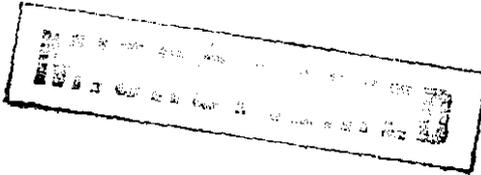


000

435001

90-3187

MINES	
File No.	E.L. 17/68
- 4 OCT 1990	
Recd. Ref.	
Auction Officer	Initials
Refer to	
CORRES. 2.10.90	
Resort to	Date



TASMANIA MINES LIMITED

EXPLORATION LICENCE 17/68

KARA - HAMPSHIRE

NW TASMANIA

ANNUAL REPORT

4TH NOVEMBER 1989 TO 4TH NOVEMBER 1990

OPEN FILE

Cliff H. Whitehead
 Cliff H. Whitehead
 2nd October 1990

EL 17/68 - ANNUAL REPORT

4TH NOVEMBER 1989 TO 4TH NOVEMBER 1990

C O N T E N T S

	<u>PAGE No</u>
1. GENERAL	1
2. EXPLORATION OBJECTIVES	2 - 3
3. EXPLORATION WORK (1989/90)	4
3A - Hampshire Magnetite Skarn Zone	4 - 5
3B - Hampshire Silver Mine	6
3C - Wollastonite	7
3D - Magnetite Resources	8 - 9
3E - Water Sampling/Analyses	10

A P P E N D I C E S

APPENDIX A1

- Hampshire Magnetite Drilling/Reserves

APPENIDIX A2

- Hampshire Silver Mine
Percussion Drilling Programme

APPENDIX A3

- BHP Central Research Laboratories
"An investigation of the potential for beneficiation of
Tasmania Mines Magnetite".

EL 17/68 - ANNUAL REPORT

4TH NOVEMBER 1989 TO 4TH NOVEMBER 1990

L I S T O F P L A N S

- Plan No 6/EX/EL - EL 17/68 - EXTENSION AREA
Location and Geology - Scale 1:10,000
- Plan No 7/EX/EL - EL 17/68 - EXTENSION AREA (GEOLOGY)
North and Eastern Section - Scale 1:10,000
- Plan No 8/EX/EL - Hampshire Silver Mine
Percussion drill site locations
Scale 1:500
- Plan No 9/EX/EL - Water Sample Locations
Environmental Base Line Orientation Study
- Plan No 10/EX/EL - Hampshire Magnetite Deposit
Percussion drill site location
Scale 1:500

1. GENERAL

Exploration Licence 17/68 covering 14km² occurs south of Hampshire and embraces the operating Tasmania Mines Limited consolidated mining lease N° 1371P/M (approx. 7.22km²) covering the Kara N° 1 tungsten mine and associated scheelite deposits (Kara North, Kara South, Eastern Ridge and Location L5).

The current licence is an extension of the former much larger E.L. 17/68, which simultaneously with the E.L. extension was reduced in size from 75km to its present size.

This current Annual Report covers the period November 1989 to November 1990, which is the second term of a two year exploration work programme commencing 4th November 1988.

2. EXPLORATION OBJECTIVES

The two year work programme for E.L. 17/68 aimed at evaluating the potential of three main minerals, namely magnetite, scheelite and wollastonite.

The licence area itself borders and encircles the demarcated and evaluated tungsten and magnetite deposits of Kara No 1, Kara South, Eastern Ridge and Location L1, all of which are currently covered by Tasmania Mines Consolidated Mining Lease No 1371P/M.

The area surrounding the above deposits, and now covered by E.L. 17/68, has been the subject of past (1972-74 and 1980-85) extensive exploration campaigns undertaken by Tasmania Mines Ltd (then Tasminex N.L.) and Joint Venture exploration partners. This work, in addition to delineating extensions of known magnetite skarns (Loc. L5 and Loc. L13) along the Kara synform structure affecting buried Ordovician sequences, had also been successful in outlining highly prospective areas such as the Hampshire Magnetite Skarn Zone and a skarn adjacent to the Hampshire Silver Mine.

The proposed programme of work during the current E.L. extension period was designed to evaluate the scheelite and magnetite economic potential of both the above mentioned delineated skarn zones and specific outlined targets.

The Ordovician sequences of the eastern section of the E.L. also includes known occurrences of wollastonite. These, likewise, had been partially investigated during the latter stages of the original E.L. tenancy, and both the metallurgical/marketing aspects of the commodity, and an investigation of geologic extensions of the deposit were to be completed.

In total five separate projects/areas itemized below were to be investigated during the E.L. extension period. The locations of these areas are shown on Plan No 7/EX/EL while specific exploration objectives for each are outlined on Sheet A overleaf.

Exploration projects/areas - E.L. 17/68

- A - Hampshire Magnetite Skarn Zone
- B - Hampshire Silver Mine
- C - Location L13 to Loadwater Creek
- D - Location L5
- E - Wollastonite Investigations

E.L. 17/68 - PROPOSED EXPLORATION PROGRAMMEWORK PROPOSALS

Commencing 4th November 1988, a two year programme of work is proposed for E.L. 17/68 by Tasmania Mines Limited.

As shown below, five separate projects/areas will be investigated, and the three main commodities to be evaluated are magnetite, wollastonite and tungsten.

A. Hampshire Magnetite Skarn Zone

The magnetite potential of the Hampshire Skarn Zone, accurately demarcated by detailed ground magnetic surveys - completed 1984/85, will initially be investigated by reconnaissance diamond drilling (200m) in order to optimise interpretation of magnetic signatures, followed by wide-spaced (300m interval) grid line shallow percussion drilling (210m). Estimated project costs, \$46,400.

B. Hampshire Silver Mine

A limited programme of percussion drilling (300m) will be drilled to investigate the potential (WO₃, Au, Ag) of the Hampshire Silver Mine anomaly, interpreted as a metamorphosed skarn zone bordering altered granite. Project expenditures - \$24,000.

C. Location L13 to Loudwater Creek

Geochemical soil sampling and detailed ground magnetic surveys will be completed at this region, the objective being to demarcate surface or near-surface magnetite skarn zones and their possible tungsten (and other mineral) anomalism. Expenditures, \$11,500.

D. Location L5

One diamond drill hole is planned for drilling to examine the northerly subsurface continuation of the scheelite bearing magnetite skarn zone previously delineated at L5. Project expenditures, \$12,400.

E. Wollastonite Investigations

These investigations would be a continuation of work currently underway, namely an evaluation of the market potential of wollastonite concentrate products recently upgraded by metallurgical bench test work.

The above programme would be supplemented by a limited programme of diamond drilling, two holes, total metres 400m. Total project expenditures would be \$35,700.

3. EXPLORATION WORK (1989/90)

3A. Hampshire Magnetite Skarn Zone

During the current year the following work has been completed at this deposit of magnetite:-

- Topographical survey.
- Assessment of drilling programme completed May-June 1989
- Reserve calculation of high grade magnetite
- Detailed metallurgical test work on magnetite ore.

An accurate topographical survey of the northern section of the skarn zone, and the drill hole collars of the 1989 Tasmania Mines Ltd percussion drilling programme (58 holes - 495.5m drilled depth) was completed by Peacock, Darcey and Anderson, licenced surveyors, Burnie. This survey permitted the deposit to be tied into both the Kara Property survey grid and the AMG co-ordinate grid system. Appendix No A1, Table No 1 items drill collar co-ordinates, and an accurate plan of drilled section of the deposit is now available at scale 1:500.

The drill hole results (Appendix A1, Tables 2 and 3) and configuration of the ore zone over approximately 125m strike length of the deposit have now been assessed and reserve calculations of ore have been made - please refer to Plan No 10/EX/EL. Over the strike distance in question, drilling and surface mapping show the deposit to average 25.9m width, reaching a maximum width of 42m. The maximum drill depth is 15 metres, but drilling on the deposit to date shows an average drilled depth of 12.8m, and this figure has been utilised in reserve calculations.

As shown on Table No 4, Appendix A1, tonnage calculations of indicated geological reserves of magnetite total 158,768 tonnes.

Table No 5, Appendix A2, summarises details of Fe grade calculations over six individual ore blocks over a total 125m strike. Although the Fe grade of drilling showed variations of grade ranging from 47.97% to 55.55% Fe, the average in-situ total Fe grade is calculated at 52.56% Fe.

In summary therefore, the overall drilling to date over the northern section of the Hampshire Magnetite deposit has proven 158,769 tonnes of high grade 52.56% Fe magnetite ore which would appear readily amenable to open pit mine extraction with a low overburden stripping ratio. The favourable location of the deposit - namely adjacent of the Hampshire railway siding, and the Guildford-Hampshire-Burnie link road - should also be noted.

Potential resources of magnetite over the entire delineated Hampshire magnetite skarn zone, namely 480m strike length - would total 500,000 tonnes for each 10m depth of ore from surface.

A representative 100kg surface sample of magnetite was collected from the Hampshire magnetite deposit. At the Kara mine site, this bulk sample was crushed to minus 25mm size and then submitted to the B.H.P. research laboratories, N.S.W., for detailed metallurgical testwork. The prime objective of the investigations was to assess its amenability to beneficiation and evaluate the coarsest possible size fraction permissible to recover marketable material.

Section 3D of this report - "Magnetite Resources" and the test work results documented in Appendix A3, summarise the results of this metallurgical work which show that both wet drum and wet high intensity magnetic separation on topsize material of 0.1mm is capable of producing a concentrate with a grade of 65% Fe.

3B. Hampshire Silver Mine

As documented in the previous E.L. 17/68 Annual Report for the year 1988/89, a small shallow percussion drilling programme at this location had been planned for a future date.

This drill programme was completed in April/May 1990, and consisted of 10 drill holes with a total drill depth of 172m. The holes were drilled along two traverses to investigate a previously delineated magnetic trend bordering the Hampshire Granite stock margin - please refer to the accompanying Plan No BEX/EL.

No strong skarn development was encountered and only samples from two holes (Nos SMEL 1 and 5) were submitted for analysis - refer to Appendix A2, Table 1 and Drill Logs for holes SMEL 1 to SMEL 10.

The prospectivity of this location has been downgraded.

3C. Wollastonite Investigation - Limestone Creek

A 10kg sample of wollastonite material from surface exposures at Limestone Creek was beneficiated to a wollastonite concentrate by the Department of Mines Launceston laboratory.

Beneficiation procedures involved jaw crushing, rolls crushing, high intensity magnetic separation and flotation. Contaminants removed included pyrrhotite, calcite, diopside, feldspar and quartz, and the resultant concentrate had the following chemical analysis:-

SiO ₂	-	51.8%
Al ₂ O ₃	-	2.4%
Fe ₂ O ₃	-	0.8%
MgO	-	2.7%
CaO	-	41.1%
L.O.I.	-	<u>0.6%</u>
Total	-	<u>99.4%</u>

Small representative samples of the above were forwarded to potential buyers of wollastonite in the following countries: Italy, Netherlands, Japan, Sweden, England, France, Belgium, Taiwan, India, U.S.A., Canada, Spain, Portugal and Indonesia.

3D. Magnetite Resource Investigations

3D (i) - Detailed metallurgical bench scale test work was completed during the year by the B.H.P. Central Research Laboratories at Shortland, N.S.W. on samples of "lump magnetite" and minus 3mm magnetite fines.

The "lump magnetite" was collected from surface samples from the Hampshire Magnetite skarn, and the magnetite fines were representative of tailings produced from the Tasminex N.L. "old mill" at the Kara No 1 deposit.

Two samples of "lump magnetite" had been crushed at mine site, Kara, to a size approximately minus 25mm plus 6mm, and one of them had been upgraded by permanent magnet prior to forwarding to B.H.P. Each sample is believed to have weighed approximately 50kg.

The objective of the test work was to "recover marketable magnetite at the coarsest possible topsize".

