NEWNHAM EXPLORATION & MINING SERVICES

MAIN CREEK PROJECT

CONCEPTUAL DEVELOPMENT PLAN and INDICATIVE COSTS for DELIVERY OF MAGNESITE

SUMMARY REPORT

Prepared For:

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1. SUMMARY

(a) Initial drilling in the Main Creek area has identified an inferred mineral resource of 47.4 Mt 43.36% MgO, 2.2% CaO, 2.66% SiO_2 and 1.75% Fe_2O_3.

This represents a large, high grade resource with low levels of deleterious elements.

(b) Conceptual studies indicate 400,000 tpa of crushed and unbeneficiated high grade magnesite from this resource could be delivered to a magnesium metal refinery on the following long-term basis:

Capital Expenditure:	**A$18M**	
Operating Costs:	**cents A/lb Mg**	**cents US/lb Mg**
Tasmanian Refinery	**9.4**	**5.8**
Non-Tasmanian Refinery	**15.7**	**9.7**

This tonnage of magnesite would produce approximately 80,000 tpa magnesium metal.

(c) An underground cut and fill mining operation is recommended. This would minimise environmental impacts and maximise product quality.

Initial mining from the Bowry Creek deposit is recommended provided metallurgical testing is favourable.

(d) No substantive environmental issues relating to the underground mining and delivery of crushed magnesite to a refinery were identified. Major (long-term) open-cut mining would present problems with reference to acid mine drainage associated with exposure and stockpiling of pyritic waste.

(e) There are operational, environmental and cost advantages in not undertaking any mine site beneficiation of the magnesite. Mine quality control systems could eliminate the need for any pre-refinery beneficiation.

(f) The recommended option for transporting magnesite from the mine to the refinery is road freight to Whyte Hill south of

Waratah, then rail to either a Tasmanian refinery or the port of Burnie for shipment.

(g) The recommended mine site access road, crushing and site facilities are on ground currently not controlled by, or under option to, GTR. This is not a serious matter but would need to be addressed at some future time by negotiation with Government. Precedents exist to resolve this issue.

(h) Availability of adequate gas and electricity supplies in Tasmania for a magnesium metal refinery remains as a fundamental factor in the location of a refinery.

(i) The additional US 4 cents/lb Mg to freight the magnesite to a non-Tasmanian refinery could be offset by lower utility charges, lower refinery capital, operating and maintenance costs, and product disbursement costs.

(j) Prior to a commitment to develop a magnesite mine at Main Creek, a range of detailed pre-development studies would be required. A "ball-park" figure to complete these is $16M.

If the magnesite was to be sold to an existing refinery, these pre-development costs would be substantially less.

(k) The level of Government support for this project will depend upon whether the magnesium metal refinery is developed in Tasmania or elsewhere. However, this decision is beyond the control of GTR if Government cannot facilitate provision of power and gas.

2. INTRODUCTION

This report is intended to summarise and draw together the conclusions and recommendations of a series of recent studies on the Main Creek magnesite deposits; viz:

- identified resource
- conceptual mine plan
- environmental issues
- infrastructure

It provides indicative capital and operating costs to deliver magnesite to a magnesium metal refinery either in Tasmania or outside Tasmania.

The report also identifies and costs pre-development studies which must be undertaken prior to any commencement of mining.

3. DEVELOPMENT PROPOSAL

The recently completed drilling program identified the following inferred resources (Newnham):

	Mt	%MgO	%CaO	%SiO_2	%Fe_2O_3
Main Creek Lenses	**24.3**	**44.03**	**2.17**	**2.41**	**1.22**
Bowry Creek Lenses	**23.1**	**42.64**	**2.24**	**2.93**	**2.32**
TOTALS	**47.4**	**43.36**	**2.20**	**2.66**	**1.75**

Potential exists in both areas to increase resources. Acknowledging the very wide spaced nature of the current drilling pattern, it is reasonable to conclude that the tonnages and chemistry in **each** of these two areas is similar; ie, approximately 24 Mt 43% MgO, 2.2% CaO, 2.6% SiO_2, 1.7% Fe_2O_3.

Allowing for losses in various stages of processing, it is estimated that approximately 5 tonnes of magnesite will be required to produce 1 tonne of magnesium metal. An 80,000 tpa magnesium metal refinery would thus require a mining rate of approximately 400,000 tpa.

