91 NO. OF PAGES:

COMPANY NAME: KILBORN

ATTENTION: PAUL TUCKER TRANSIT NO.:

RE: FROM THE DESK OF: B. BURROWS

PLEASE FIND ENCLOSED OUR BUDGET PROPOSAL FOR THE EQUIPMENT YOU REQUESTED.

AS THIS PROJECT PROGRESSES WE WOULD BE PLEASED TO SUBMIT A FIRM AND FORMAL QUOTATION

REGS
BRIAN BURROWS

MINPRO

MINPRO LTD.

OFFICE & PLANT: 3401 WOLFEDALE ROAD, MISSISSAUGA, ONTARIO, CANADA, L5C 1V8
TELEX 06-960341 FAX: (416) 276-1880 TEL. (416) 276-6377

NEW AND RE-MANUFACTURED • MINING • MILLING • CONSTRUCTION EQUIPMENT AND SUPPLIES • PLANT APPRAISAL AND LIQUIDATION

June 3, 1991

KILBORN ENGINEERING LTD.
2200 Lakeshore Blvd. West
Toronto, Ontario
M8V 1A4

Attn: Mr. Paul Tucker

Re: Equipment Proposal

Dear Paul,

As per our telephone conversation of May 23, 1991 we are pleased to submit the following budget proposal for your consideration:

One (1) Only 36" x 48" Minpro Jaw Crusher, single toggle overhead design, roller bearings, heavy duty welded steel frame, cast pitman, manganese steel jaw plates and cheek plates, hydraulic toggle adjustement, balanced flywheels, 150 Hp motor, v-belt drive and guards.(new)

Price.....$163,000.00

One (1) Only 3' Symons Standard Cone Crusher complete with main shaft and head assembly with conventional grease seal arrangement, liners, feed platform assembly, feed plate assembly, independent lubrication assembly consisting of external oil pump and oil reservoir, unit will have duckworth wedge type adjustment. Crusher will be reconditioned from a composite of new, reconditioned and re-used as-is parts that have been meticulously inspected and will be complete with sheaves, belts, guards and 100 Hp motor.(reconditioned)

230.1092.01

Price.....$59,700.00

One (1) Only 27'dia. x 10'lg. Allis Chalmers SAG Mill complete with babbit trunnion bearing inserts, rubber liners and lifters, overflow discharge with trommel, twinducer drive consisting of twin 1500 Hp sychronous motors, lubrication system and guards.(as is)

Price.....$997,000.00

One (1) Only 8'dia. x 12'lg. Allis Chalmers Ball Mill complete with ring gear assembly, pinion gear assembly with roller bearings, babbit trunnion bearing inserts, steel liners, 400 Hp synchronous motor and guards.(reconditioned)

Price.....$115,700.00

One (1) Only 5'dia. x 10'lg Marcy Ball Mill complete with ring gear assembly, pinion gear assembly with roller bearings, bronze trunnion bearing inserts, steel liners, 125 Hp motor and gear reducer drive. Unit is mounted on a custom built modular frame.(reconditioned)

use 75,000 Price.....$69,700.00 vs Sale x 0.5 = 78.000

One (1) Only 4' x 8' Dillon Vibrating Screen c/w counter balanced eccentric shaft, suspension assembly consisting of spring mounted rods, single deck with screen cloth to suit, 3 Hp motor, v-belt drive and guard.(reconditioned)

Price.....$6,700.00

One (1) Only 6' x 12' Allis Chalmers Ripl-Flo Vibrating Screen c/w eccentric shaft, suspension assembly consisting of spring mounted rods, single deck with screen cloth to suit, 10 Hp motor, v-belt drive and guard.(reconditioned)

241.4111.01

Price.....$9,700.00

One (1) Only 12" x 12" Shriver Plate and Frame Filter Press c/w 28 chambers, 1" thick cake, manual opening and closing, plate and frames are cast.(reconditioned)

Price.....$6,900.00

4000 lb
$11.000

One (1) Only 50' Dorr Oliver Long Thickener Mechanism consisting of mechanism with manual lift, torque indicator with alarm, 3 Hp drive motor, shaft, two long rakes and two short rakes, discharge cone with cone scraper, feedwell and superstructure.(reconditioned)

Price.....$45,700.00

One (1) Only 35' Eimco Thickener Mechanism consisting of mechanism with automatic lift, torque indictator, 2 Hp drive, shaft, two long and two short rakes, discharge cone with cone scraper, feedwell and superstructure.(reconditioned)

Price.....$39,700.00

Two (2) Banks - 6 Only - MINPRO Model # FM 50 open flow Flotation Machines complete with 15 Hp/two cells, launders, feed box, discharge box. New Construction by Minpro

Price ... $ 119,700.00

Two (2) Banks - 6 only - MINPRO Model # FM500 open flow Flotation Machines complete with 40 Hp single drive, launders, feed box, discharge box. New Construction by Minpro

Price ... $ 424,700.00

One (1) Bank - 6 only - MINPRO Model # FM300 open flow Flotation Machines complete with 30 Hp single drive, launders, feed box, discharge box. New Construction by Minpro

Price ... $ 129,700.00

One (1) Only MINPRO Cyclone Distributor designed to accomodate 8 - D15B cyclones complete with feed pipe to distributor head, isolation valves, overflow pipes, overflow well with discharge tank. All slurry handling surfaces to be rubber lined. New Construction by Minpro

Price ... $ 29,700.00

241.4142.01

29,700
+(8×4000)
= 62,000

One (1) Only Eimco Horizontal Belt Filter - Reconditioned complete with the following :

- 8-ft. wide x 20-ft. long rubber belt
- 7.5 Hp variable speed drive
- gear reducer, vacuum pump
- filtrate pumps, receivers, piping
- filter media

Price ... $ 167,500.00

Ten (10) Only D15B Krebs Cyclones complete with vortex and apex to suit.(reconditioned)

Price.....$3,975.00 each

Five (5) Only D10B Krebs Cyclones complete with vortex and apex to suit.(reconditioned)

Price.....$3,275.00 each

One (1) Only 6'9" x 10 disc Eimco Filter complete with 650 sq.ft of filter area, fabricated steel tank, automatic filter valves with flexible vacuum connections, variable speed filter drive, paddle type agitator, snap-blow mechanism, less vacuum system.(reconditioned)

Price.....$51,700.00

Two (2) Only 20'dia. x 20' Minpro Conditioners complete with rubber covered prop, shaft, gear reducer drive and 20 Hp motor. (new)

Price.....$24,700.00 each 24.431705

One (1) Only 34'dia. x 36' Minpro Stock Tank Agitator complete with rubber covered prop, shaft, gear reducer drive and 100 Hp motor.(new)

Price.....$49,700.00

Two (2) Only 23'dia. x 25' Minpro Stock Tank Agitators complete with rubber covered prop, shaft, gear reducer drive and 30 Hp motor.(new)

Price.....$25,700.00 each = 24300 + 6300 = 30600 say 31,000

400 kg/m for bridge @ $2200/t = $900/m + 7 = $6300

3.5 t @ 20 mt = 70 mt bridge + 16 = agitator / 25

Prices are: FAS Montreal, Quebec
All taxes are extra if applicable
Delivery and terms to be discussed

We trust this brief proposal is adequate for your present requirements and should you have any questions please feel free to contact us.
Yours truly,
MINPRO LTD.

Brian A. Burrows
General Sales Manager

MINERAL DEPOSITS (AMERICAS) INC.

(INCORPORATED IN DELAWARE, USA)

MD

14818 West 6th Avenue, Unit 10A
Golden, Colorado 80401 USA

TEL: (303) 279-8932
FAX: (303) 279-7702
TLX: 283-010

(MEMBER OF THE BROKEN HILL PROPRIETARY COMPANY LIMITED GROUP)

May 7, 1991

Kilborn Engineering Construction
Kilborn Limited
2200 Lake Shore Blvd., West
Toronto, Ontario M8V-1A4
CANADA

Attn: Paul V. Tucker
Senior Coal Preparation Engineer

REF: Spiral Concentrators for Andorja Project

Dear Paul;

It was a pleasure meeting with you at the Coal Prep '91 conference last week in Lexington. I hope it was productive for you, even though the papers didn't seem to be up to par.

Regarding the spirals recommended for the Andorja Project in Norway, we wish to confirm the figures to you and Ray Walton as follows:

ROUGHER STAGE SPIRAL CIRCUIT.