The test work procedures involved:-

- Jaw crush to a top size of 8mm. The liberation characteristics were determined by assaying and mineralogical work.
- Rolls crushed to a top size of 1mm.
- Comparison made between dry and wet low intensity magnetic separation.
- The ore was further reduced to topsizes of 0.355mm and minus 0.125mm, and concentrates and tailings fractions were separated by a two stage beneficiation process -- Sala Magnetic wet drum low intensity magnetic separation. Products were sampled and assayed.

The results of the test work were:-

- Preliminary test work showed the lump ore was amenable to beneficiation by magnetic separation. Both wet drum and wet high intensity magnetic separation produced a concentrate with a grade of 65% Fe.
- Due to ore texture, grinding to a topsize of approximately 0.1mm was required to effect liberation from the gangue. Grinding also liberated phosphorus.
- A suggested plant flowsheet would include cobbing at lump size to remove the non-magnetic fraction followed by crushing and grinding to a topsize of 0.1mm, and finally by magnetic separation as a 2 stage wet drum separation.
- The minus 3mm magnetic fines sample could not be upgraded by screening out the lowest size fraction. A grade of 64.8% Fe, 3.6% SiO₂ and 1.17% Al₂O₃ compared favourably with other Australian Fe ores. The low phosphorus levels were considered very favourable.

Full details of the B.H.P. test work and results are attached as Appendix N° A3.

- 3D(ii) - An updated review of the magnetite resources (tonnages and grades) on the licence area and encompassed consolidated mining lease was continued during the current year but not finished.

3E. Water Sampling Programme

A programme of water sampling to gather baseline environmental information on existing water quality around the Kara Properties, both within E.L. 17/68 and C.L. 1371F/M has been completed.

Test work consisted of collecting a total of twelve "regional" water samples from the main Old Park-Companion-Emu River drainage system and its major tributaries (please refer to Plan N° 9/EX/EL for sample location sites).

Initially six of these samples have been forwarded to the Department of Mines Laboratories, Launceston and will be analysed for twenty-one elements, plus determination of suspended solids and pH.

This programme is being run in conjunction with additional water samples collected in and around the Kara N° 1 mine operation.

The regional water sample locations were sited with the following objectives in mind:-

- Provide information re "background levels" of the Old Park river upstream from the Kara properties, and downstream from undisturbed known tungsten bearing magnetite skarns. (i.e. Eastern Ridge and Kara North).
- To assess the extent and nature of possible contamination of the Old Park, Companion River and Emu River drainage downstream from the Kara mine operations.
- Compare present results with a similar water sampling programme undertaken in 1982.

WATER SAMPLE LOCATIONSE.L. 17/68 - C.L. 1371 P/M

<u>Sample No</u>	<u>Sample Location</u>
WS.1	Old Park River - south of pump station - upstream Kara Properties.
WS.2	Old Park River - north of pump station - immediately upstream discharge from Kara No 1 mine
WS.3	Old Park River - north of pump station - immediately downstream discharge from Kara No 1 mine.
WS.4	Companion River - Kara N road crossing - downstream Old Park - Companion River junction
WS.5	Kara Creek - at junction with Companion River
WS.6	East Kara Creek - drainage immediately north of Kara No 1 Main Pit
WS.7	Kara Creek - drainage immediately north of Kara No 1 Main Pit
WS.8	Wester Limb Creek - discharge downstream from tailings setting ponds.
WS.9	Kara North Creek - at junction with Companion River
WS.10	Companion River - immediately upstream from Loudwater Creek junction
WS.11	Loudwater Creek - immediately upstream from Companion River junction
WS.12	Emu River - at Hampshire water gauge location.

E.L. 17/68 - ANNUAL REPORT

4TH NOVEMBER 1989 TO 4TH NOVEMBER 1990

A P P E N D I C E S

- APPENDIX A1 - Hampshire Magnetite Drilling/Reserves
- APPENDIX A2 - Hampshire Silver Mine
- APPENDIX A3 - Magnetite Beneficiation Testwork - BHP

T A S M A N I A M I N E S L I M I T E DH A M P S H I R E M A G N E T I T E S K A R N Z O N E - E . L . 1 7 / 6 8A M G C O - O R D I N A T E S - D R I L L I N G P R O G R A M M E 1 9 8 8 / 8 9

<u>Drill Hole No</u>	<u>Easting</u>	<u>Northing</u>	<u>Level</u>
HM. 1	397879.608	5430299.732	486.874
HM. 2	397862.831	5430327.571	487.426
HM. 2A	397862.835	5430327.572	487.428
HM. 3	397853.603	5430320.731	486.489
HM. 3A	397851.441	5430320.830	486.255
HM. 4	397868.106	5430333.710	488.282
HM. 5	397863.407	5430337.301	488.185
HM. 6	397864.936	5430347.238	488.482
HM. 7	397858.195	5430344.791	487.891
HM. 7A	397853.940	5430346.142	487.804
HM. 8	397849.081	5430349.465	487.709
HM. 9	397854.152	5430303.684	486.410
HM. 10	397866.518	5430393.438	488.604
HM. 10A	397863.364	5430394.636	488.602
HM. 11	397873.271	5430377.563	489.288
HM. 11A	397870.863	5430378.397	489.125
HM. 12	397857.703	5430370.348	488.314
HM. 13	397849.797	5430370.458	487.874
HM. 14	397846.153	5430383.854	487.902
HM. 15	397851.845	5430384.930	488.063
HM. 16	397869.420	5430408.793	489.088
HM. 16A	397866.261	5430409.929	489.023
HM. 17	397860.772	5430402.566	488.320
HM. 18	397852.656	5430395.407	487.945
HM. 18A	397852.461	5430394.604	488.105
HM. 19	397847.018	5430396.823	487.966
HM. 19A	397847.232	5430395.716	487.960
HM. 20	397855.772	5430408.566	488.320
HM. 21	397862.542	5430414.028	487.562
HM. 24	397867.963	5430420.216	489.163
HM. 25	397856.146	5430419.607	488.650
HM. 26	397863.365	5430435.907	488.611
HM. 27	397860.147	5430447.419	488.318
HM. 28	397853.099	5430332.243	487.074
HM. 29	397849.303	5430341.385	487.250
HM. 30	397850.146	5430355.970	487.803
HM. 30A	397848.703	5430365.676	487.751
HM. 31	397843.049	5430351.173	487.185

HM. 32	397848.675	5430297.242	486.051
HM. 32A	397848.675	5430291.120	485.942
HM. 34	397844.141	5430303.119	486.153
HM. 35	397867.448	5430319.599	487.381
HM. 36	397859.795	5430315.659	486.726
HM. 37	397852.660	5430311.701	486.416
HM. 37A	397851.508	5430313.303	486.373
HM. 38	397864.013	5430298.933	485.360
HM. 38A	397866.097	5430300.835	486.611
HM. 38B	397862.058	5430300.457	486.364
HM. 39	397863.149	5430306.925	486.950
HM. 40	397872.068	5430310.163	487.241
HM. 41	397883.440	5430307.406	487.558
HM. 42	397885.479	5430315.797	487.867
HM. 43	397874.668	5430292.286	486.517
HM. 44	397871.353	5430284.591	486.143

039

435020

APPENDIX A1

TABLE No 2

E.L. 17/68

HAMPSHIRE MAGNETITE SKARN ZONE

PERCUSSION DRILLING PROGRAMME

Dates Drilled	29th May, 1989	-	16th June, 1989
No of Holes Drilled	-	58	
Hole Nos	-	HM.1	to HM.44
Total Drilled Metres	-	495.5m	
Av Depth	-	8.54m	

APPENDIX A1

TABLE N^o 3E.L. 17/68 HAMPSHIRE MAGNETITE SKARN ZONEPERCUSSION DRILL PROGRAMME

(29TH MAY - 16TH JUNE, 1989)

Summary - Holes Assayed and Fe Intersections/Assays

<u>Hole No</u>	<u>Depth Drilled (m)</u>	<u>Fe Intersections</u>	
		<u>Drill Length</u>	<u>% Total Fe</u>
HM. 1	13.50	0.0 - 13.5	47.97
HM. 2	4.50	0.0 - 3.0	49.10
HM. 2A	12.00	0.0 - 12.0	50.28
HM. 3	4.50	0.0 - 4.5	43.70
HM. 3A	11.50	3.0 - 11.5	60.48
HM. 4	9.00	0.0 - 6.0	50.85
HM. 5	13.50	0.0 - 6.0	52.20
HM. 6	12.00	0.0 - 6.0	53.20
HM. 7	7.50	0.0 - 7.5	54.25
HM. 7A	14.00	0.0 - 14.0	56.44
HM. 8	15.00	6.0 - 12.0	54.93
HM. 9	11.00	0.0 - 11.0	51.65
HM. 11	3.00	0.0 - 3.0	58.50
HM. 11A	15.00	0.0 - 6.0	54.05
HM. 12	6.00	0.0 - 6.0	60.00
HM. 13	15.00	0.0 - 12.0	52.78
HM. 14	15.00	0.0 - 9.0	55.86
HM. 15	15.00	0.0 - 15.0	46.64
HM. 17	9.00	0.0 - 3.0	45.40
HM. 18	3.00	0.0 - 3.0	55.90
HM. 18A	6.50	0.0 - 6.5	44.68
HM. 19A	7.00	0.0 - 7.0	58.43
HM. 29	15.00	3.0 - 9.0	55.70
HM. 33	11.00	6.0 - 11.0	50.70

E.L. 17/68

HAMPSHIRE MAGNETITE SKARN ZONE

ORE RESERVE CALCULATIONS

INDICATED GEOLOGICAL RESERVES

(Please refer to Plan No 10/EX/EL)

<u>Ore Block No</u>	<u>Width</u> m	<u>Ore Zone</u> <u>Depth</u> m	<u>Strike</u> m	<u>Block</u> <u>Vol</u> m ³	<u>S.G.</u> <u>Factor</u>	<u>Block</u> <u>Tonnage</u> Tonnes
A	22.5	13.5	15	4,556	4.08	18,588
B	29.0	11.0	25	7,975	4.08	32,538
C	23.0	11.5	25	6,613	4.08	26,981
D	33.5	14.0	15	7,035	4.08	28,703
E	32.0	12.0	15	5,760	4.08	23,501
F	15.5	15.0	30	6,975	4.08	28,458
Av =	<u>25.9m</u>		<u>125m</u>		Total =	<u>158,769</u>

002

435023

APPENDIX A1

TABLE No 5

E.L. 17/68

HAMPSHIRE MAGNETITE SKARN ZONE

Fe GRADE CALCULATIONS

(NORTHERN SECTION)

<u>Block</u>	<u>Hole Nos</u> <u>Fe Intersections Used</u>	<u>Total</u> <u>Depth</u>	<u>Cumulative</u> <u>Fe x m</u>	<u>Average</u> <u>% Fe Grade</u>
A	1	13.5	647.595	47.97
B	9, 33	10.0	511.75	51.18
C	2, 2A, 3, 3A, 4, 5 & 6	46.0	2397.14	52.12
D	7, 7A, 14, 8, 29	48.5	2693.14	55.53
E	11, 11A, 12, 13	27.0	1493.16	55.30
F	14, 15, 17, 18, 18A	36.5	1796.46	49.22
			<u>Average % Fe =</u>	<u>52.56%</u>

Department of Resources & Energy

DIVISION OF MINES & MINERAL RESOURCES

257 Wellington Street
SOUTH LAUNCESTON
TASMANIA 7249

(003) 44 2431
(003) 44 6565

14.5.90

O/No 4905

Tasmania Mines Ltd
P.O. Box 815
Burnie 7320

Reg. nos 902015-025 Exploration Samples

Dear Sir,

Please find below results of samples submitted to this laboratory.