Each of the resource areas is capable of supporting a 400,000 tpa operation for approximately 50 years.

BFP Consultants Pty Limited reviewed and conceptualised various mining options.

Their principal conclusions were:

- An underground operation at Bowry Creek was the best mining option.
- A short life open-pit operation at Main Creek was also feasible but was unlikely to be significantly lower cost because of access and environmental costs.
- A cut and fill mining method would be best for quality control reasons. If additional information demonstrated consistency of grade trends, then a benching method could be considered.

Mining could either be by contract or do-it-yourself.

An underground mine at Bowry Creek would deliver 400,000 tpa ore to an adjacent crushing facility.

If SiO_2 is in the 2-3% range, there appears to be a diminished need to beneficiate the run-of-mine ore to reduce this level. Beneficiation would require crushing, grinding, silica flotation, drying and loading, accompanied by waste storage. The 2-3% silica would be replaced in the concentrate to be trucked by 6-7% moisture.

If beneficiation to achieve SiO_2 reduction is, in fact, required at all, it would be cost beneficial to do this at the refinery.

Thus, it is recommended that on site treatment of run-of-mine ore be restricted to single pass crushing to approximately 40 mm. Crushed magnesite would be conveyed directly to overhead bins which would feed direct into trucks for transporting to a rail head.

Crushing and loading could either be contract or do-it-yourself. Trucking should be contracted.

Power would be transmitted to site from a purpose built line from the Savage River substation.

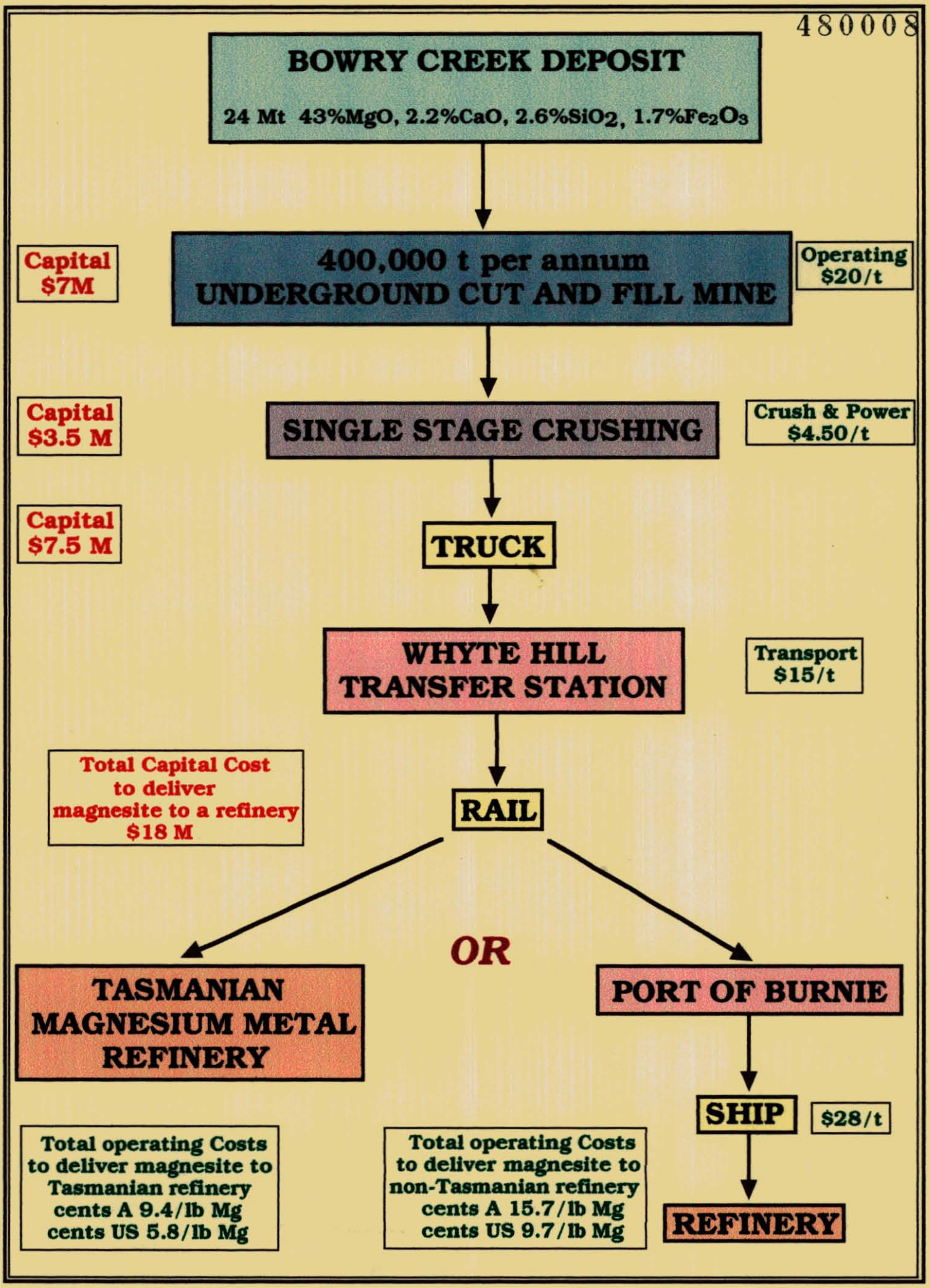
A range of options for transporting the crushed magnesite to the refinery was considered. The recommended option is to truck crushed magnesite by B-double or superdog trucks to a railhead at Whyte Hill, south of Waratah.