It is recommended using two (2) Banks-of-8 Reichert HG8 twin-start spirals (total of 16 spirals, or 32 troughs) for the 51.4 MTPH feed rate. The HG8 spirals do not use dressing water (wash-water), and they are well suited for feed materials containing higher concentrations of heavy minerals. We have assumed up-grading ratios according to the figures on the flowsheet, but in practice the HG8's should be able to do somewhat better.

The HG8 spirals can be provided in 'banks-of-8' in double-row configurations, complete with feed distributors and launder systems. The price per bank is as follows:

5-turn trough configuration - SUS 52,716.00
7-turn trough configuration - SUS 60,640.00

Accordingly, 16 five-turn spirals would cost SUS 105,432.00,, and 16 seven-turn spirals would cost SUS 121,280.00.

These costs are FOB a West Coast port-of-entry, either Canada or USA.

CLEANER STAGE SPIRAL CIRCUIT.

MDL recommends using seven (7) Reichert HG8 spiral concentrators, twin-start configurations, to process the rougher stage concentrate, based upon weight distributions shown in the flowsheet. We believe the performance of both the rougher stage spirals and the cleaner stage spirals will exceed the figures shown, however. The seven spirals would be provided in a double-row assembly suited for 8 spirals, but with one space vacant. The spirals would be provided with a feed distributor, all feed hoses and hose clamps, and a 3-product launder system, priced as follows:

5-turn trough configuration - $US 48,864.00
7-turn trough configuration - $US 55,687.00

Prices are FOB a West Coast port-of-entry, either Canada or USA.

As shown, the spirals are provided with either 5 or 7 turns; the number of turns is usually determined by test work, as the metallurgical performance may justify using the 7-turn configurations.

We believe the data shown in the flowsheet should be reviewed with the possibility of reducing the number of shaking tables required in the finisher section of the plant. We understand a concentrate of about 97% purity is required, and alternatives should be reviewed to meet this requirement at the least cost. We believe using HG8 spirals in the rougher and cleaner stage will enhance the circuit, but we suggest considering the use of one more stage of spirals to enhance the grade of feed (and to lower the tonnage) to the table circuit. We would like the opportunity of reviewing the test data on which the flowsheet was prepared, as it would provide very good information upon which to make recommendations.

Please let us know if that would be possible. We believe improvements CAN be suggested.

Thank you for allowing us to provide this information. We look forward to your response.

Sincerely,

Thomas C. Ferree, Manager
Mineral Separation Systems

cc: Ray Walton

Spiral Concentrators

PATENTS PENDING AND GRANTED

HG8 - 7 Turn

High Grade Series

For the recovery and concentration of valuable minerals.

Applications:

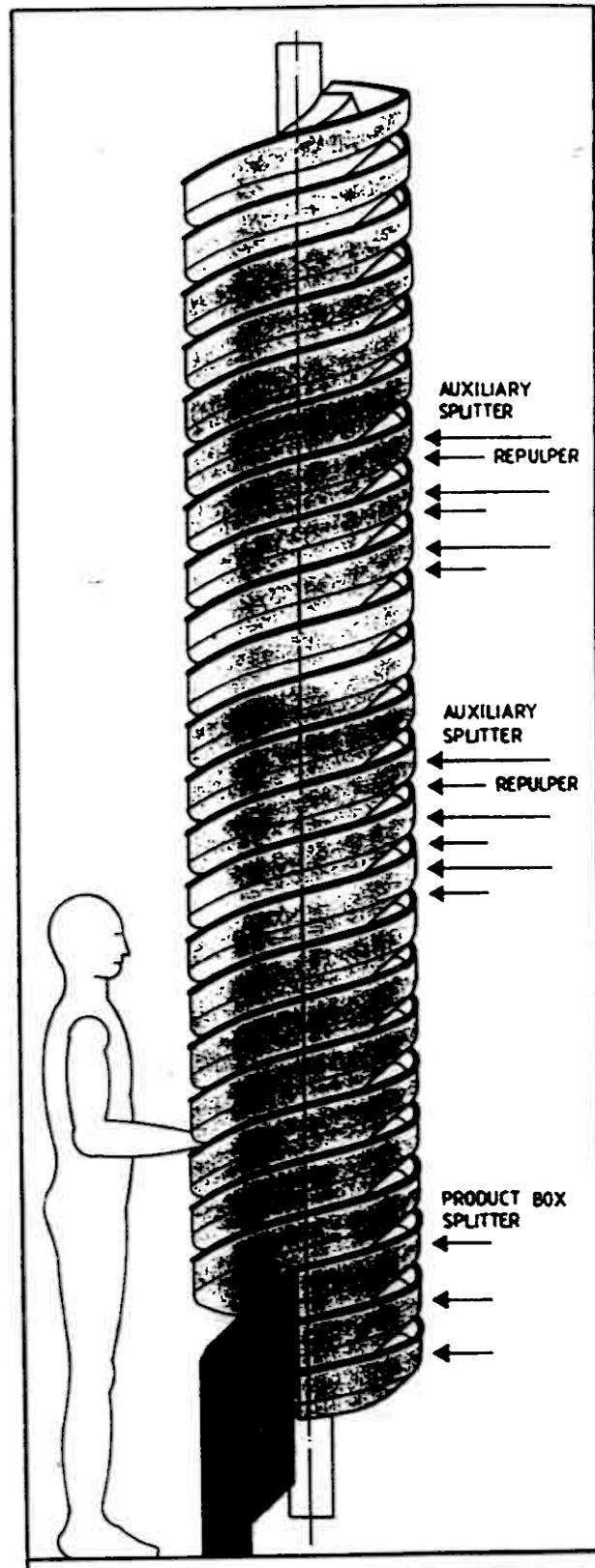
The principal area of application is the recovery and concentration of minerals from pulp streams that contain more than 10% and up to 80% by weight of valuable minerals.

Some Applications are:

For the areas listed below the HG8 Spiral can be used for primary and/or cleaning duties within a process circuit.

Iron Ore	The production of a high grade iron ore product from fine material.
Mineral Sands	Upgrading of primary concentrates generated in a mineral sands mining plant.
Mineral Sands	Separation of valuable heavy minerals from lower SG non-valuable heavy minerals.
Tin	Upgrading of primary tin concentrates.
Ilmenite (Hard Rock)	Upgrading of ilmenite from hard rock feed material by recovering ilmenite and rejecting gangue minerals.
Titano magnetite	Upgrading of primary concentrates to a high grade by the rejection of gangue and composite particles.

In the HG spiral range the choice of spiral is dependant on feed sizing, mineral sizing and required duty. Metallurgical testwork usually determines the choice of spiral.