Reg. No	Description	g/t					%	g/t
		W ₃	Ag	Zn	Bi	Cu	F	
	1768							
902015	S M E.L. 1 0-3	330	<10	115	<10	67	<0.06	
016	" 1 3-6	175	13	175	10	70	<0.06	
017	" 1 6-9	27	10	160	<10	100	<0.06	
018	" 1 9-12	290	14	150	14	54	<0.06	
019	" 1 12-15	450	11	150	<10	52	0.10	
020	" 1 15-17	180	14	100	13	42	0.08	
021	" 5 0-3	390	<10	53	<10	60	<0.06	
022	" 5 3-6	250	<10	125	<10	56	<0.06	
023	" 5 6-9	430	<10	450	<10	81	<0.06	
024	" 5 12-15	360	<10	110	<10	71	<0.06	
025	" 5 15-17	770	<10	150	<10	310	<0.06	

Analyses by. *[Signature]*

(D. Zani) *[Signature]*

Chief Chemist & Metallurgist

HAMPSHIRE SILVER MINE ASSAYS

EXPLORATION LICENCE 17/68

HAMPSHIRE SILVER MINE LOCATION

PERCUSSION DRILLING PROGRAMME - APRIL/MAY 1990

HOLE NO: SMEL 1 PLAN NO: 8/EX/EL
 CO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 685 (N TRAVERSE)
 DEPTH DRILLED: 17m DATES DRILLED: 19 April 1990

DRILL INTERVAL (m)		Assays (ppm)				Lithology
From	To	WO ₃	Ag	Zn	Cu	
0	3	330	<10	115	67	Fe Diop Skarn
3	6	175	13	175	70	"
6	9	27	10	160	100	"
9	12	290	14	150	54	"
12	15	450	11	150	52	"
15	17	180	14	100	42	"

HOLE NO: SMEL 2 PLAN NO: 8/EX/EL
 CO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 685.5 (N TRAVERSE)
 DEPTH DRILLED: 16m DATES DRILLED: 19 April 1990

DRILL INTERVAL (m)		Assays (ppm)				Lithology
From	To	WO ₃	Ag	Zn	Cu	
0	3		N/A			Skarn (Litte Fe)
3	6		"			"
6	9		"			"
9	12		"			"
12	15		"			"
15	16		"			"

Assayed - Dept. of Resources & Energy, Launceston
 Reg Nos - 902015-025
 Date - 14 May 1990

435026

EXPLORATION LICENCE 17/68

HAMPSHIRE SILVER MINE LOCATION

PERCUSSION DRILLING PROGRAMME - APRIL/MAY 1990

HOLE NO: SMEL 3 PLAN NO: B/EX/ELCO-ORDINATES: MAGNETIC SURVEY GRID POINT - No 685 (N TRAVERSE)DEPTH DRILLED: 18m DATES DRILLED: 20 April 1990

DRILL INTERVAL (m)		WO ₃	Assays (ppm)			Cu	Lithology
From	To		Ag	Zn			
0	3		N/A				Sst (Little Fe)
3	6		"				Sst
6	9		"				"
9	12		"				"
12	15		"				"
15	18		"				"

HOLE NO: SMEL 4 PLAN NO: B/EX/ELCO-ORDINATES: MAGNETIC SURVEY GRID POINT - No 686.5 (N TRAVERSE)DEPTH DRILLED: 16m DATES DRILLED: 20 April 1990

DRILL INTERVAL (m)		WO ₃	Assays (ppm)			Cu	Lithology
From	To		Ag	Zn			
0	3		N/A				Sst
3	6		"				"
6	9		"				Qzt
9	12		"				"
12	15		"				"
15	16		"				"

Assayed - Dept. of Resources & Energy, Launceston
 Reg Nos - 902015-025
 Date - 14 May 1990

EXPLORATION LICENCE 17/68

HAMPSHIRE SILVER MINE LOCATION

PERCUSSION DRILLING PROGRAMME - APRIL/MAY 1990

HOLE NO: SMEL 5 PLAN NO: 8/EX/EL

CO-ORDINATES: MAGNETIC SURVEY GRID POINT - No 6 (S TRAVERSE)

DEPTH DRILLED: 17m DATES DRILLED: 22 April 1990

DRILL INTERVAL (m)		Assays (ppm)				Lithology
From	To	WO ₃	Ag	Zn	Cu	
0	3	390	<10	53	60	Sst (Altered Fe)
3	6	250	<10	125	56	"
6	9	430	<10	450	81	"
9	12	N/A				"
12	15	360	<10	110	71	Qtz
15	17	770	<10	150	310	"

HOLE NO: SMEL 6 PLAN NO: 8/EX/EL

CO-ORDINATES: MAGNETIC SURVEY GRID POINT - No 5.66 (S TRAVERSE)

DEPTH DRILLED: 18m DATES DRILLED: 23 April 1990

DRILL INTERVAL (m)		Assays (ppm)				Lithology
From	To	WO ₃	Ag	Zn	Cu	
0	3	N/A				Sst
3	6	"				"
6	9	"				"
9	12	"				"
12	15	"				"
15	18	"				"

Assayed - Dept. of Resources & Energy, Launceston
 Reg Nos - 902015-025
 Date - 14 May 1990

435028

EXPLORATION LICENCE 17/68

HAMPSHIRE SILVER MINE LOCATION

PERCUSSION DRILLING PROGRAMME - APRIL/MAY 1990

HOLE NO: SMEL 7 PLAN NO: B/EX/ELCO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 5.33 (S TRAVERSE)DEPTH DRILLED: 18m DATES DRILLED: 2 May 1990

DRILL INTERVAL (m)		WO ₃	Assays (ppm)			Lithology
From	To		Ag	Zn	Cu	
0	3		N/A			Sst
3	6		"			"
6	9		"			Sst (Gr ?)
9	12		"			Gr
12	15		"			"
15	18		"			"

HOLE NO: SMEL 8 PLAN NO: B/EX/ELCO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 5 (S TRAVERSE)DEPTH DRILLED: 18m DATES DRILLED: 2 May 1990

DRILL INTERVAL (m)		WO ₃	Assays (ppm)			Lithology
From	To		Ag	Zn	Cu	
0	3		N/A			Granite
3	6		"			"
6	9		"			"
9	12		"			"
12	15		"			"
15	18		"			"

Assayed - Dept. of Resources & Energy, Launceston
 Reg Nos - 902015-025
 Date - 14 May 1990

EXPLORATION LICENCE 17/68

HAMPSHIRE SILVER MINE LOCATION

PERCUSSION DRILLING PROGRAMME - APRIL/MAY 1990

HOLE NO: SMEL 9 PLAN NO: 8/EX/EL
 CO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 4.5 (S TRAVERSE)
 DEPTH DRILLED: 18m DATES DRILLED: 3 May 1990

DRILL INTERVAL (m)		WQ _z	Assays (ppm)			Lithology
From	To		Ag	Zn	Cu	
0	3		N/A			Granite
3	6		"			"
6	9		"			"
9	12		"			"
12	15		"			"
15	18		"			"

HOLE NO: SMEL 10 PLAN NO: 8/EX/EL
 CO-ORDINATES: MAGNETIC SURVEY GRID POINT - N° 6.5 (S TRAVERSE)
 DEPTH DRILLED: 16m DATES DRILLED: 4 May 1990

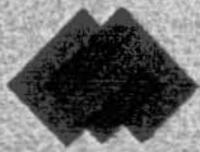
DRILL INTERVAL (m)		WQ _z	Assays (ppm)			Lithology
From	To		Ag	Zn	Cu	
0	3		N/A			Sst
3	6		"			"
6	9		"			"
9	12		"			"
12	15		"			"
15	16		"			"

Assayed - Dept. of Resources & Energy, Launceston
 Reg Nos - 902015-025
 Date - 14 May 1990

029

435030 CRL/C/2/90

APPENDIX A3



BHP
Research &
New Technology

**CENTRAL
RESEARCH
LABORATORIES**

**SHORTLAND, N.S.W.
AUSTRALIA**

**AN INVESTIGATION
OF THE POTENTIAL
FOR BENEFICIATION
OF THREE SAMPLES
OF TASMANIA
MINES MAGNETITE**

by

**Mark Hoffman
(Metallurgist)**

and

**Allan Waters
(Principal Research
Officer)**

April, 1990

TABLE OF CONTENTS

	Page No.
SUMMARY	
1. INTRODUCTION	1
2. EXPERIMENTAL	2
2.1 Samples Tested	2
2.2 Magnetite Lump	2
2.3 Magnetite Fines	3
3. RESULTS AND DISCUSSION	4
3.1 Magnetite Lump	4
3.1.1 Beneficiation of Lump at the "As Received" Size	4
3.1.2 Lump Ore Characterisation	4
3.1.3 Comparison of Wet and Dry Magnetic Separation	4
3.1.4 Wet Drum Magnetic Separation with Decreasing Topsize	4
3.1.5 WHIMS Testwork	10
3.2 Magnetite Fines	10
3.3 Comparison of Magnetite Samples	15
3.4 Comparison of Tasmanian Mines Concentrate to Other Commercially Traded Iron Ores	15
4. CONCLUSIONS	19
5. ACKNOWLEDGEMENTS	20
APPENDIX 1 - SEM/EDS investigation of polished sections	

SUMMARY

Preliminary testwork on a sample of Tasmania Mines "lump magnetite" showed that both wet drum magnetic separation and wet high intensity magnetic separation could be used to produce a concentrate with a grade of 65% Fe. However, in order to effect liberation of the magnetite, grinding to a topsize of approximately 0.1mm was required. Above this size, liberation was not significant, and little increase in iron grade resulted. It should also be noted that grinding liberated phosphorus and the product was extremely low in this undesirable element.

Testwork on the minus 3mm "magnetite fines" sample showed that it could not be easily upgraded by screening out low grade fractions at the "as received" size due to the relatively uniform chemistry with size. At the current grade of 64.8% Fe, the magnetite fines compare favourably with other Australian iron ores.

Mineralogical examination showed that the magnetite lump sample examined was a somewhat different ore type to the fines sample currently sold to BHP Steel. The "lump" contained finely dispersed gangue components, thus requiring grinding to liberate, whereas the "fines" sample was relatively pure magnetite with only a small amount of the gangue associated with the magnetite.

1. INTRODUCTION

A request was made to BHP Central Research Laboratories by the Slab and Plate Products Division (SPPD) Raw Materials Supply Department, on behalf of Tasmania Mines Limited, to conduct beneficiation testwork on three samples of magnetite ore. The testwork program was to determine low cost options for increasing the grade of the "as mined" magnetite lump, as well as the magnetite fines currently stockpiled.

Most of the iron ore tonnage mined in Australia, and hence most of the ore used in sinter plants within BHP, is classified as high grade hematite (typically greater than 62% Fe). With the current trend towards the use of higher grade (lower gangue) ores for use as sinter feed, this necessitates the use of concentrates (typically greater than 67% Fe) in the sinter plant iron ore feed, in order to meet the grade requirements.

From a comparison of hematite and magnetite based on their chemical composition, the theoretical Fe contents of hematite and magnetite are 70.0% and 72.4% respectively; magnetite being higher in Fe because of its lower oxidation state. As a consequence, an impure magnetite containing 3.3% gangue, can have the same Fe content as pure hematite. Thus when comparing hematite and magnetite ores, not only must the Fe grades be compared but the gangue levels must also be considered, since for two ores having the same iron content, the magnetite ore will have the higher gangue level, and this will affect sintering and blast furnace performance.

2. EXPERIMENTAL

2.1 Samples Tested

Three samples of magnetite ore were supplied by Tasmania Mines Limited in 20 litre drums for testwork as follows;

1. Magnetite Lump (minus 25mm, plus 6mm).
2. Upgraded Magnetite Lump (minus 25mm, plus 6mm). This material had been upgraded with a permanent magnet.
3. Magnetite Fines (-3mm).

2.2 Magnetite Lump

The two samples of lump ore provided for testwork had been screened into the minus 25mm, plus 6mm size fraction. It should be noted that at this topsize and with only a 20 litre drum sample, the material supplied may not have been representative of the larger lot size from which it was taken. One of the two lump samples had the non-magnetic material removed by the use of a permanent magnet by Tasmania Mines personnel, and was labelled as "upgraded".

The objective of the testwork was to recover the magnetite at the coarsest topsize possible, thereby minimising the milling cost; and for the grade to be suitable as a marketable product to BHP sinter plants. Preliminary tests were conducted by examining the possibility of upgrading the magnetite lump at the "as received" size by the rejection of the non-magnetic fraction.