A loading facility at Whyte Hill would feed rail trucks for direct rail to either a Tasmanian refinery site, probably in the Highclere area, or to the Port of Burnie for shipment to either a mainland or overseas refinery. This option requires Tasrail to both negotiate competitive freight prices and to extend a branch line from Guildford to Whyte Hill.

Trucking up to 400,000 tpa from the mine to Whyte Hill will require a substantial initial capital upgrade of the road and an annual road maintenance budget.

The operation to deliver magnesite to a refinery as described above is straightforward. The mine and crushing facility footprint would be very small and no major environmental issues have been identified by NSR Environmental Consultants Pty Limited.

The recommended development proposal is illustrated below.



MAIN CREEK MAGNESITE PROJECT: DEVELOPMENT PLAN

4. CAPITAL COSTS

Capital costs to develop the magnesite mine and provide infrastructure to deliver magnesite to the refinery will vary considerably depending on several decisons:

- mine on contract or do-it-yourself
- crush on contract or do-it-yourself
- will Tasrail incur the expenditure of extending a branch line from Guildford to Whyte Hill?
- what level of capital road works will Government require on the Main Creek to Whyte Hill road?

Anticipated capital costs have been assigned to six groupings:

(a) pre-production mine costs

(b) mine equipment

(c) site costs

(d) power

(e) road capital

(f) rail capital

(a) Pre-production Mine Costs: ($5M)

These are the costs of developing the mine to the point where magnesite production can commence. They were detailed and quantified in BFP's report, and they are based on an underground cut and fill operation at Bowry Creek. They include:

- portal development
- initial decline access
- ventilation development
- early lateral development and sampling

It could be argued that these are operating costs. However, because they are not specific to actual magnesite production and are utilised for the life-of-mine, it is recommended they be capitalised.

If early stage mining was a small open-cut at Main Creek, there would still be pre-production costs of this order (**or more**) associated with:

- access road development
- creek diversion
- waste dump construction
- waste removal

BFP estimated the Bowry Creek pre-production costs at $4.5M. A contingency allowance would bring this to $5M.

(b) Mine Equipment: ($2.0M)

If GTR decided to operate the mine on a do-it-yourself basis, BFP estimates mine equipment costs would range between $1.5M for second hand equipment to $5M for new equipment.

This covers items such as underground trucks, drills, shovels, etc.

There is a healthy second hand market in Australia, so a mid-range amount of $2M is provided.

(c) Site Costs: ($1.5M)

The infrastructure report (Newnham) estimated site costs of $1.3M, say $1.5M with a contingency provision.

This was based on a contractor providing the crushing, loading and weighing facility.

Provision was made for:

- clearing and preparing the site
- offices, change rooms, ablutions, crib room, lamp room
- first aid and mine rescue
- laboratory
- workshop
- water supply

If GTR decided to crush and load on a do-it-yourself basis, a further $2M capital should be provided.

(d) Power: ($2M)

The capital cost of providing power to the mine site is estimated at $2M and covers:

- upgrade of Savage River substation
- constructing new line to site
- constructing site substation
- reticulation of supply to mine and site works

It may be possible to negotiate some government assistance with provision of the supply to the mine site but this has not been anticipated.