HG8 - 7 SPIRAL CONCENTRATOR

MINERAL DEPOSITS LIMITED

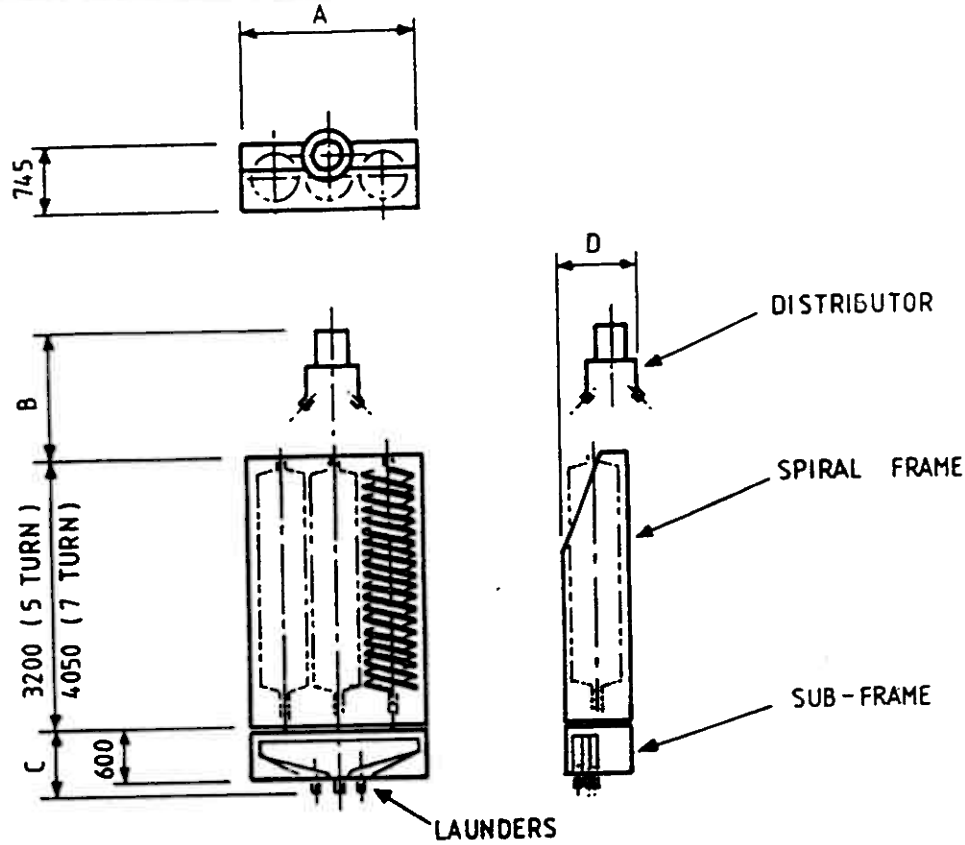
Mineral Technology Division

[illegible] Road, Rundall, Queensland, Australia, 4217

TECHNICAL DATA SHEET

HG8

SPIRAL BANK SINGLE ROW



N° OF SPIRALS		N° OF STARTS	DIMENSIONS				INSTALLED MASS OF MODULE (DRY) tonnes				VOLUME PACKED FOR FREIGHT m^3	
							TOP FED		BOTTOM FED			
			A	B	C	D	5 TURN	7 TURN	5 TURN	7 TURN	5 TURN	7 TURN
1	SINGLE	1	745	–	–	–	0,28	0,31	–	–	3.1	3.5
	TWIN	2	745	644	–	–	0,35	0,39	–	–	3.1	3.5
	TRIPLE	3	745	644	–	–	0,37	0,42	–	–	3.1	3.5
2	TWIN	4	1380	1100	600	–	0,55	0,61	0,57	0,63	6.1	6.3
	TRIPLE	6	1380	1100	600	–	0,6	0,68	0,62	0,70	6.1	6.3
3	TWIN	6	2015	1100	725	–	0,72	0,85	0,75	0,88	8.3	9.3
	TRIPLE	9	2015	1500	725	920	0,83	1,0	0,86	1,03	8.3	9.3
4	TWIN	8	2650	1500	725	920	1,15	1,3	1,2	1,35	11.3	12.3
	TRIPLE	12	2650	1500	725	920	1,25	1,45	1,3	1,5	11.3	12.3

RECOMMENDED BOLTING-DOWN METHOD IS BY J-BOLTS
DRILLING THROUGH THE SUB-FRAME NOT RECOMMENDED
DIMENSIONS & MASSES SUBJECT TO CHANGE WITHOUT NOTICE
ALL DIMENSIONS IN MILLIMETRES

FEED PIPE FLANGE FOR BOTTOM FED MODULE { 100 AS TABLE D / 100 DIN 2576 ND10 / 4" ANSI 150 lb }

FOR OPERATING MASS ADD 0,01 TO 0,02 tonne PER START FOR 1 tph OF HEAD FEED

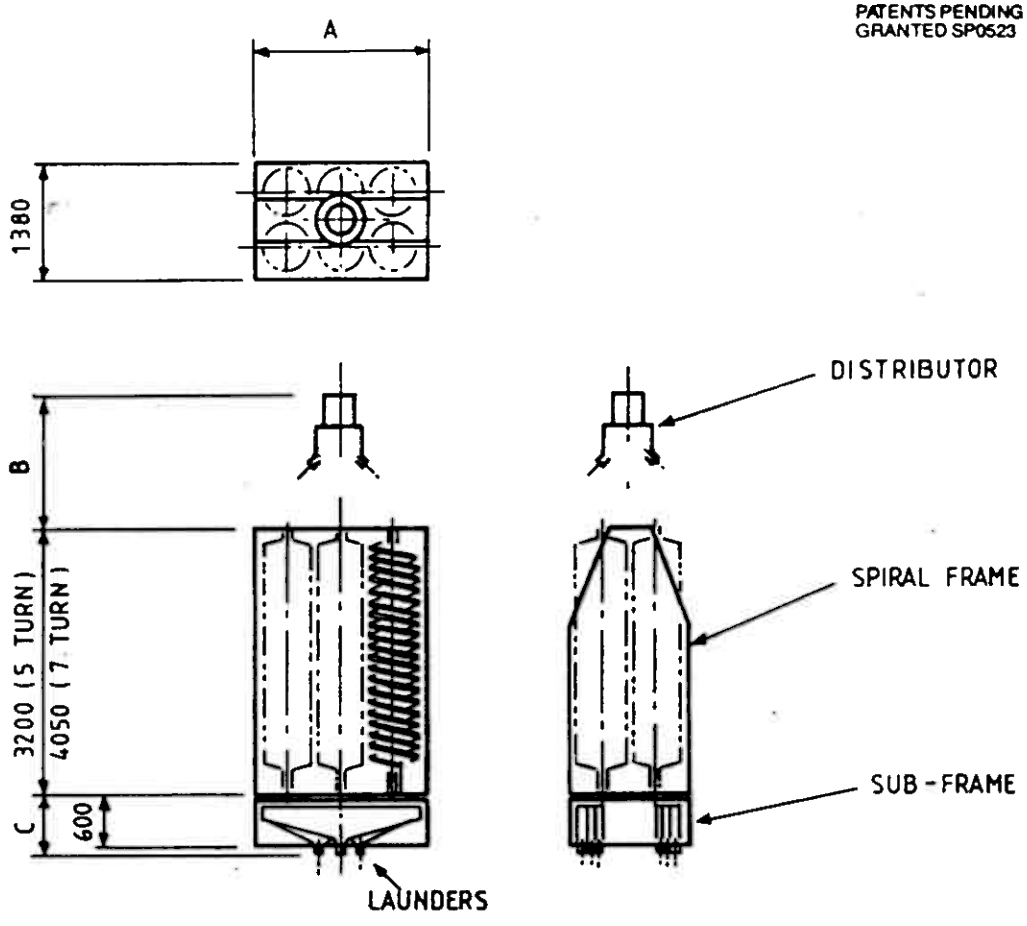
BRANCH OFFICES:

SOUTH AFRICA:
Mineral Deposits Ltd.,
47 Bezuidenhout Street, Wadeville 1407,
Transvaal, Republic of South Africa
Postal Address: P.O. Box 14546, Wadeville, 1422, South Africa.
Telephone: 8270330/1 Telex: 746146 Fax: 27/11/824/2728

BRAZIL:
Akw do Brazil,
(Equipmentos Para Mineracao Ltda)
Av. Industrial, 1.001
Jardim Cerejeiras,
Atibaia - SP 12.940 (Caixa Postal 232), Brazil
Telex: 79893 Telephone: 484 7522 Fax: 55114842267

TECHNICAL DATA SHEET | HG8 SPIRAL BANKS DOUBLE ROW

PATENTS PENDING AND GRANTED SP0523



N° OF SPIRALS		N° OF STARTS	DIMENSIONS			INSTALLED MASS OF MODULE (DRY) tonnes				VOLUME PACKED FOR FREIGHT m^3	
			A	B	C	TOP FED		BOTTOM FED			
						5 TURN	7 TURN	5 TURN	7 TURN	5 TURN	7 TURN
2	TWIN	4	745	1100	—	0,5	0,57	0,52	0,59	5	8
	TRIPLE	6	745	1100	—	0,55	0,65	0,57	0,67	5	8
4	TWIN	8	1380	1500	600	0,9	1,03	0,92	1,05	8.2	9.3
	TRIPLE	12	1380	1500	600	1,0	1,15	1,02	1,17	8.2	9.3
6	TWIN	12	2015	1500	725	1,2	1,42	1,23	1,45	11.5	14
	TRIPLE	18	2015	1600	725	1,38	1,6	1,42	1,65	11.5	14
8	TWIN	16	2650	1600	725	1,7	1,95	1,8	2,05	14.8	18
	TRIPLE	24	2650	1600	725	1,9	2,2	2,0	2,3	14.8	18

RECOMMENDED BOLTING-DOWN METHOD IS BY J-BOLTS
DRILLING THROUGH THE SUB-FRAME NOT RECOMMENDED
DIMENSIONS & MASSES SUBJECT TO CHANGE WITHOUT NOTICE
ALL DIMENSIONS IN MILLIMETRES
FEED PIPE FLANGE FOR BOTTOM FED MODULE { 150 AS TABLE D / 150 DIN 2576 ND10 / 6" ANSI 150 lb

FOR OPERATING MASS ADD 0,01 TO 0,02 tonne PER START FOR 1 tph HEAD FEED

MINERAL DEPOSITS LIMITED
Mineral Technology Division

HG8 - 7 Turn Spiral Concentrator

This comprises a spiral trough or troughs, feed box, product box and centre column.