The upgraded magnetite lump was then crushed in a laboratory jaw crusher to a top size of 8mm and the liberation characteristics of the ore were determined by assaying and mineralogical analysis.

The upgraded magnetite lump was then further reduced to a topsize of 1mm using a roll crusher and a direct comparison was made between dry and wet low intensity magnetic separation. Dry Roll Magnetic Separation, using a CARPCO, Inc. induced magnetic roll separator and Wet Drum Magnetic Separation, using a SALA MAGNETICS, Inc. single wet drum, were compared in terms of both grade and recovery of iron units.

The wet drum magnetic separator was used for the separation of the upgraded magnetite lump sample after the ore was further reduced to topsizes of minus 0.355mm and minus 0.125mm. These two finer topsizes were achieved by wet grinding in a ceramic ball mill, which minimises contamination of iron from media wear. The relationship between the reduction in top size and the grade and recovery of both magnetite and total iron units was investigated.

The SALA MAGNETICS wet drum low intensity magnetic separator was fed at 20% solids (by mass) via a calibrated vibratory feeder and metered water addition, at a solids feed rate of 460 g/min. A low pulp density was used as the laboratory scale wet drum magnetic separator is unable to handle high feed rates of a material with a high magnetic susceptibility without choking. The drum separator was operated with the concentrate and tailings fractions being separated concurrently. The products were dewatered, dried and weighed. The concentrate (CONC 1) was then repassed through the wet drum magnetic separator to produce a cleaned concentrate (CONC 2); this simulated a two stage beneficiation process. The concentrates and tails produced were then subsampled and assayed.

As a comparison to the grade of product that could be produced using a two stage wet drum magnetic separator, tests were also conducted using Wet High Intensity Magnetic Separation (WHIMS). WHIMS by comparison would involve a higher unit cost process due to a substantially higher capital cost.

2.3 Magnetite Fines

The "magnetite fines" sample supplied was sampled from an existing stockpile at the Tasmania Mines plant.

Size by size analysis of the sample was performed as well as both wet and dry sizings, to determine the possibility of a low cost upgrading of the fines by rejection of size fractions with lower iron grades.

3. RESULTS AND DISCUSSION

3.1 Magnetite Lump

3.1.1 Beneficiation of Lump at the "As Received" Size

The magnetite lump was screened and the sizing and chemical analyses are listed in Table 1. From an examination of the assays with size it is evident that the iron units, in terms of total iron and magnetite, are well distributed between the size fractions. Thus, it is not possible to upgrade the ore by screening the lump to reject any one size fraction and produce an acceptable grade ore.

The lump ore was then subjected to magnetic separation by passing a permanent magnet over the ore. It was determined that 3.7 percent of the material was non-magnetic at the lump size. Although the percentage of low grade material that could be rejected in this way is relatively low, and it could be achieved at a low cost by use of a cobbing magnet on a conveyor head drum, the grade of the lump remained unsatisfactory. Hence, the magnetite ore at the lump size received, offers no opportunity for beneficiation to an acceptable grade.

3.1.2 Lump Ore Characterisation

The lump ore was reduced to an 8mm topsize by crushing and the size distribution and corresponding assays are listed in Table 2. The reduction in topsize did not increase liberation significantly (i.e. by preferentially crushing the magnetite from the gangue ore) thus the assays with size still vary little between the various fractions. A sample was examined using optical microscopy for magnetite grain characteristics. The average magnetite particle size for good liberation was 0.1mm in diameter. Therefore fine grinding would be necessary to achieve this.

A polished section was also examined by scanning electron microscopy and X-ray microanalysis. This showed that the sample was composed of granular magnetite intergrown with a silicate gangue composed of andradite, diopside etc. (see Appendix 1).

Apart from the occasional trace levels of calcium, the magnetite is free of impurities, within detection limits, but does contain some very small inclusions. Only a relatively small percentage of the magnetite is oxidised to hematite.

3.1.3 Comparison of Wet and Dry Magnetic Separation

A sample of lump magnetite ore was reduced in topsize from 8mm to 1mm in order to make a direct comparison between wet and dry magnetic separation.

The conditions listed below in Table 3 were used to obtain the results shown in Table 4 for beneficiation using the dry induced roll magnetic separator.

TABLE 1. AS RECEIVED SIZE DISTRIBUTION TASMANIA MINES LUMP

Size (mm)	Weight (%)	Fe	Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
+16.0	28.4	38.8	48.0	24.0	3.09	0.22	0.013	0.46	11.40	5.33	0.18	0.033	-0.3
+10.0	51.4	39.5	48.9	23.6	2.98	0.20	0.015	0.43	11.10	5.33	0.19	0.032	-0.4
+6.4	15.7	41.1	51.8	22.4	2.87	0.19	0.012	0.42	10.60	5.02	0.17	0.036	-0.5
-6.4	4.5	44.1	51.6	19.9	2.56	0.19	0.014	0.55	9.22	4.40	0.14	0.038	-0.5
Calc Head	100	39.8	49.2	23.4	2.98	0.20	0.014	0.44	11.02	5.24	0.18	0.33	-0.4

030

5

435037

TABLE 2. SAMPLE CRUSHED TO MINUS 8mm SIZE DISTRIBUTION

Size (mm)	Weight (%)	Fe	Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
+4.000	31.1	34.4	42.9	27.4	3.72	0.22	0.014	0.45	12.60	6.11	0.28	0.027	-0.1
+2.000	26.2	36.1	44.1	26.4	3.28	0.20	0.013	0.43	12.50	5.86	0.21	0.031	-0.4
+1.000	9.6	38.1	46.8	24.7	3.19	0.19	0.016	0.43	11.90	5.48	0.19	0.031	-0.4
+0.500	9.9	43.9	55.5	20.1	2.72	0.22	0.010	0.41	9.68	4.49	0.15	0.036	-0.8
+0.250	6.4	46.2	59.4	18.5	2.46	0.22	0.009	0.39	9.00	4.16	0.13	0.040	-0.8
+0.125	5.6	43.2	55.2	20.8	2.25	0.22	0.010	0.39	10.10	4.97	0.12	0.035	-0.5
+0.063	5.8	33.5	40.8	28.5	2.27	0.17	0.016	0.42	13.40	7.02	0.14	0.028	0.3
+0.045	2.1	29.4	34.2	31.9	2.50	0.16	0.022	0.47	14.70	7.88	0.18	0.027	0.4
-0.045	3.3	31.4	37.8	29.5	3.17	0.19	0.030	0.52	13.40	6.89	0.23	0.028	1.2
Assay Head		39.5	49.3	23.6	3.07	0.20	0.013	0.39	11.10	5.28	0.2	0.033	-0.2

435038

TABLE 3. ROLL SEPARATOR SETTINGS

RUN	PASS	ROTOR SPEED	CURRENT SETTING (amps)
1	1	20	0.3
2	1	40	0.2
2	2	40	0.1

The first run gave a concentrate of 47.9% Fe with a recovery of 93.3% of the iron units; this was only a marginal upgrade from an original head grade of 39.5% Fe. The second run was carried out at a higher rotor speed in order to give increased selectivity between magnetic and non-magnetic materials by increasing the throw of the discharged non-magnetic material. Throughout the runs difficulty was experienced in operating the separator, because the magnetite tended to bridge between the roll and the nose block. This resulted in a decrease in the efficiency of separation. As a result of the difficulties experienced with bridging of the magnetite, the current was reduced to decrease the magnetic field strength. After the first pass of the second run the product produced was marginally higher in grade and recovery than the first run. The grade obtained was 48.3% Fe with 94.7% recovery of Fe. The product produced from the first pass was then repassed through the separator to clean the concentrate. This upgraded the concentrate to 51.5% Fe.

The wet drum magnetic separator results for comparison are listed in Table 5. The minus 1mm, concentrate produced after the first pass was 51.8% Fe. This was higher in grade than was possible with two passes using the dry roll separator. This is due to the increased efficiency of separation of the wet drum separator, compared to the dry roll separator, for a material with a high magnetic susceptibility. After the second pass a concentrate of 53.0% Fe was obtained. The recovery of the magnetite at a 1mm topsize was 94.7%. Although high recoveries resulted, beneficiation of the ore at a topsize of 1mm is not possible due to poor liberation; as a result the concentrate grade is relatively low. It was therefore decided to use the wet drum for magnetic separation and determine the grades and recoveries attainable at various topsizes.

3.1.4 Wet Drum Magnetic Separation with Decreasing Topsize

Samples of the magnetite ore were crushed to a topsize of 0.335mm and 0.125mm, and magnetically separated using the wet drum. The results are shown in Table 5 and compared to beneficiation at 1mm.

As the topsize was reduced from 1mm to 0.125mm the product grade increased from 53% to 65.5% Fe and similarly for the magnetite from 68.9% to 85.6%. This was achieved at very high recoveries; the iron recoveries were approximately 90 percent and the magnetite

039

TABLE 4. DRY ROLL MAGNETIC SEPARATION

Feed Size (mm)	Product Type	Weight %	% Total Fe	Recovery of Fe (%)	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
-1mm RUN 1	Conc 1	77.2	47.9	93.3	17.2	2.38	0.22	0.011	0.37	7.80	4.09	0.144	0.039	1.0
	Tail 1	22.8	11.3	6.6	44.2	5.24	0.13	0.022	0.50	21.15	9.31	0.389	0.014	-1.9
	Head	100.0	39.6	100.0										
-1mm RUN 2	Conc 2	65.7	51.5	86.1	14.6	2.11	0.22	0.010	0.35	6.53	3.53	0.120	0.040	1.5
	Tail 2	11.4	25.1	7.3	34.3	4.24	0.18	0.020	0.45	16.03	7.60	0.299	0.023	-0.7
	Tail 1	22.9	11.4	6.6	44.2	5.10	0.14	0.021	0.50	21.23	9.47	0.376	0.014	-1.8
	(Conc 1)	(77.1)	48.3	(94.7)	17.3	2.43	0.21	0.011	0.37	7.87	4.10	0.143	0.039	1.2
	Head	100.0	39.3	100.0										

435040

TABLE 5. WET DRUM MAGNETIC SEPARATION

Feed Size (mm)	Product Type	Weight %	% Total Fe	Recovery of Fe (%)	% Fe ₃ O ₄	Recovery of Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
-1mm	Conc 2	69.2	53.0	92.0	68.9	94.7	13.4	2.10	0.23	0.006	0.35	6.12	3.26	0.120	0.043	-1.3
	Tail 2	2.3	11.2	0.6	7.3	0.3	44.5	4.78	0.15	0.024	0.51	20.50	10.10	0.350	0.025	2.1
	Tail 1	28.5	10.4	7.4	8.8	5.0	45.2	4.98	0.13	0.025	0.52	21.27	9.90	0.385	0.016	-1.9
	(Conc 1)	(71.5)	51.8	(92.6)	67.6	(95.0)	14.2	2.17	0.22	0.008	0.35	6.49	3.41	0.116	0.041	1.5
	Head	100.0	39.9	100.0	50.4	100.0										
-0.355mm	Conc 2	59.0	62.0	89.7	81.4	93.9	6.7	1.41	0.24	0.004	0.32	2.95	1.71	0.057	0.049	-2.2
	Tail 2	3.3	13.9	1.1	13.2	0.9	42.1	5.32	0.17	0.026	0.50	18.80	9.37	0.410	0.034	2.2
	Tail 1	37.7	10.1	9.2	7.1	5.2	45.1	4.94	0.12	0.029	0.49	21.40	10.10	0.360	0.017	1.7
	(Conc 1)	(62.3)	59.7	(90.8)	78.1	(94.8)	8.5	1.64	0.25	0.004	0.33	3.77	2.09	0.075	0.048	-2.0
	Head	100.0	40.8	100.0	51.1	100.0										
-0.125mm	Conc 2	55.2	65.5	88.6	85.6	92.3	4.2	1.19	0.25	0.002	0.30	1.79	1.10	0.034	0.052	-2.7
	Tail 2	3.0	11.8	0.9	11.7	0.7	43.6	5.41	0.19	0.023	0.50	19.30	9.71	0.420	0.038	2.4
	Tail 1	41.8	10.3	10.5	8.6	7.0	44.9	5.05	0.14	0.029	0.49	21.10	10.20	0.370	0.017	1.7
	(Conc 1)	(58.2)	63.1	(89.5)	82.5	(93.0)	6.0	1.34	0.25	0.003	0.31	2.55	1.51	0.052	0.051	-2.3
	Head	100.0	40.8	100.0	51.2	100.0										

070

9

435041

recoveries as expected were higher. This is represented graphically in Figures 1 and 2. Correspondingly, as the topsize was reduced there was a decrease in the level of the impurity elements in the concentrate due to the increased liberation and effective separation.

The concentrate produced at minus 0.125mm was 55 mass percent of the feed and assayed 65.5% Fe. The silica and alumina levels were 4.2% and 1.19% respectively, which compare favourably with other commercially available iron ores. The TiO_2 loading is relatively high at 0.25%. It should be noted that the phosphorus is liberated from the ore and less than 10% of the phosphorus in the head sample reports to the concentrate. The phosphorus levels are very low at 0.002% and this offers significant advantages to sinter plants in using such a low phosphorus ore in the blend. The concentrate contains 0.3% Mn and if used in significant quantities would reduce the amount of manganese alloying required in the steelmaking process, offering further possible price advantages.

The K_2O and zinc levels are relatively high, and these two metals lead to the build-up of deleterious deposits in the blast furnace. Hence sinter chemistry requirements places limitations on these elements, but at low mass fraction addition rates to the sinter feed, the presence of these undesirable elements are not seen as being likely to create significant restrictions on the use of this ore. However, when used in conjunction with other high zinc/ K_2O ores, the amount of Tasmania Mines ore that could be incorporated into any particular blend may be limited.

Overall, the concentrate would be an attractive component to the sinter plant feed.

3.1.5 WHIMS Testwork

Concurrently with the wet drum magnetic separation tests, samples were separated using wet high intensity magnetic separation (WHIMS) at topsizes of 1, 0.355, 0.125 and 0.045mm. The results are shown in Table 6. This work was undertaken to make a direct comparison between the separations obtained using WHIMS and wet drum magnetic separation. From a comparison of the results it is evident that the wet drum magnetic separation results were superior in terms of grade. Difficulty was experienced in operating the WHIMS unit due to the high magnetic susceptibility of the magnetite ore, resulting in the magnetite bridging across the separating matrix and significantly reducing the efficiency of separation.

3.2 Magnetite Fines

Wet and dry sieve sizings were performed on the "as received" minus 3mm fines. An analysis of each fraction of the dry sieve sizing was obtained and the results are listed in Table 7. From an examination of the assays with size, it is evident that the iron units, both in terms of total iron and magnetite, are well distributed between the fractions. The size fractions that are marginally lower in grade with respect to the calculated head only represent a small mass percent of the ore. Thus it is not possible to upgrade the ore by screening to reject any one size

WET MAGNETIC SEPARATION

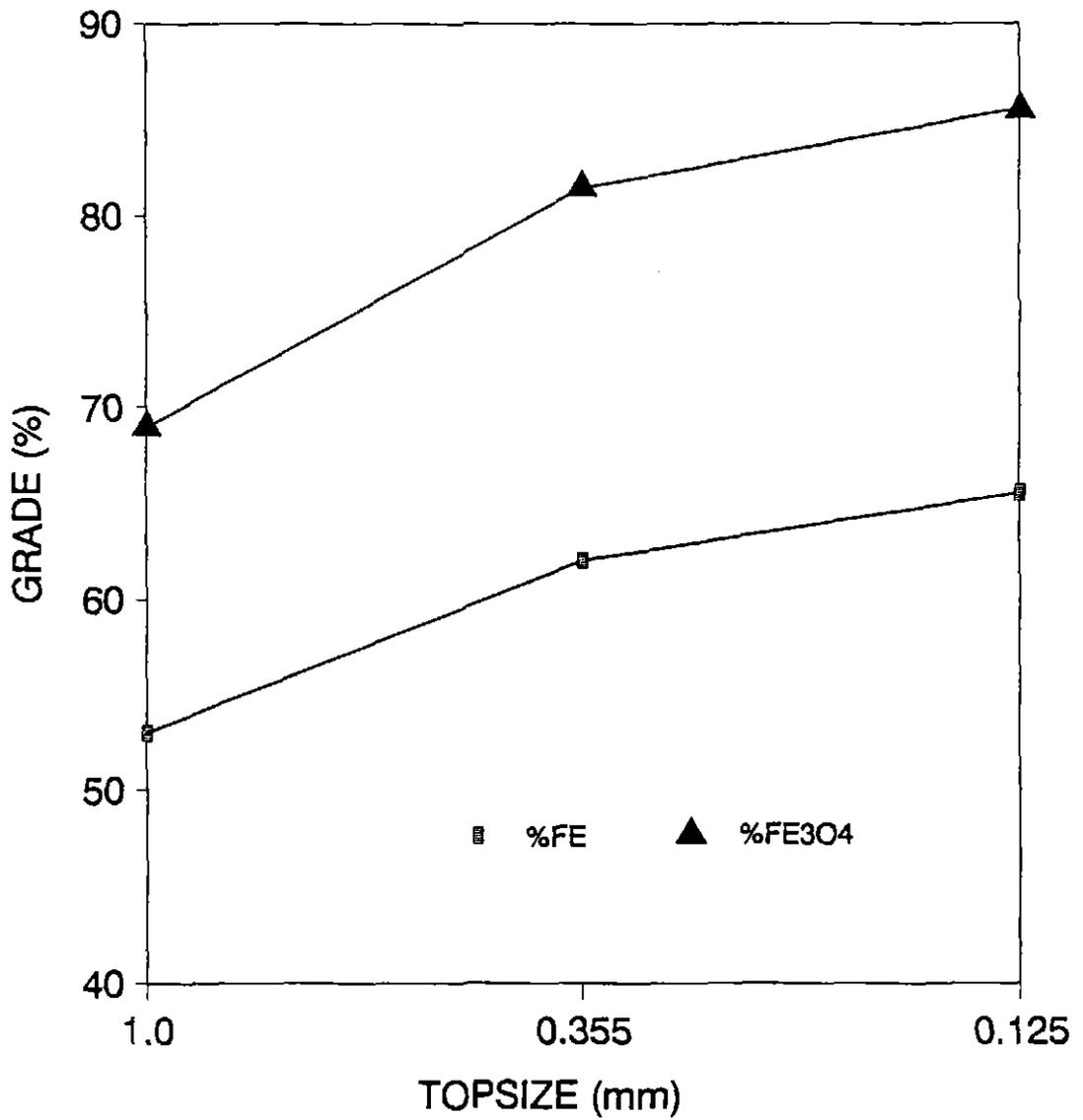


Figure 1. Concentrate grades at various top sizes.

WET MAGNETIC SEPARATION

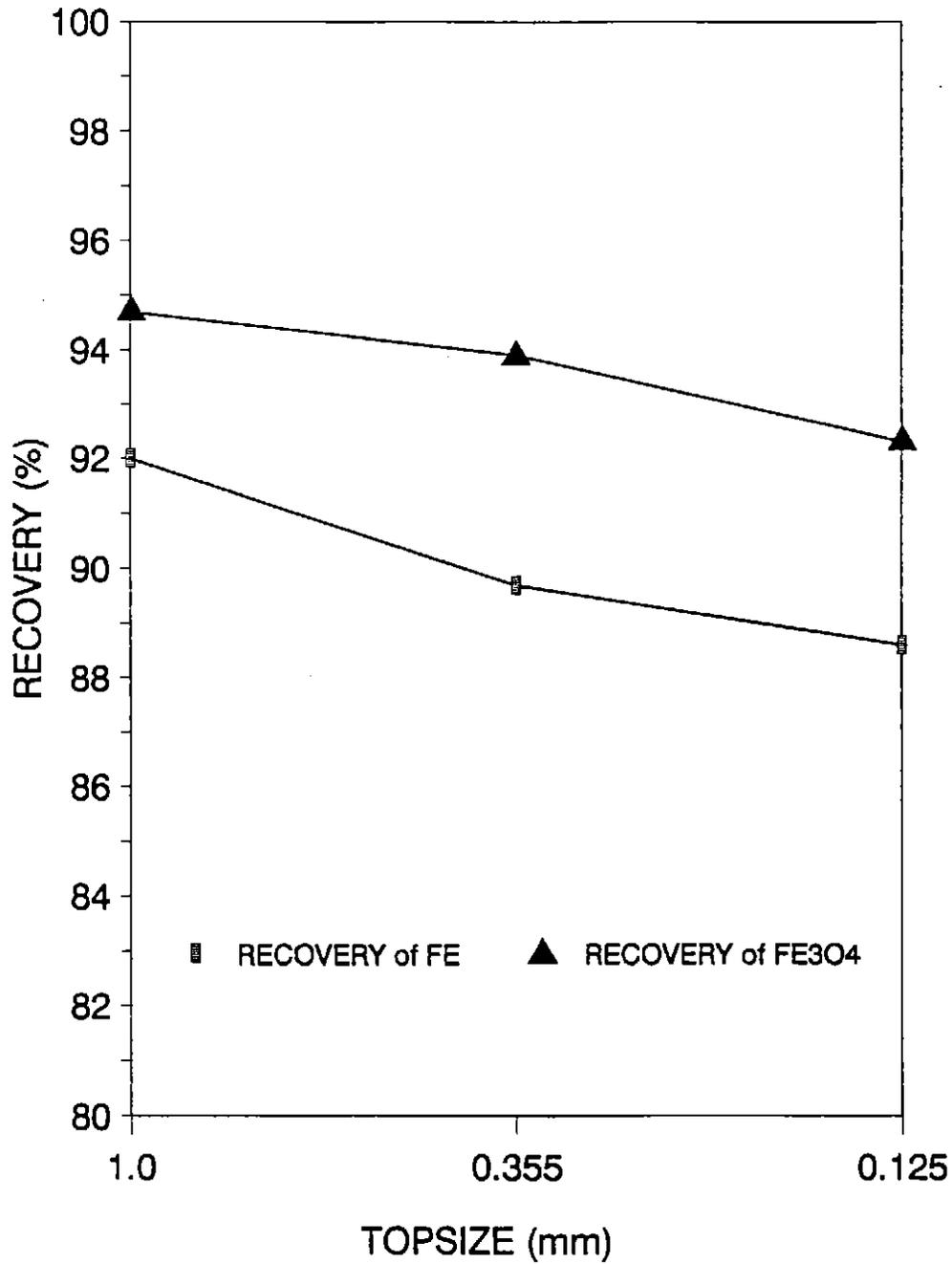


Figure 2. Recovery of Fe and Fe₃O₄ at various topsizes.