Starts
The HG8 spiral concentrator can be supplied in three forms:

Single Start — 1 spiral trough per column.
Twin Start — 2 spiral troughs per column.
Triple Start — 3 spiral troughs per column.

Turns
For a HG8 spiral each trough has seven turns beginning at the feed box and ending at the product box.

Feed Box
The entry point at the top of the spiral for the pulp stream.

Auxilliary Splitters
The HG8 - 7 turn spiral has two auxilliary splitters on each trough. These are located on the 2nd and 4th turns of the trough. Both splitters are of a slide type with splitter operation controlled from outside the spiral.

Product Box
Located at the base of the spiral to divide the products generated by the product splitters.

Product Splitters
Device located in the product box to separate mineral flows into three products referred to as concentrate, middling and tailing.

Spiral Banks
The HG8 spirals are assembled into banks of spirals.
Banks are supplied with feed distributor, spiral sub-frame and product launders.

Spiral Features
- Three sets of splitters of the slide type per spiral trough.
- Repulping device is located on the spiral trough after each auxilliary splitter to assist recovery and concentration.
- A deflector device is located before the splitter to assist with mineral concentration.
- Product outlets are ganged for ease of operation.
- No wash water required.
- The splitter arrangement allows HG8 spirals to remove large quantities of high grade mineral as a concentrate.
- The HG8 spiral is constructed in strong lightweight fibreglass with polyurethane covering and castings for corrosion and abrasion resistance.

Design Data
Head Feed (Per Start)

Capacity: up to 3TPH solids depending on application.

Pulp Density (w/w): up to 50% solids.

Size Range: 0.03 - 2mm.

Pulp Volume (max.): 5.0mV/hr.

Concentrate Removal (Per Start)

Rate: up to 2.5 TPH solids.

Pulp Density: 30-60% solids w/w.

BRANCH OFFICES:

SOUTH AFRICA:
47 Bezuidenhout Street, Wadeville 1407
Transvaal, Republic of South Africa
Postal Address: P.O. Box 14546, Wadeville, 1422, South Africa.
Telephone: 8270330/1 **Telex:** 746146 **Fax:** 27/11/824/2728

UNITED KINGDOM:
Lynnfield House, Church Street,
Altrincham, Cheshire WA14 4DZ, England.
Telephone: (061) 928 9956 **Telex:** 656561 **Fax:** 061/928 8494

U.S.A.
14818 West 6th Avenue, Unit 10 A,
Golden, Colorado, U.S.A. 80401.
Telephone: (303) 279 8932 **Telex:** 283010 **Fax:** 303/2797702

BRAZIL:
Akw do Brazil
(Equipmentos Para Mineracao Ltda)
Av. Industrial, 1.001, Jardim Cerejeiras,
Atibaia - SP 12.940 (Caixa Postal 232), Brazil
Telephone: 484 7522 **Telex:** 79893 **Fax:** 55114842267

AGENTS:

Nordberg
A Nordberg Group Company

FACSIMILE COVERING LETTER

Date: 5/28/91.

To: DENNIS KEAY. (416) 231-5356

From: BRAD TOCKETT

Number of Pages (including covering letter) 4.

Transmitting from: NEFAX System III-SE Automatic
(519-821-4376)

IF YOU DO NOT RECEIVE ALL PAGES, CALL BACK AS SOON AS POSSIBLE.

Our number is 519-821-7070

BUDGET PRICING AS REQUESTED, ORIGINAL TO FOLLOW BY MAIL.

B.d.

Nordberg Machinery Limited
P.O. Box 1330, 700 Woodlawn Road West, Guelph, Ont., Canada N1H 6N8 Tel: 519/821-7070 Fax: 519/821-4376

Nordberg®

Kilborn Engineering

Toronto, Ontario

3' Standard Cone Crusher

Nordberg Group Company

May 28, 1991.

Kilborn,
2200 Lakeshore Blvd. West,
Toronto, Ontario.
M8V 1A4

Attention: Mr. Dennis Keay

Subject: Nordberg Machinery Limited
Quotation #567

Dear Mr. Keay:

We take pleasure in submitting our budget pricing for a 3' Symons Cone Crusher. The attached quotation covers basic machine description and a budget price of $ 167,600.00.

All prices are F.O.B. Guelph, Ontario and do not include any applicable Federal or Provincial Sales Tax.

Note that these are budget prices only and are subject to change.

Payment terms would be negotiated subject to satisfactory credit information being received.

In addition to our quotation we include, at no extra charge, two days of start up assistance and operator training to be performed by an authorized Nordberg Service Superintendent.

We trust you will find the enclosed information to your satisfaction, but please do not hesitate to contact us if you require any further details or have any additional questions.

Yours Sincerely,

B. J Tuckett

Brad Tuckett,
Product Application Specialist,
Nordberg Machinery Limited.

BT:ks

cc: Larry Erlendson

Nordberg Group Company

QUOTATION

Kilborn Engineering
Quotation #567
May 28, 1991
Page 1

DESCRIPTION: SYMONS CONE CRUSHER MODEL: 3' STD.

ONE (1) 3' Standard Symons Cone Crusher, equipped with:

- manganese steel crushing members
- duckworth wedge type bowl clamping system
- bronze bearings
- automatic tramp iron spring release
- independent oil lubrication system (consisting of oil tank with cooling coils, independent oil pump and motor, piping, relief valve, flow switch, pressure gauge, temperature switch and oil level indicator)
- crusher sheave, motor sheave and v-belts
- feed platform
- foundation bolts
- tools

Less drive guard, drive motor and controls

Note: Grease seal is standard

BUDGET PRICE: $ 167,600.00

OPTIONS:	PRICE
Air/fan oil cooler	$ 5,582.00
Oil Filter	2,171.00
100hp 575v 60hz motor	6,500.00

All prices are in Canadian funds F.O.B. Guelph, Ontario.

This quotation is subject to our standard conditions of sale appearing above and on the reverse side hereof, and to your acceptance within 30 days from date. Acceptance is expressly limited to the terms hereof. Prices quoted are our current prices and are subject to billing at our prices in effect and permitted by law at time of shipment.

4014A

Nordberg Machinery Limited
P.O. Box 1330, 700 Woodlawn Road West, Guelph, Ont., Canada N1H 6N8 Tel: 519/821-7070 Fax: 519/821-4376

KILBORN

DESIGN CALCULATION Nº

AREA	SECT.	Nº
—	—	

CLIENT _____ PAGE ____ CONT. ON ____

PROJECT _____ PROJ. Nº 3754 PREP. ____ DATE JUN 91

AREA _____ DIV. Nº 15 CHECK ___ DATE ____

SUBJECT _____ REF. DWG. Nº _____

SLIP ENERGY RECOVERY SYSTEM — $400.000
RELCON OF BRAMPTON, ONTARIO

→ CONVERT 2 × 3500 single speed motors on FAG mill to "Variable Speed System"

Requires: addl costs of

140 { $25K (US) for starters
$20K (US) for switches
$45K (US) for capacitor bank + switches
$50K (US) for wiring system

Recognize $150 K for reversing motors

Total Cost: 400
140
150 — see Direct Costs
$690 say $700

Mill 760 — doubled = 1,500,000
700,000
2,200,000

Add 300 for shipping → 2,500,000

FORM KE-18 REV. 3.

OROCON INC.

1456 MAIN STREET, NORTH VANCOUVER, B.C., CANADA V7J 1C8 TEL: (604) 980-7986 FAX: (604) 980-0572

May 30th, 1991

Kilborn Engineering
2200 Lakeshore Blvd. West,
Toronto, Ont.
M8V 1A4

Attention: Mr. Paul Tucker

We are couriering you the following manuals and drawings on our 27' x 18' Allis-Chalmers Rockcyl SAG Mill.

1. Parts Book
2. A-C 27' x 18' Rockcyl Mill - Mill Parameters
3. "Primary Grinding at Hanna Mining Co." - Technical Paper
4. Installation, Operation and Maintenance - Trunnion Bearings
5. 1C9291 Liquid Rheostats
6. Drawings (51)

We have many more original drawings, parts and equipment manuals, correspondence and files in our North Vancouver office if you would like to inspect them.