TABLE 6. WET HIGH INTENSITY MAGNETIC SEPARATION (WHIMS)

Feed Size (mm)	Product Type	Weight %	% Total Fe	Recovery of Fe (%)	% Fe ₃ O ₄	Recovery of Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
-1mm	+1amp	84.8	46.5	96.6			18.1	2.70	0.20	0.010	0.37	8.53	4.05	0.161	0.038	+1.0
	+6amp	11.2	10.2	2.8			46.4	4.37	0.12	0.007	0.50	20.90	10.62	0.357	0.020	-1.3
	-6amp	4.0	6.9	0.6			44.3	3.63	0.12	0.128	0.42	23.80	11.10	0.229	0.024	-4.0
	Total	100.0	40.8	100.0												
-0.355mm	+1amp	75.1	52.4	94.3	67.7	96.1	14.0	2.16	0.21	0.004	0.35	6.58	3.19	0.120	0.043	-1.4
	+6amp	7.6	11.3	2.1	7.9	1.1	45.2	5.03	0.12	0.004	0.50	20.50	9.91	0.400	0.018	1.1
	-6amp	17.3	8.7	3.6	8.4	2.8	45.1	4.78	0.15	0.057	0.47	21.90	10.60	0.330	0.023	2.5
	Total	100.0	41.7	100.0	52.9	100.0										
-0.125mm	+1amp	70.3	56.0	93.5	72.7	95.9	10.9	1.81	0.23	0.002	0.33	5.08	2.54	0.092	0.046	-2.0
	+6amp	6.8	12.8	2.1	10.7	1.4	44.1	5.50	0.14	0.004	0.52	19.60	9.23	0.490	0.019	0.8
	-6amp	22.9	8.2	4.5	6.3	2.7	45.9	4.67	0.13	0.046	0.46	22.50	10.80	0.300	0.018	2.0
	Total	100.0	42.1	100.0	53.3	100.0										
-0.045mm	+1amp	54.8	65.0	85.1			4.4	1.22	0.23	0.002	0.31	2.00	1.04	0.042	0.055	-2.4
	+6amp	2.8	18.9	1.3			39.6	6.73	0.17	0.003	0.53	16.60	6.92	0.766	0.024	0.7
	-6amp	42.4	13.5	13.6			45.4	4.90	0.16	0.030	0.54	21.90	10.50	0.350	0.016	0.7
	Total	100.0	41.9	100.0												

047

13

435045

TABLE 7. AS RECEIVED SIZE DISTRIBUTION AND GRADE OF MINUS 3MM FINES

Size (mm)	Dry Size Weight (%)	Wet Size Weight (%)	Fe	Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	TiO ₂	P	Mn	CaO	MgO	K ₂ O	Zn	Ignition
+2.000	0.7	0.6	59.7	57.2	7.8	1.95	0.13	0.010	0.47	3.15	0.74	0.041	0.056	-0.4
+1.000	13.7	13.8	64.1	61.4	3.9	1.33	0.09	0.008	0.49	1.58	0.51	0.024	0.049	-1.1
+0.500	25.2	25.2	65.0	62.0	3.5	1.24	0.10	0.007	0.47	1.42	0.46	0.016	0.052	-1.1
+0.250	29.7	30.0	65.5	58.9	3.1	1.08	0.10	0.008	0.44	1.31	0.39	0.012	0.052	-1.0
+0.125	20.4	18.7	64.6	53.9	3.9	1.14	0.13	0.010	0.40	1.86	0.42	0.012	0.054	-1.1
+0.063	6.9	6.7	64.5	51.4	3.8	1.03	0.13	0.009	0.37	1.55	0.46	0.012	0.050	-1.0
+0.045	1.8	1.5	65.6	49.7	3.2	0.94	0.13	0.009	0.36	1.01	0.38	0.012	0.047	-0.9
-0.045	1.6	3.5	62.9	47.2	5.1	1.29	0.12	0.015	0.36	1.48	0.52	0.023	0.043	0.0
Calc Head	100	100	64.8	58.1	3.6	1.17	0.11	0.008	0.44	1.52	0.44	0.015	0.052	-1.0

14

435046

fraction and produce a significant increase in grade. The magnetite fines would have some potential for upgrading, but this would require a reduction in topsize to liberate the remaining gangue from the magnetite.

The calculated head grade was 64.8% Fe, 3.6% SiO₂, and 1.17% Al₂O₃. This grade compares favourably with other Australian iron ores. One of the most notable characteristics of this ore that would make it attractive as a sinter feed is the very low phosphorus levels.

3.3 Comparison of Magnetite Samples

The lump magnetite and the magnetite fines show quite different grade/size and liberation characteristics. Comments from Tasmania Mines personnel indicated that the lump ore should have been similar to the current minus 3mm fines shipments supplied to BHP Steel (see section 3.2), and hence it would not be expected that the lump would require such fine grinding to liberate the gangue components. CRL further examined the samples, in light of these comments, by comparing the two magnetite samples - lump ore crushed to a 1mm topsize and a sample of minus 3mm fines - using optical microscopy techniques.

Microscopy revealed that, as suspected, the two ores were texturally dissimilar. The lump contained fine intermixed gangue components, with the majority of particles containing locked gangue (particles that require comminution to release the gangue) with a liberation size of less than 0.1mm. The fines sample also contained some locked gangue particles, but the majority of particles examined contained no gangue components at all, being pure magnetite, i.e., the ore was obviously higher grade. Liberation size for the particles containing gangue in the fines sample was also approximately 0.1mm. Photographs 1 and 2 show the difference in texture of particles with locked gangue. Hence it is clearly demonstrated that differences in chemistry between the lump and fines sample is due to a difference in ore types. This may reflect on the representativity of the sample of lump ore sent to CRL for testwork.

3.4 Comparison of Tasmanian Mines Concentrate to Other Commercially Traded Iron Ores

In Table 8, a comparison is given of the grade of the concentrate produced from Tasmania Mines magnetite and that of other commercially traded iron ores, both from within Australia and also from overseas, that are currently used in Australian sintering feed ore blends.

TABLE 8. A COMPARISON OF TASMANIA MINES CONCENTRATE TO OTHER AUSTRALIAN AND OVERSEAS IRON ORES

Ore Name	Fe	Fe ₂ O ₃	Fe ₃ O ₄	SiO ₂	Al ₂ O ₃	P	MnO	CaO	MgO	S	K ₂ O	Zn	LOI	Type	Size
Carajas Sinter Feed	67.75			0.6	0.80	0.050	0.26	0.02	0.03	0.008	0.004		1.35	Sinter Feed	92%, -6.35mm 9%, -0.10mm
Mt Newman Fines	62.5	62.4	0.1	5.6	2.60	0.068	0.09	0.04	0.05	0.011	0.020	0.004	2.10	Sinter Feed	95%, -6.0mm 9%, -0.15mm
Kudremukh Concentrate	67.5			2.6	0.40	0.025	0.15	0.02	0.03	0.005	0.005		1.00	Pellet Feed	100%, -0.21mm 63.6%, -0.044mm
Samarco Concentrate	67			1.8	1.10	0.040	0.03	0.08	0.04	0.004	0.020	0.001	1.20	Pellet Feed	98.5%, -0.074mm
Carol Concentrate	65.9	68.1		4.6	0.15	0.008	0.13	0.43	0.30	0.004	0.003		0.26	Sinter Feed	97.2%, -0.85mm 8.9%, -0.075
Tasmanian Mines Concentrate	65.5			4.2	1.19	0.002	0.39	1.79	1.10		0.034	0.052	-2.70	Sinter Feed	100%, -0.125mm

4. CONCLUSIONS

Preliminary testwork on a sample of Tasmania Mines lump magnetite showed that the ore was amenable to beneficiation by magnetic separation. Both wet drum magnetic separation and wet high intensity magnetic separation could be used to produce a concentrate with a grade of 65% Fe. Wet drum magnetic separation would be favoured in terms of capital cost and ease of operation.

However, due to the ore texture of the magnetite, in order to effect liberation from the gangue, grinding to a topsize of approximately 0.1mm was required. Above this size, liberation was not significant, and little increase in iron grade could be obtained. It should be noted that grinding liberated phosphorus and the product was extremely low in this undesirable element.

It should be envisaged that a plant flowsheet would include cobbing at a lump size to remove the non-magnetic fraction followed by crushing and grinding to a topsize of approximately of 0.1mm. Magnetic separation would be undertaken using a two stage wet drum separator.

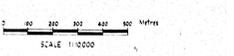
The minus 3mm magnetite fines sample could not be upgraded easily by screening out unwanted low grade size fractions as the chemistry was relatively uniform with size. At the current grade of 64.8% Fe, 3.6% SiO₂ and 1.17% Al₂O₃ the magnetite fines compare favourably with other Australian iron ores. It should also be noted that the phosphorus levels are very low.

Optical microscopy of the lump and fines samples indicated that the ore types appeared to be different. The lump ore had finely disseminated gangue whereas the minus 3mm fines sample was relatively pure with many particles containing no gangue constituents. This finding indicates either variability in ore type within the deposit or an unrepresentative sample of the lump ore from Tasmania Mines.

-  AREA FOR EXTENSIO
-  EXISTING CONSOLIDATION
-  MINERAL LEASES

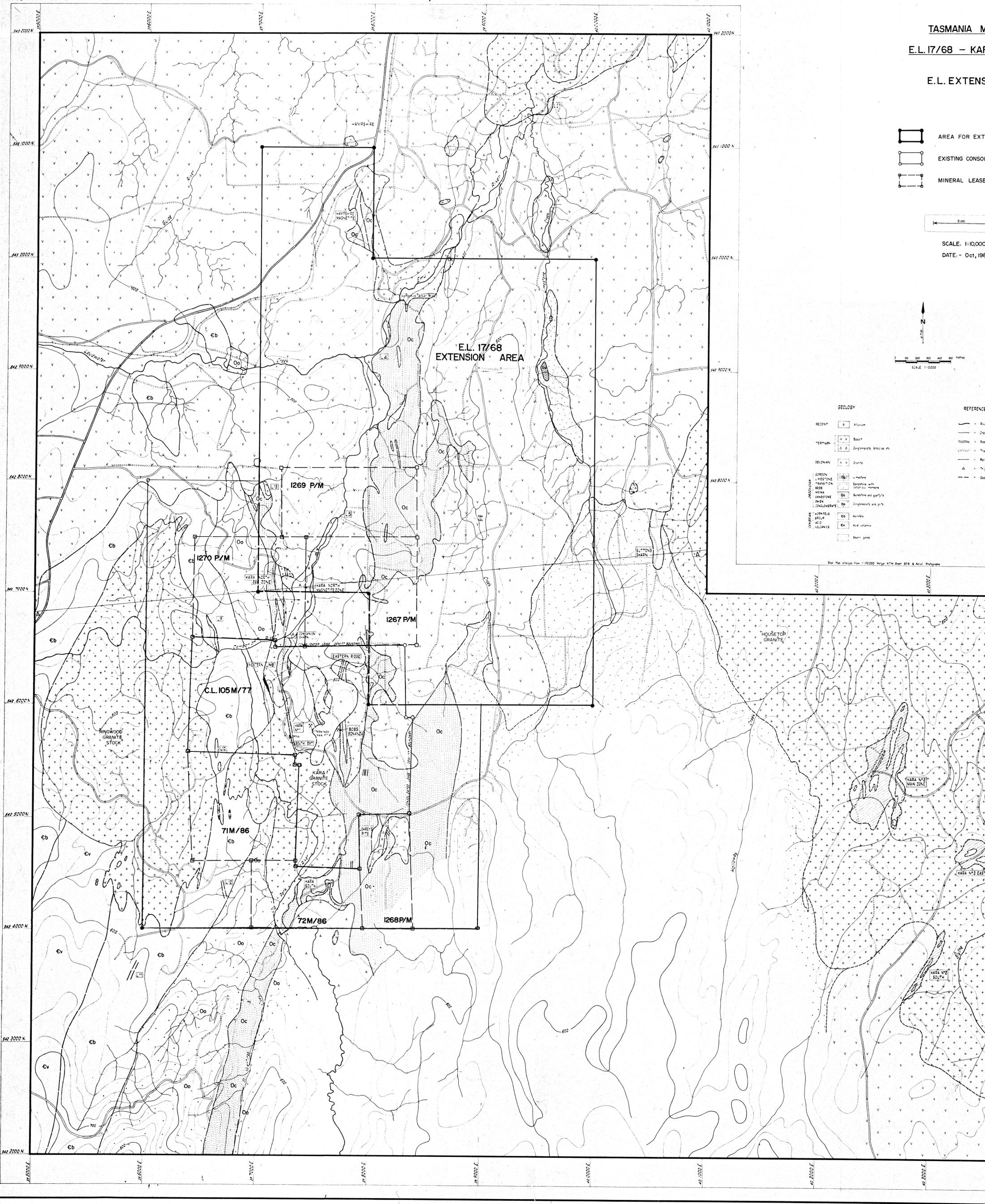


SCALE: 1:10,000
DATE: - Oct, 1987



GEOLOGY		REFERENCE
RECENT	A Alluvium	 River
QUATERNARY	B Beach	 Creek
	C Conglomerate, bricke etc	 Road
DELVONIAN	D Granite	 Track
	E Sandstone and quartzite	 Railway
	F Sandstone with 10% or more mica	 Triang. Sta.
	G Sandstone and quartzite	 Geological
	H Conglomerate and gneiss	
TRIASSIC	I Basalt	
	J Basalt with 10% or more mica	
	K Basalt and quartzite	
	L Basalt and gneiss	
PERMIAN	M Basalt	
	N Basalt and quartzite	
	O Basalt and gneiss	
	P Basalt and gneiss	
	Q Basalt and gneiss	
	R Basalt and gneiss	
	S Basalt and gneiss	
	T Basalt and gneiss	
	U Basalt and gneiss	
	V Basalt and gneiss	
	W Basalt and gneiss	
	X Basalt and gneiss	
	Y Basalt and gneiss	
	Z Basalt and gneiss	