Our Electrical Manager, Heinz Drews, tells me that the main motor contactor is missing (used unit available for approximately $12,000) and the control relays would now be replaced by a modern PLC unit. Westinghouse say the motors can be reconnected to 8 poles from the existing 10 poles and will work on 50 cycle power.

However, motor life will be impaired and they recommend re-winding the motor and starter for 50 Hz operation. Total cost for both motors: $150,000. This is a good price because it would cost $30,000 to $40,000 to overhaul the motors anyway. All switchgear is good for 50 Hz. Motor speed will go from 720 to 750 RPM when going to 50 cycle. If this is a problem, a reducer pinion gear could be changed. However, a small speed increase (4.2%) may not be a problem.

Please call us if you need more information.

Yours truly.

Mike Ross
President
Orocon Inc.

MR/sd

DROCON INC.

FACSIMILE COVER SHEET

DESTINATION FAX #: 416-231-5356 ORIGIN FAX #: (604) 980-0572

TO: PAUL TUCKER / Kilborn ENG.

ATTENTION:

FROM: MIKE ROSS

DATE: 30 MAY / 91. SENT BY: MR

NUMBER OF PAGES TRANSMITTED INCLUDING THIS COVER SHEET 34

IF YOU DO NOT RECEIVE ALL OF THE PAGES OR FIND COPIES ILLEGIBLE, PLEASE CONTACT THE SENDER ASAP: (604) 980-7595

MESSAGE INFO ON LIQUID RHEOSTATS IS ATTACHED. EXTRA ELECTRICAL PARTS REQ. FOR INSTALLATION ARE ESTIMATED AS FOLLOWS.

	$ 000's
USED MAIN MR CIRCUIT BREAKER, 1200A 5KV	15.0
PLC	30.0
overhaul Liq Rheostat	5.0
Panelmate II	10.0
MCC for Auxiliary devices, Instrumentation	25.0
* Rewind motors for 50 HZ operation	150.0
TOTAL .	235.0

TRAY, CABLING & MISC SUPPLIES NOT INCL BUT ESTIM. AT $90,000. (depends on distances)

Mike Ross

1458 MAIN STREET, NORTH VANCOUVER, B C CANADA V7J 1C8 TEL (604) 980-7595

KILBORN

DESIGN CALCULATION Nº

AREA	SECT.	Nº
–	–	

CLIENT _____ PAGE ____ CONT. ON ____

PROJECT _____ PROJ. Nº 3754 PREP. ____ DATE 5 JUN 91

AREA _____ DIV. Nº 15 CHECK ____ DATE ____

SUBJECT _____ REF. DWG. Nº _____

SLIP ENERGY RECOVERY SYSTEM
RECON OF BRAMPTON, ONTARIO

$400.000

→ CONVERT 2 x 3500 single speed motors on FAG mill to "Variable Speed System"

Requires: add'l costs of

140
- $25K (US) for starters
- $20K (US) for switches
- $45K (US) for capacitor bank + switches
- $50K (US) for wiring system

Recognize $150 K for rewinding motors

Total Cost:

400	
140	
150	± see Direct Costs
$690	say $700

Mill 760 – doubled = 1,500.000
700.000
2,200,000 → 2,500,000

3:05

DK

WHITE RESOURCES CORPORATION
125 W. Granite • Butte, MT 59701 • (406) 782-2379 • Fax (406) 723-9554

FAX COVER SHEET

TO : BERNIE TYSON

FROM : HALEY BEAUDRY

FAX :

DATE : 30/Apr/91

PAGES INCLUDING COVER: 10

TIME :

Rec'd from B. Tyson 31 May 91

OUR TELEPHONE NUMBER IS (406) 782-2379; AND OUR FAX NUMBER IS (406) 723-9554, BUTTE, MONTANA. IF YOU DO NOT CALL OR FAX, WE WILL ASSUME THE MESSAGE WAS WELL RECEIVED.

MESSAGE

Bernie,

I found this listing this afternoon. Mr. Mike Loss faxed me this package. He has "over 100 lb. of drawings" as well as other specs; and he is going to receive a report on the mill from Wright Engineers (They studied it for Sante Fe.) sometime soon. Regards, Haley

OROCON INC.

1408 MAIN STREET, NORTH VANCOUVER, B.C. CANADA V7J 1C8 TEL: (604) 980-7886 FAX: (604) 980-0672

QUOTATION

(1) Used Allis Chalmers 27' x 18' SAG Mill
- Mfg. ID# 2-2-77-041451
- powered by (2) 3500 HP Westinghouse induction motors, type CWP-6, 713 RPM
- 4160 volts,449 amps, secondary volts:1334 volts, 120 amps
- serial # 1S-85P-610 & 2S-85P-610
- incl. motor starters, control panels & other electric components available
- c/w mill drawings, foundation drawings & electric system drawings
- c/w special mill tools & spare parts - list attached
- c/w liner handler

F.O.B. Butler Taconite, Hibbing, Minnesota, loaded on truck or rail

PRICE: US$ 780,000

The above is powered with (2) 3500 HP motors, motor starters and operating control panel. Main drive gear and pinion gears are in good condition. Journal and shell of the mill are in good condition. Hour meter on the main switch gear shows 60,000 hours. The mill was purchased new in 1975 and this mill was completely rebuilt in May 1980, replacing new journal, new shells and rebuilt heads, etc. No cracks in any part of the mill.

All equipment quoted is subject to prior sale. Taxes and duty extra, if applicable.

ALLIS CHALMERS SAG MILL - 27' X 18'

LIST OF SPARE PARTS

PART NO.	MFG. NO.	DESCRIPTION	QTY.
3920	1 1/2 x 8	Bolt,liner	5
3921	1 1/2 x 8 x 2.5	Bolt, liner	21
3922	1 1/2 x 9.75	Bolt, liner	21
3923	1 1/2 x 13	Bolt, liner	20
3927	2 x 20.5	Bolt, liner	22
3929	2 x 25	Bolt, liner	10
3030	2 x 30	Bolt, liner	25
4010	FR-5245	Liner, feed, hd., ring	3
4026	C-4046	Ring, filler, F.H.	15
4036	F-4036	Grate, 3/4" radial	4
4051	F-4051	Liner, inner, F.H.	12
4052	F-4052	Liner, throat F.H.	14
4053	HC40534	Liner, end chute	14
4054	HC-5054	Rail, dead bed chute	3
5000	B29286	Shaft, spur pinion, rebuilt	1
5054	00-631-221-116	Nut, acorn - 1.0"	4
5059	1040-0	Insert, bronz bearing	1
5060	07-260-745-001	Liner, chute, long	4
5061	07-260-745-002	Liner, chute, short	3
5062	07-260-745-003	Liner, chute, long	2
5063	07-260-745-004	Liner, chute, short	3
5064	07-260-745-001	Liner, chute, long	3
5065	07-260-747-001	Liner, chute, short	1
5066	07-260-748-001	Liner, front, long	13
5067	07-260-748-002	Liner, front, short (new - 12 re)	3
5071	07-260-741-001	Liner, front side, Up RH	2
5072	07-260-741-002	Liner, front side, Up LH (new - 5 reb)	2
5073	07-260-742-002	Liner, cir. side rev (new - reb)	8
5074	07-260-739-002	Liner, chute side RH	2
5075	07-260-739-001	Liner, chute side LH	2
5076	07-260-744-002	Liner, back side RH	4
5077	07-260-744-001	Liner, back side LH	2
5079	07-156-951-001	Hose assy.	1
5082	5082	Plate, cast liner (reb)	8
5083	5083	Plate, cast liner (reb)	8
5084	5084	Plate, cast liner (reb)	2
5086	07-737-767-886	Gauge, oil sight	2
5089	2" x 2 1/2"	Plug, tex	159
5090	597-0086	Regulator	1
5091	07-158-877-501	Ring assy., seal	1
8006	A2009J	Bar, scoop clamp	34
8010		Seal, trunnion discharge	2
8012	A2009H	Scoop max. open area	32

ALLIS-CHALMERS

27' X 18' ROCKCYL. MILL

TECHNICAL DATA

DRIVE MOTORS: 3 x 3,500 HP Wound Rotor Motors

MAKE:	Westinghouse
SIZE:	3,500 HP, 2,610 kW
PRIMARY VOLTAGE:	4,000V
PRIMARY AMPS:	449 A
SECONDARY VOLTAGE:	1,334 V
SECONDARY AMPS:	1,201 A
FULL LOAD RPM:	713 RPM
PULL OUT TORQUE:	215 %
WK^2:	25,500 lb.-ft.^{2}
EFFICIENCY:	95.9% at full load
POWER FACTOR:	86.5% at full load
FRAME:	CWP-6
SERIAL NUMBERS:	1S-85P610 & 2S85P610