Base Map enlarged from 1:100,000 Major N.T.M. Sheet 858 & Actual Photographs



E.L. EXTENSION AREA

-  AREA FOR EXTENSION
-  EXISTING CONSOLIDATED LEASE CL 105M/77
-  MINERAL LEASES UNDER APPLICATION

8 cm

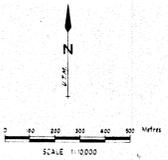
SCALE: 1:10,000

DATE: - Oct, 1987

90-3187

435050

PLAN 6/EX/EL L



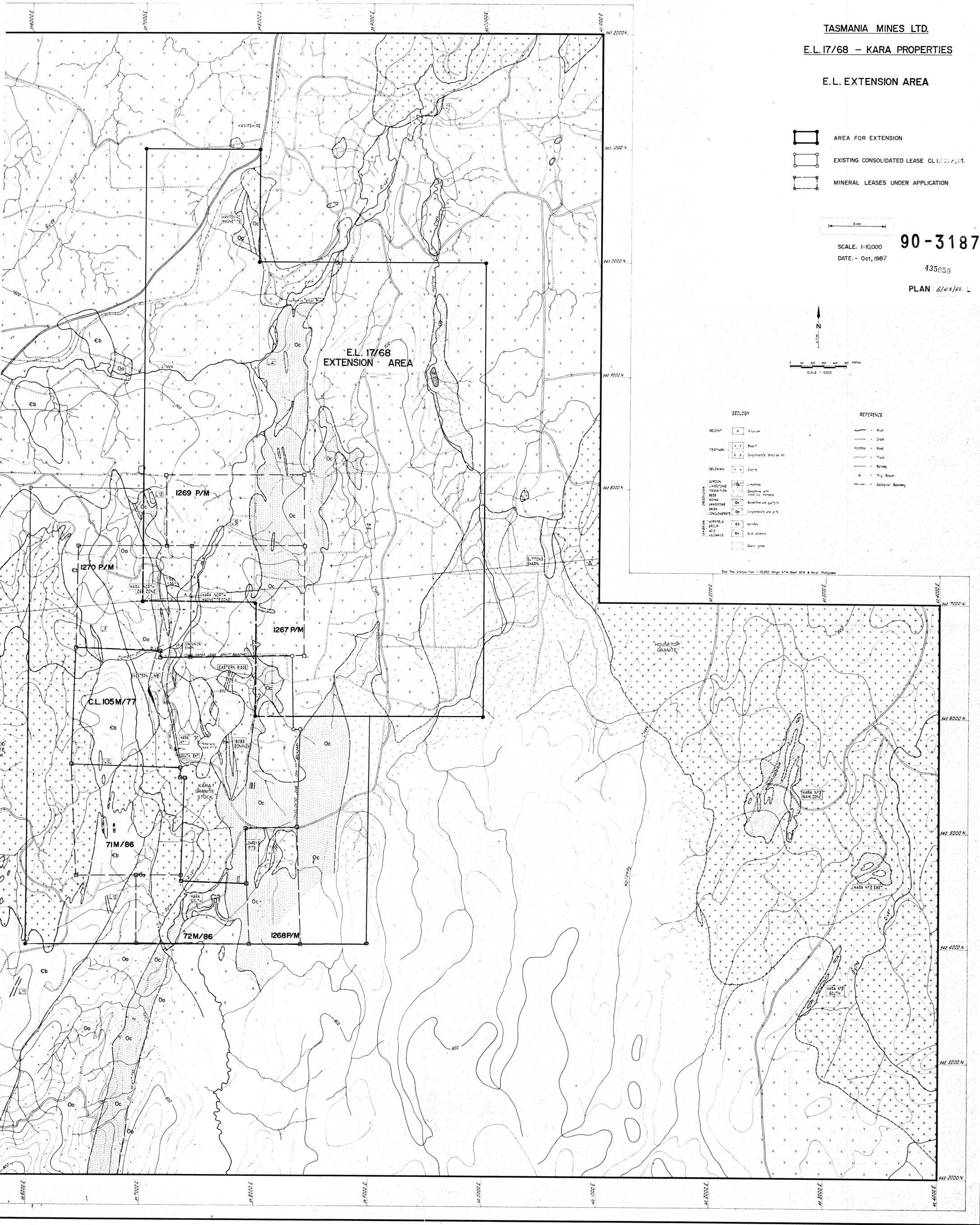
GEOLOGY

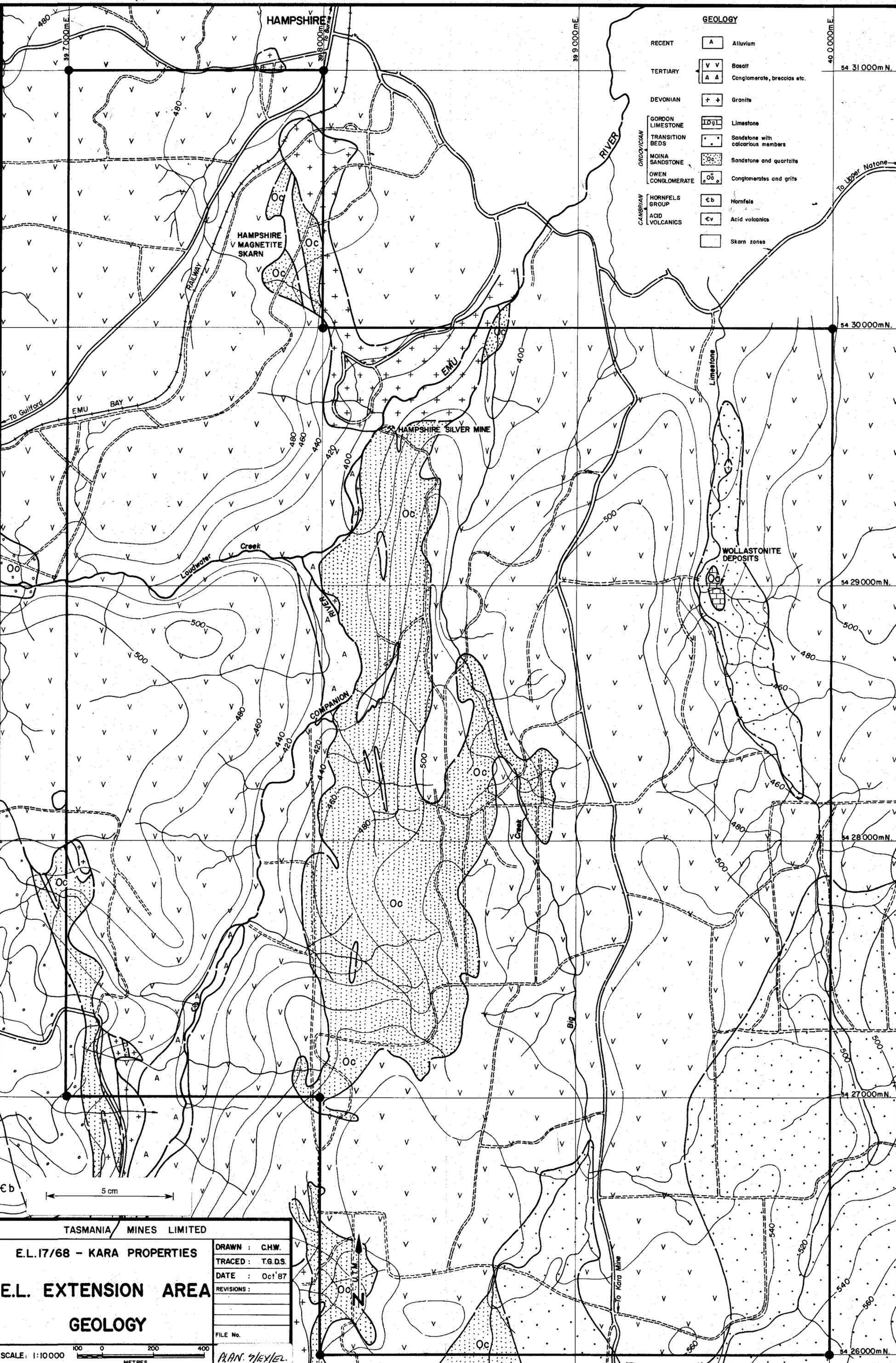
- | | | |
|-------------------|----|----------------------------------|
| RECENT | A | Alluvium |
| TERTIARY | V | Basalt |
| | B | Conglomerate, brecciated etc. |
| DEVONIAN | + | Granite |
| GORDON LESTERON | L | Limestone |
| TRANSITION BEGS | S | Sandstone with calcareous shales |
| MOWA | De | Sandstone and quartzite |
| JANSTONE | Oo | Conglomerate and gneiss |
| OWEN CONGLOMERATE | | |
| JANSTONE | EB | Basalts |
| | EV | Acid volcanics |
| | | Signe zone |

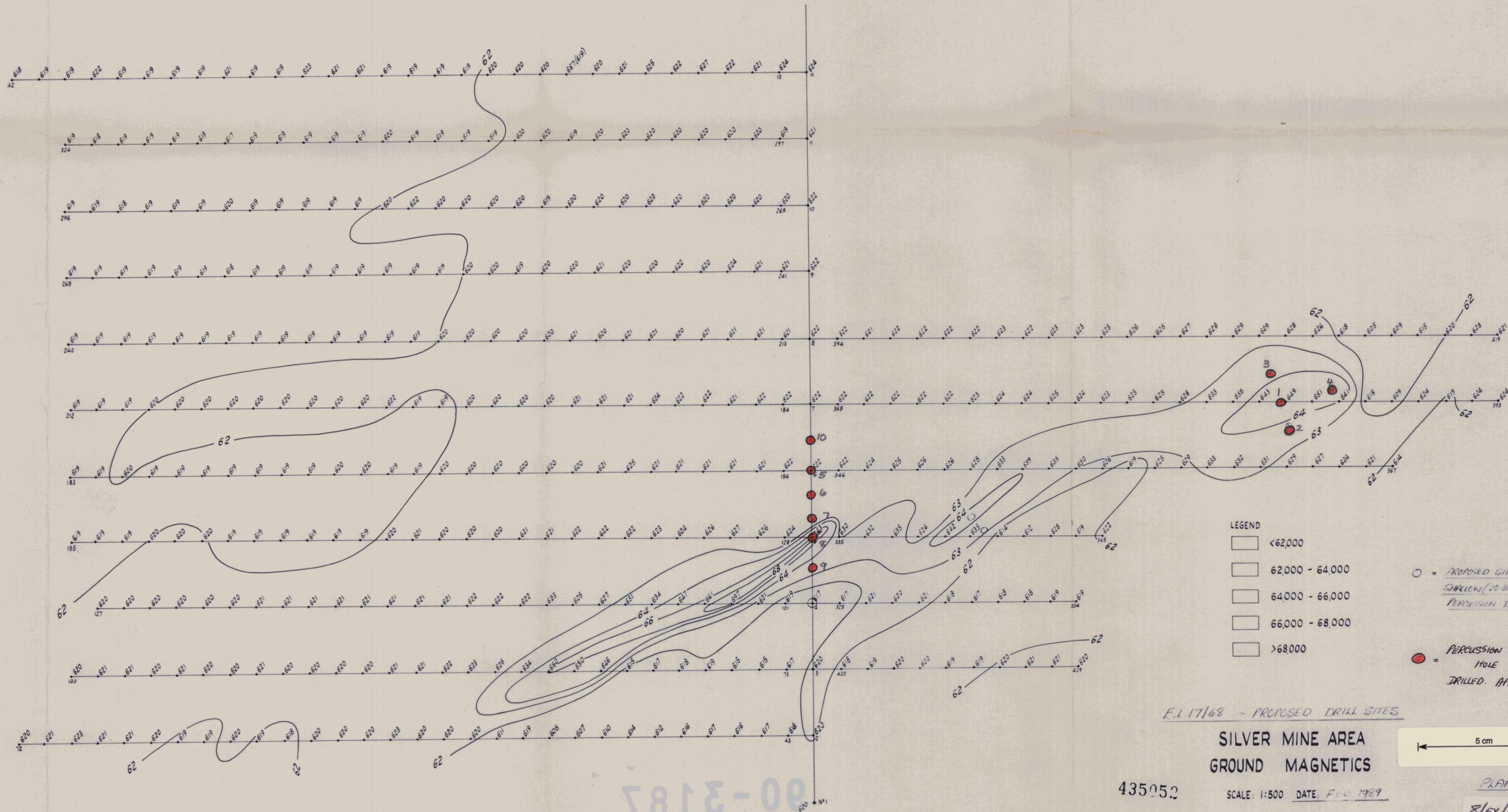
REFERENCE

-  River
-  Creek
-  Road
-  Track
-  Railway
-  Trig Station
-  Geological Boundary