LIQUID RHEOSTAT:

MAKE:	General Electric
SIZE:	2 x 6,000 HP
MEDIUM:	light soda ash

GEAR REDUCER:

MAKE:	Falk Corporation
H.S. SHAFT RPM:	705 RPM
L.S. SHAFT RPM:	131.78 RPM
RATIO:	5.35:1
CATALOGUE RATING:	6,500 HP
SERVICE RATING:	3,250 HP
SERVICE FACTOR:	2.0
UNIT SIZE:	51 x 27Z1S
OIL CAPACITY:	295 US gallons
EFFICIENCY:	98.5%

SAG MILL:

MILL WORKING DIA.:	26 ft.
NOMINAL LENGTH INSIDE LINERS:	18 ft.
TOTAL VOLUME INSIDE LINERS:	9,123 cubic feet
MILL SPEED:	11.46 RPM
MILL SPEED (% OF CRITICAL):	76.5%
MAX. CHARGE:	15.5% of mill volume
MAX. DESIGN CHARGE WEIGHT:	513,000 lbs.
MAX. LINER WEIGHT:	605,000 lbs.
MAX. BALL CHARGE:	11% of mill volume or 322,779 lbs. (290 lbs. per cubic foot)

SPUR GEAR:

PITCH DIAMETER:	364" or 30'4"
NUMBER OF TEETH:	372
LENGTH OF FACE:	33"

PINION SHAFT:

PITCH DIAMETER:	31.311"
SHAFT DIAMETER:	
SHAFT LENGTH:	10'1"
NUMBER OF TEETH:	32
LENGTH OF FACE:	33-1/2"

13/2/91

ALLIS CHALMERS 27' DIAMETER X 18' ROCKCYL MILL
7000 HP AUTOGENOUS MILL
DRAWING LIST

TRANSMITTAL

GENERAL ARRANGEMENTS

4209-X11-1 - - Line 5 - Flowsheet & Equipment List
4209-X11-2 - Rev. 2 - Line 5 - General Elevation
4209-X11-3 - Rev. 1 - Line 5 - Elevation A & B
4209-X11-4 - Rev. 1 - Line 5 - Floor Plans @ El. 0'0", 14'0" & 22'0"
4209-X11-6 - - Line 5 - Floor Plan @ El. 62'6", 53'0", 47'0", 39'0" & 26'0"

GENERAL

4209-X11-A1 - Line 5 - Drawing Index & General Notes - Architectural
4209-X11-A2 - Line 5 - Electrical Control Room Addition - Plan & Elev.
4209-X11-A3 - Line 5 - Architectural Details
4209-X11-A4 - Line 5 - Lube Oil Room - Plan & Elevations

4209-X11-B1 - Line 5 - Conveyor Data Sheet
4209-X11-B2 - Line 5 - Pulley Data Sheet, Equipment Guards & Scrapers
4209-X11-B3 - Line 5 - Exist. Conveyor Changes, Drive & Pulley Relocat
4209-X11-B4 - Line 5 - 24" Recirculating Conveyor #1
4209-X11-B5 - Line 5 - 24" Recirculating Conveyor #2
4209-X11-B6 - Line 5 - 24" Recirculating Conveyor #3
4209-X11-B7 - Line 5 - 24" Recirculating Conveyors #1 & #2 Skirting & Chutes

4209-X11-C1 - Line 5 - General Notes, Drawing List & Std. Details
4209-X11-C2 - Line 5 - Screen Feed Sump
4209-X11-C3 - Line 5 - Mill Feed Conv. Disch. Chute & Diversion Chute
4209-X11-C4 - Line 5 - Screen Oversize Chute
4209-X11-C5 - Line 5 - Screen U/Size Launder
4209-X11-C6 - Line 5 - Cobber Conc. Launders & Cobber & Cyclone Feed Sumps
4209-X11-C7 - Line 5 - Cyclone U/Flow & O/Flow Launders
4209-X11-C8 - Line 5 - Trommel U/Size & O/Size Chute

4209-X11-D1 - Line 5 - Existing Dust Collection Modifications

4209-X11-G1 - Line 5 - Crib Wall & Ramp - Plan, Elevations & Specifications

4209-X11-M1 - Line 5 - Portable Inching Device Base

STRUCTURAL STEEL

4209-X11-S1 - Rev. 1 - Line 5 - Drawing Index & General Notes
4209-X11-S2 - - Line 5 - Demolition Floors @ El. 14'0", 22'0-7/8 & 32'6"
4209-X11-S3 - - Line 5 - Demolition Platforms @ El. 42'9", 47'6 & 53'0"
4209-X11-S4 - - Line 5 - Demolition Plan @ 62'6", Crane Griders Conveyor Ramp #3
4209-X11-S5 - - Line 5 - Floors @ El. 53'0" & 70'0" - Plans & Sections
4209-X11-S6 - - Line 5 - Miscellaneous Details
4209-X11-S7 - - Line 5 - Cobber Floor @ El. 31'6" & Distributor Platform @ El. 54'9-1/8"
4209-X11-S8 - - Line 5 - Cyclone Floors @ El. 47'0" & 39'0"
4209-X11-S9 - Rev. 8 - Floor @ El. 14'0" - Plans, Sections & Details
4209-X11-S10 - Rev. 3 - Line 5 - Floor @ El. 32'6" - Plans & Details
4209-X11-S11 - Rev. 1 - Line 5 - Floor @ El. 41'11" - Plans & Details
4209-X11-S12 - Rev. 0 - Line 5 - Floor @ El. 62'6" - Plans, Sections & Details
4209-X11-S13 - - Line 5 - Recycle Conv. #2 Ramp
4209-X11-S14 - - Elevation Line 14 - Sections & Details
4209-X11-S15 - - Line 5 - Recycle Conv. #1, Removable Ramp & Diagonal Bracing
4209-X11-S16 - - Line 5 - Stairs from El. 0'0" to El. 14'0"

CONCRETE

4209-X11-F1 - - Line 5 - General Notes, Key Plan & Drawing Schedule
4209-X11-F2 - - Line 5 - New Mill Foundation, Excavation & Fil Concrete
4209-X11-F3 - - Line 5 - Demolition Drwg., Existing Mill Found

4209-X11-F4 - Rev. 2 - Line 5 - New Mill Foundation - Mill Foundation M
4209-X11-F5 - Rev. 7 - Line 5 - New Mill Foundation Pier Outline Detail
4209-X11-F6 - Rev. 3 - Line 5 - New Mill Foundation Plans & Elevation
4209-X11-F7 - Rev. 0 - Line 5 - New Mill Foundation Sections
4209-X11-F8 - Rev. 3 - Line 5 - New Mill Foundation Elevations & Sectic
4209-X11-F9 - Rev. 1 - Line 5 - Floors @ El 53'0", 62'6", 14'0" - Slabs Details
4209-X11-F10 - Rev. 2 - Line 5 - Cobber Floor @ El. 31'9 1/2"
4209-X11-F11 - - Floors @ El. 14'0" & 14.17' - Plans, Sections & Details
4209-X11-F12 - - Line 5 - Floor @ El. 32.5' & 44.54' - Plans, Sections & Details
4209-X11-F13 - Rev. 1 - Line 5 - Grade Slab Plan Drainage & Details
4209-X11-F14 - Rev. 1 - Line 5 - Embedded Steel Details
4209-X11-F15 - Rev. 1 - Line 5 - Anchor Bolt Details
4209-X11-F16 - - Line 5 - Pump Pads - Plan & Details

PIPING

4209-X11-P1 - - Screens Distributor Feed & O/Flow Piping
4209-X11-P2 - - Screens Distribution Piping
4209-X11-P3 - - Cobber Distributor Feed & Distribution O/Flow
4209-X11-P4 - - Magentic Separators Distributor Piping
4209-X11-P5 - - Magnetic Separators U/Flow & O/Flow & Floor Drains
4209-X11-P6 - - Ball Mill Feed & Cyclones Feed & Discharge Pi
4209-X11-P7 - - Slurry Piping Details
4209-X11-P8 - - Slurry Piping Details
4209-X11-P9 - - Recirculating Water
4209-X11-P10 - Rev. 2 - Autogenous Mill Lubrication Piping
4209-X11-P11 - - Air, Fire Protection & Misc. Details
4209-X11-P12 - Rev. 4 - Line 5 - Recirculating & Cooling Water Piping
4209-X11-P13 - - Line 5 - Floor Drains on Elev. 14' & 53'

PIPING & INSTRUMENTION DIAGRAM

4209-X11-PID-1 - Rev. 0 - Piping & Instrumentation Diagram Slurry & Recirculating Water
4209-X11-PID-2 - Rev. 0 - Piping & Instrumentation Diagram Cooling We Lube & Air Piping

ELECTRICAL

4209-X11-EP6-1 - Rev. 1 - Line 5 - Electrical Single Line Diagram
4209-X11-EP6-2 - Rev. 1 - Line 5 - Primary Mill Connection Diagram
4209-X11-EP6-2A - Rev. 1 - Line 5 - Primary Mill Control Schematic
4209-X11-EP6-2A - Rev. 3 - Line 5 - Primary Mill Control Schematic
4209-X11-EP6-2B - Rev. 1 - Line 5 - Primary Mill Control Schematic
4209-X11-EP6-2C - Rev. 2 - Line 5 - Primary Mill Control Schematic Rela
4209-X11-EP6-2C - Rev. 1 - Line 5 - Primary Mill Control Schematic Rela
4209-X11-EP6-3 - Rev. 1 - Line 5 - Liquid Rheostat Control Schematic
4209-X11-EP6-3A - Rev. 0 - Line 5 - Liquid Rheostat Control Relays
4209-X11-EP6-4 - Rev. 3 - Line 5 - Relay Panel R108 Layout
4209-X11-EP6-5 - Rev. 2 - Line 5 - Relay Panel R108 Terminal Board Connection Diagram
4209-X11-EP6-5A - Rev. 1 - Line 5 - Relay Panel R108 Jumper Layout & Schedule
4209-X11-EP6-6 - Rev. 3 - Line 5 - Control Panel C570 Layout & Connection Diagram (Sht. 1)
4209-X11-EP6-6 - Rev. 1 - Line 5 - Control Panel C570 Layout & Connection Diagram (Sht. 2)
4209-X11-EP6-7 - Rev. 2 - Line 5 - Reset Stations C571 & C572
4209-X11-EP6-8 - Rev. 1 - Line 5 - Electrical Power Layout El. 0'0"
4209-X11-EP6-9 - Rev. 0 - Line 5 - Electrical Power Layout El. 14'0" & 22'0"
4209-X11-EP6-10 - Rev. 0 - Line 5 - Electrical Power Layout El. 20'0". 26'1 1/2". 32'6". 33'5" & 41'11"
4209-X11-EP6-11 - Rev. 0 - Line 5 - Electrical Power Layout El. 32'6" 53'0"
4209-X11-EP6-12 - Rev. 1 - Line 5 - Electrical Power Layout El. 0'0" & 14'0"
4209-X11-EP6-13 - Rev. 0 - Line 5 - Electrical Power Layout El. 0'0" Instrument
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 1)
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 1A)
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 2)
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 3)
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 4)
4209-X11-EP6-14 - Rev. 2 - Line 5 - Cable & Conduit Schedule (Sht. 5)
4209-X11-EP6-15 - Rev. 3 - Line 5 - Cable & Conduit Schedule Instrumentation (Sht. 1)

4209-X11-EP6-15 - Rev. 3 - Line 5 - Cable & Conduit Schedule Instrumentation (Sht. 2)

4209-X11-EP6-16 - - Line 5 - Electrical Cable Tray Demolition

4209-X11-EP6-17 - - Line 5 - Electrical Cable Tray Demolition

4209-X11-EP6-18 - - Line 5 - Electrical Cable Tray Demolition

4209-X11-EP6-19 - - Line 5 - Relay Panel R108 Dismantling

4209-X11-EL6-1 - - Line 5 - Lighting Plan, Primary Grinding, El. 0'0"

PERRY EQUIPMENT COMPANY, INC. EQUIPMENT FOR THE PROCESS INDUSTRIES

MOUNT LAUREL ROAD, HAINESPORT, NEW JERSEY 08036 ■ PHONE: (609) 267-1600 ■ TELEX: 84-5297 ■ FAX: (609) 267-4499

03 JUN 1991

[illegible] LIMITED FAX TO: (#) 416-231-5356

TARIO, CANADA

TENTION: MR. PAUL V. TUCKER REF. ANDORJA MAGNETITE - NORWAY

AR MR. TUCKER:
REQUESTED IN YOUR RECENT INQUIRY, WE ARE PLEASED TO DESCRIBE
E FOLLOWING EQUIPMENT:

USED BIRDSBORO-BUCHANAN 36" X 48" BLAKE TYPE DOUBLE JAW CRUSHER. 150HP 3/60/2300 VOLT MOTOR. INCLUDES SPARE PARTS.
ZR27340 PRICE: $65,000 WHERE IS, CANADA

UNUSED 42" X 54" ROLLER BEARING OVERHEAD ECCENTRIC JAW CRUSHER MANUFACTURED BY KOBEL.CO. COMES WITH UNUSED 200 HP MOTOR. SINGLE TOGGLE. 1988.
ZR29245 PRICE: $180,000 WASHINGTON

* USED TELSMITH MODEL 36FC CONE CRUSHER, WITH CRUSHER SHEAVE, BUT WITH
* OUT MOTOR (REQUIRES 75 HP, [illegible] RPM)
16709 PRICE: $27,500 HAINESPORT

* USED SYMONS 3' STANDARD CONE CRUSHER, S/N 3387 WITH CRUSHER
* SHEAVE.
17153-1 PRICE: $24,500 HAINESPORT

* USED TELSMITH 367-S GYRASPHERE CONE CRUSHER, MODEL "B", INCLUDING
* OIL TANK. 28" DIAMETER X 9" WIDE, 6-GROOVE "D" SECTION DRIVE
* PULLEY, LESS POWER.
17037V PRICE: $24,500 HAINESPORT

USED SYMONS 3' SHORT HEAD CONE CRUSHER. INCLUDES SPARE FINE BOWL AND FINE LINER. INCLUDES OIL RESERVOIR TANK AND PUMP. 75 HP MOTOR, 1200 1200 RPM.
ZR25251 PRICE: $32,500 CANADA

USED 3' STANDARD SYMONS CONE CRUSHER WITH 125 HP DRIVE MOTOR, OIL PUMP AND TANK. CRUSHER REPORTED TO HAVE RECENTLY BEEN REBUILT. MEDIUM BOWL AND LINERS.

PERRY PERRY EQUIPMENT COMPANY, INC. EQUIPMENT FOR THE PROCESS INDUSTRIES

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ZR24555 PRICE: $32,500 KENTUCKY

USED ALLIS CHALMERS 28' DIA. X 16' LONG SEMI-AUTOGENOUS GRINDING MILL WITH (2) 3500 HP MOTORS, STARTERS AND REDUCERS. LOTS OF SPARES. SHELL IS BOLTED INTO 2 PIECES LENGTHWISE AND INTO 4 PIECES CIRCUMFERENTICALLY. MILL HEADS ARE ALSO 2 PIECES EACH. MILL WAS LAST USED WITH A 5" PARTIAL BALL CHARGE. NEW 1975. SHUTDOWN IN 1985. ACCESSORIES ALSO INCLUDE A LINER HANDLER FOR THE STEEL LINERS. LAST USED IN WET GRIND SERVICE AT 350 TPH.

ZR26568 PRICE: $825,000 MINNESOTA

USED 6' X 12' ALLIS CHALMERS DOUBLE DECK RIPL-FLO VIBRATING SCREEN. 20 DEGREE SLOPE. INCLUDES 10 HP MOTOR AND RECONDITIONING.

ZR25290 PRICE: $10,000 CANADA

* USED 5' WIDE X 10' LONG W.S. TYLER MODEL F900 TY-ROCK INCLINED
* VIBRATING SCREEN, SINGLE DECK, WITH APPROX. 20 HP ELECTRIC
* MOTOR DRIVE.

16596-01 PRICE: $6,500 WHERE IS, MISSOURI

USED 4' WIDE X 12' LONG HORIZONTAL DOUBLE DECK VIBRATING SCREEN WITH SPARE ECCENTRIC. MANUFACTURED BY CEDARAPIDS.