Base Map extracted from 1:50,000 Military NTM Sheet 801 & Aerial Photographs







LEGEND

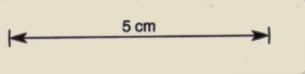
[White box]	< 62,000
[Light gray box]	62,000 - 64,000
[Medium gray box]	64,000 - 66,000
[Dark gray box]	66,000 - 68,000
[Black box]	> 68,000

○ = PROPOSED SITE FOR SHALLOW (20-30 m) PERCUSSION DRILLING

● = PERCUSSION DRILL HOLE DRILLED. APRIL/MAY 1990.

E.L. 17/68 - PROPOSED DRILL SITES

SILVER MINE AREA
GROUND MAGNETICS



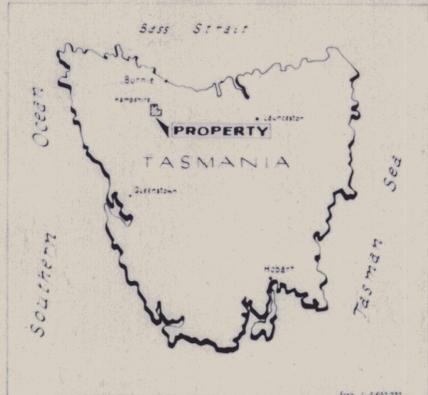
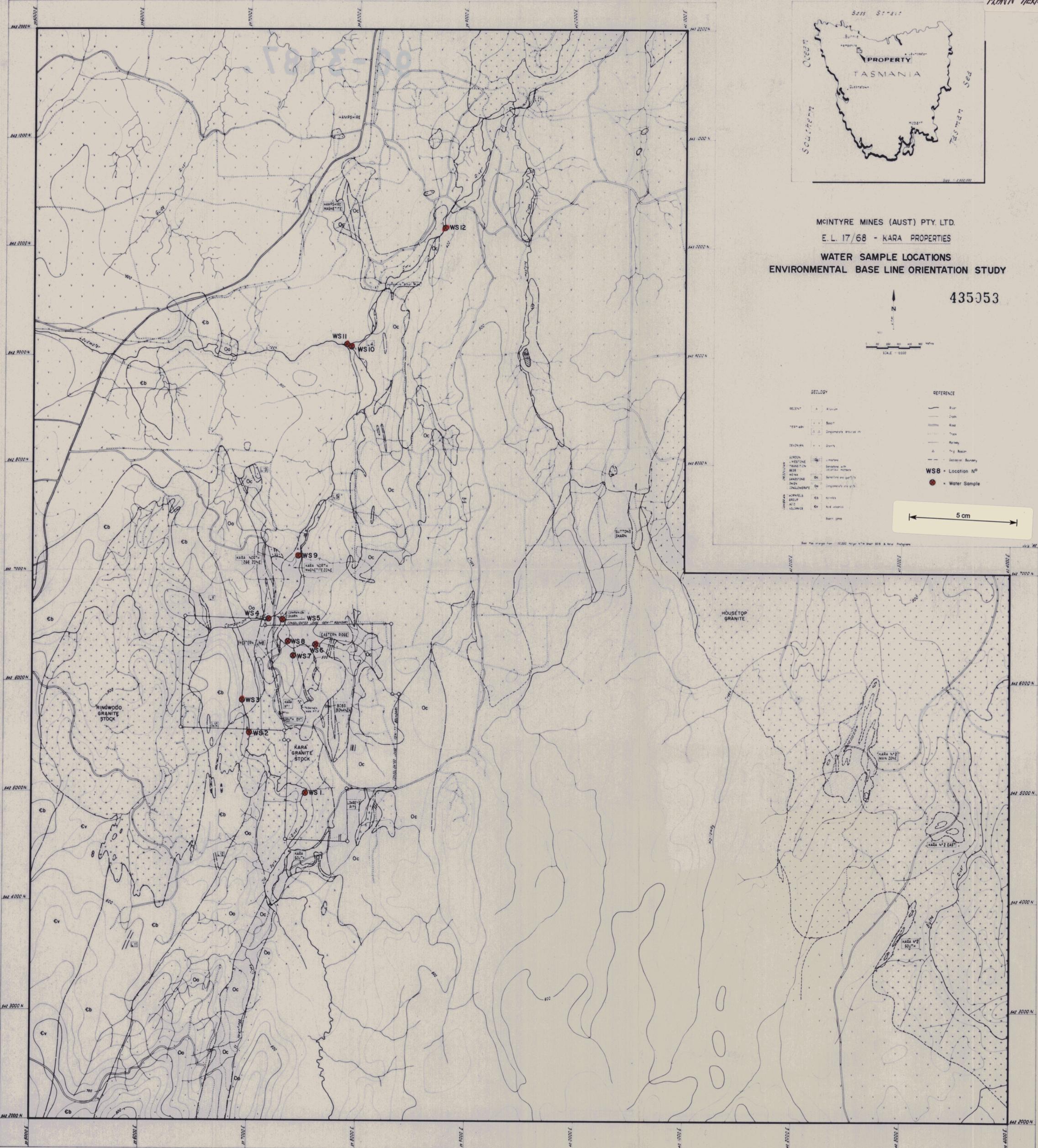
435052

SCALE: 1:500 DATE: FEB 1989

PLAN NO

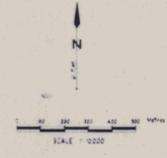
8/EX/EL.

00-3187



MCINTYRE MINES (AUST) PTY. LTD.
 E.L. 17/68 - KARA PROPERTIES
 WATER SAMPLE LOCATIONS
 ENVIRONMENTAL BASE LINE ORIENTATION STUDY

435053

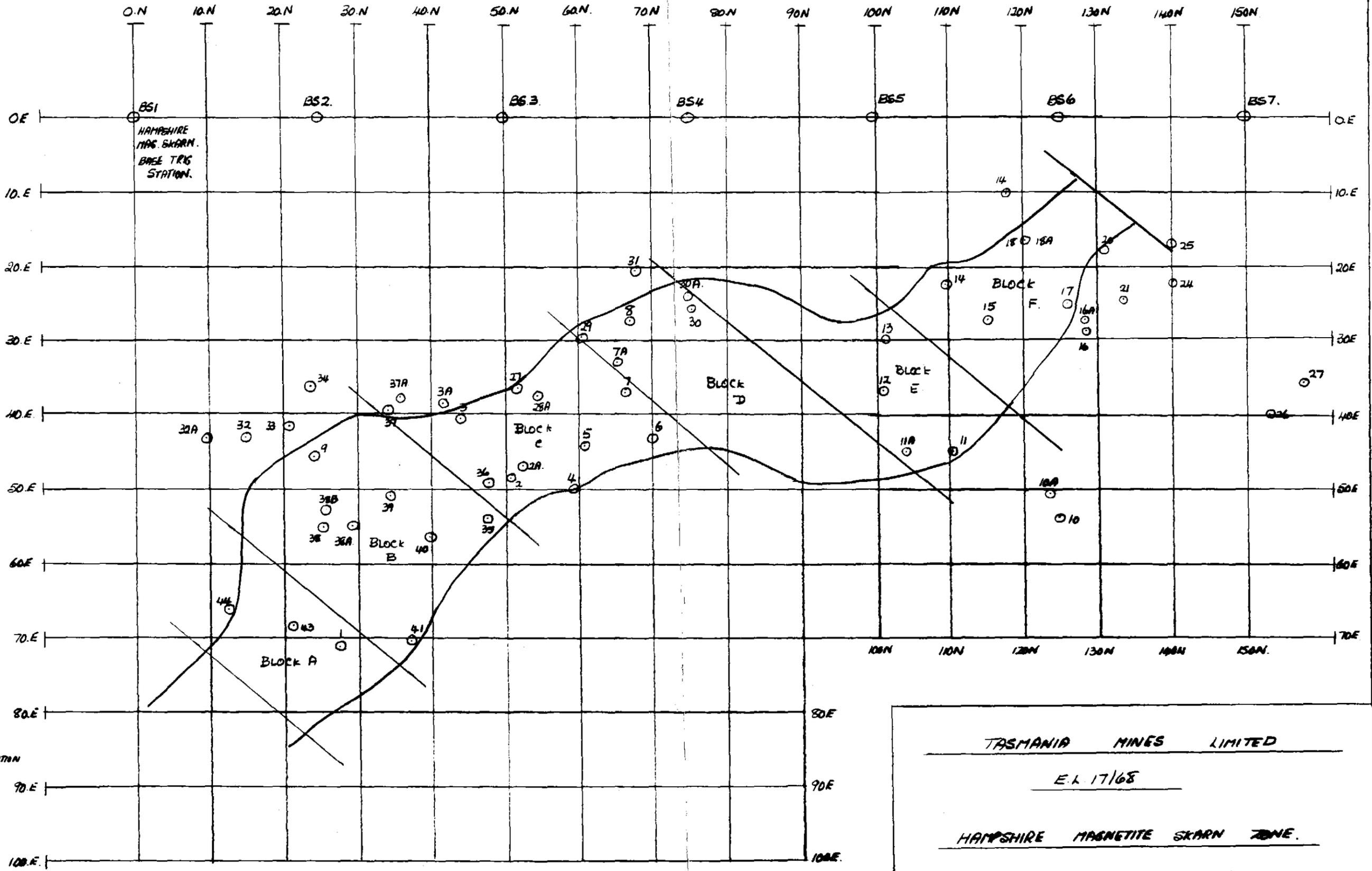


GEOLOGY		REFERENCE	
RECENT	Blank	—	Road
TERTIARY	Blank	—	Stream
DEVONIAN	Blank	—	Track
PERMIAN	Blank	—	Railway
TRIASSIC	Blank	—	Trig Station
CRETACEOUS	Blank	—	Geological Boundary
QUATERNARY	Blank	—	WS8 = Location No
		●	Water Sample



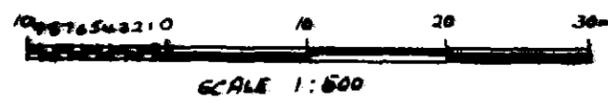
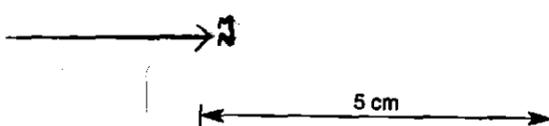
9700

HAMPSHIRE MAGNETITE SKARN.



42
 ○ = PERMISSION
 DRILL SITE LOCATION
 + DRILL HOLE NO

0N 10N 20N 30N 40N 50N 60N 70N 80N 90N



435054

TASMANIA MINES LIMITED

E.L. 17/68

HAMPSHIRE MAGNETITE SKARN ZONE.

DRILL SITE LOCATION PLAN

SCALE 1:500 DATE FEB. 1967

PLAN NO
10/EX/EL.