ZR28992 PRICE: $7,500 OKLAHOMA

USED C.E. TYLER 4' X 12' DOUBLE DECK TYROCKET. INCLINED SCREEN, S/N 50-1865, TYPE 330. WITH 3 HP MOTOR AND DRIVE.

[illegible]31-T103 PRICE: $7,500 WHERE IS, MAINE

USED STEARNS MODEL #WPD, 36" X 48" TRIPLE DRUM WET MAGNETIC SEPARATOR. PERMANET TYPE. COMPLETE WITH DRIVES AND MOTOR. RATED 50 TON/HR.

Z16645 PRICE: $8,500 NEVADA

USED STEARNS-ROGER 30" X 48" MAGNETIC SEPARATORS, MODEL MD, SINGLE DRUM. (3) AVAILABLE.

Z16646 PRICE: $3,250 NEVADA

USED ALLIS CHALMERS 6' DIA. X 10' LONG BALL MILL. TRUNNION DISCHARGE, 150 HP MOTOR. STEEL LINED LAST USED WET. (2) AVAILABLE.

XZR13841 PRICE: $44,500 WHERE IS, NEW JERSEY

USED GALIGHER AGITAIR #48 50 CUFT FLOTATION CELLS ARRANGED IN A BANK OF 26. CELLS CAN BE BROKEN INTO 4-CELL UNITS. EACH 2 CELLS ARE DRIVEN BY (1) 20 HP ELECTRIC MOTOR. (2) AVAILABLE.

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KILBORN LIMITED
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ZRV2-20548 PRICE: $750 WHERE IS, NEW MEXICO

* USED SPERRY 12" X 12" STAINLESS STEEL PLATE AND FRAME FILTER PRESS.
* TYPE 47, S/N 73189. (8) 2" FRAMES, (3) 1" FRAMES, AND (5) 1/2"PLATES.
* 4 EYE. CLOSED DELIVERY. HANDWHEEL CLOSURE. ON STAND WITH CASTERS.

18055-2 PRICE: $3,750 HAINESPORT

USED SPERRY 12" X 12" STAINLESS STEEL PLATE AND FRAME FILTER PRESS. (5) 2" PLATES AND (6) 2" FRAMES FOR APPROX. 9 SQ. FT. FILTERING AREA. APPROX. .36 CU. FT. CAKE CAPACITY. 4 EYE RATCHET CLOSURE.

ZG27065 PRICE: $3,750 ILLINOIS

USED 12" X 12" INDEPENDENT STAINLESS STEEL PLATE AND FRAME FILTER PRESS. (11) CHAMBERS, 12"X12"X1", HAND RACHET CLOSURE. 4-EYE CLOSED DELIVERY. 14" FILLER BAR. UNIT ON CASTERS. APPROX. .75 CU.FT. CAKE CAPACITY. 18 SQ.FT. FILTER AREA. (2) AVAILABLE.

G22579 PRICE: $6,800 NEW JERSEY

USED SPERRY 12" X 12" STAINLESS STEEL PLATE AND FRAME FILTER PRESS. 3-EYE, CLOSED DELIVERY. (15) CHAMBERS, 1/2" FRAMES. HAND CLOSURE. WITH STAINLESS STEEL CENTRIFUGAL WORTHINGTON PUMP, MODEL 1CGH.

ZG22594 PRICE: $8,000 NEW JERSEY

* USED 12" X 12" SPERRY PLATE AND FRAME FILTER WITH 20 STAINLESS STEEL
* PLATES AND 20 STAINLESS STEEL FRAMES, 40 SQ. FT., WITH 2" CAKE
* CAPACITY, 4 EYE DELIVERY HAND CLOSURE.

18249-4 PRICE: $9,750 HAINESPORT

USED 50' DIA. X 12' DEEP EIMCO THICKENER, WITH BRIDGE, ENCLOSED GEAR DRIVE, APPROX. 3 HP MOTOR, MANUAL LIFTING DEVICE.

ZR26008 PRICE: $17,500 NEVADA

USED 8' DIA. X 6' LONG ALLIS CHALMERS BALL MILL. INCLUDES 200 HP MOTOR.

ZR28725 PRICE: $25,500 IDAHO

USED MARCY 8' X 6' BALL MILL, 300 HP DRIVE, 2200 VOLTS.

ZR25020 PRICE: $88,000 WHERE IS, CALIFORNIA

USED 9' DIA. X 8' LONG MARCY WET-GRIND BALL MILL. 450 HP, 440 VOLT MOTOR. HERRINGBONE GEAR. STEEL LINERS AND SCOOP FEED.

ZR28632 PRICE: $78,500 COLORADO

USED MARCY 9' DIA. X 9' LONG BALL MILL, 600 HP DRIVE, 2300 VOLTS,

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TROMMEL DISCHARGE, INCLUDING WEIGHT BELT FEEDER. (2) AVAILABLE.
ZR25019 PRICE: $112,500 WHERE IS, CALIFORNIA

USED ALLIS CHALMERS 9' DIA. X 10' LONG BALL MILL, 400 HP DRIVE.
ZR25096 PRICE: $92,500 WHERE IS, CANADA

USED DORR OLIVER, 7' DIA. X 10 DISC ROTARY FILTER. 670 SQ. FT. FILTER AREA, CARBON STEEL, SPEED 1/3 TO 2-3/4 RPM, WITH 14" PADDLE AGITATOR, TWO MOTORS 5 AND 7-1/2 HP, 3/60/460 VOLT. PUMP RATED FOR 5200 CFM @ 27". (2) AVAILABLE.
ZR21958 PRICE: $12,500 WHERE IS, WISCONSIN

USED 8'6" DIA. X 8 DISC DOOR-OLIVER ROTARY VACUUM DISC FILTER. HAS TYPE 6F3 PADDLE AGITATOR. COMPLETE WITH MOTORS AND DRIVES. INCLUDES ASSOCIATED SPARE PARTS, VACUUM PUMP MUFFLER, MISCELLANEOUS VALVES, PIPING AND MOTORS ASSOCIATED WITH FILTER.
ZR27320 PRICE: $67,500 UTAH

* USED BELOIT JONES 120" X 10 DISC POLYDISC FILTER, S/N S.O.253, 1,300
* SQ. FT. WITH DRIVE AND MOTOR.
# 231-SP04 PRICE: $75,000 WHERE IS, MAINE

USED JONES 10' DIA. X 9 DISC POLYDISK FILTER, 304 STAINLESS STEEL, WITH STAINLESS STEEL REPULPER, AUTOMATIC SELF PURGING SHOWER, CONSISTENCY REGULATOR. USED 3 YEARS. WAS USED AT 4500 GPM, 3.84 DRAINAGE RATE AT .5% CONSISTENCY. 3/4 HP REPULPER MOTOR, 10 HP DC MOTOR ON FILTER, STAINLESS STEEL HOOD. (2) AVAILABLE.
ZR26499 PRICE: $137,500 WHERE IS, OHIO

USED IMPCO 9'6" DIA. X 12 DISC FILTER, 316 STAINLESS STEEL CONTACTS. PREVIOUSLY USED ON PAPER MACHINE SULPHITE.
XZW27868 PRICE: $45,000 WHERE IS, CANADA

USED VOITH 108" DIA., 12 DISC VACUUM FILTER, STAINLESS STEEL CONTACT PARTS WITH DRIVE AND MOTOR. (2) AVAILABLE.
ZW26486 PRICE: $79,500 WHERE IS, EUROPE

243-421-01

USED DORR-OLIVER 9' DIA. X 12 DISC ROTARY VACUUM FILTER. PLASTIC AND STAINLESS SECTORS. CARBON STEEL TUB. HAS NASH CL5002 400 HP VACUUM PUMP. FILTER HAS VARISPEED DRIVE AND WASH PIPES. NEW 1983. APPROX. 1450 SQ. FT. FILTERING SURFACE AREA.
ZR28050 PRICE: $92,500 WHERE IS, MISSOURI

* USED NASH MODEL CL3002 VACUUM PUMP, TEST #72U1729. 420 RPM. ALLIS

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* CHALMERS 125 HP, 1760 RPM, 460 VOLT MOTOR. SILENCER.
# 231-M101 PRICE: $10,800 WHERE IS, MAINE

PLEASE LET US KNOW HOW WE CAN BE OF FURTHER SERVICE.

SINCERELY,

PERRY EQUIPMENT COMPANY, INC.

Jeffrey Israel

JEFFREY ISRAEL