(e) Road Capital: ($7.5M)

An estimate for $7.5M is based on:

- new haul road from Corinna Road to mine site $1.5M
- upgrade of Corinna Road to Savage River $3.0M
- capital reconstruction of Savage River-Whyte Hill road $3.0M

Two principal factors will influence this estimate:

(a) Government demands/assistance on Savage River-Whyte Hill road

(b) Tasrail agreeing to extend rail to Whyte Hill

If the decision is made to road haul to Guildford, ie, no rail extension, the capital cost may rise to around $8.5M.

(f) Rail Capital:

No capital provision is allowed for rail construction. It is recommended that Tasrail, as the rail owners, should be persuaded to extend the line at their cost, which will undoubtedly be passed on through higher operating charges via a long-term contract.

If Tasrail was only prepared to extend the line to Waratah, GTR may be required to contribute to the extension to Whyte Hill - say $4.0M.

CAPITAL SUMMARY: ($'M)

Item	Contract Option (No-rail contrib)	DIY Option (No-rail contrib)	DIY (+ rail contrib)
Pre-production Mine	5.0	5.0	5.0
Mine Equipment	-	2.0	2.0
Site	1.5	3.5	3.5
Power	2.0	2.0	2.0
Roads	7.5	7.5	7.5
Rail	-	-	4.0
TOTALS	16.0	20.0	24.0

Summary:

For a long-term project, a DIY mine combined with a contract crushing facility is recommended. The capital cost, assuming no contribution to rail extension, would be approximately $18M.

5. OPERATING COSTS

Operating costs can be grouped into seven areas:

(i) mine

(ii) crushing and loading

(iii) power

(iv) transport

(v) environment

(vi) management

(vii) ex-mine

Operating costs are quite low because this is a relatively small, uncomplicated mine, with minimal on site treatment.

(i) Mine Costs: ($20/t)

BFP based their estimates on a Bowry Creek underground cut and fill operation -

with surface sourced fill: $18/t

with underground sourced fill: $23/t

Surface sourced fill could either be a purpose built quarry, Tertiary gravels trucked in from local existing quarries, refinery back fill, or a combination of all these.

Thus, a mid-range operating cost of $20/t is selected.

(ii) Crushing and Loading: ($2/t)

It is recommended that the crushing and loading facility be entirely operated by contractors.

Indicative costs to crush and load are $2/t.

(iii) Power: ($2.50/t)

GTR should retain responsibility for providing power to both the mine and crushing facility, whether these be contracted or not. This presumption is factored into mine and crushing operating cost estimates.

The infrastructure report estimated power costs of $2.50/t. This would reduce for an operation below 400,000 tpa and if negotiations with Aurora secured a lower unit price.

(iv) Transport: ($15/t or $43/t non-Tasmania)

The recommended transport option is road freight to Whyte Hill (35 km) then rail to either a Tasmanian refinery or the port of Burnie, thence sea freight to a non-Tasmanian refinery.

The cost components are, therefore:

Road freight	$3.50	
Road maintenance	$0.75	
Rail freight	$11.60	
Sub-Total	$15.00	(negotiated down)
Shipping	$28.00	
Sub-Total	$43.00	

(v) Environment: ($0.50/t)

The development plan as envisaged will have relatively low environmental impact. However, provision should be made for an annual audit and a works operating budget. A total $200,000 pa or $0.50 should be adequate.

(vi) Management: ($0.50/t)

The mine operating budget has a $2.90/t provision for supervision, geology and general management of the mine.

An additional amount should be provided for general management, office costs, etc, say $200,000 pa or $0.50/t.

(vii) Ex-mine costs: ($1.00/t)

Provision for insurance, head office, shipping control, etc, say $400,000 pa or $1.00/t.

Operating cost Summary:

Item	A$/t	A cents/lb Mg	US cents/lb Mg
Mine	20.00	4.54	2.81
Crushing & Loading	2.00	0.45	0.28
Power	2.50	0.56	0.35
Transport			
- Tasmania	15.00	3.40	2.11
- Non-Tasmania	43.00	9.75	6.05
Environment	0.50	0.11	0.07
Management	0.50	0.11	0.07
Ex-mine	1.00	0.22	0.14
TOTALS (rounded)			
- Tas Refinery	41.50	9.4	5.8
- Non-Tas Refinery	69.50	15.7	9.7

* **Costs/lb Mg metal are calculated on basis of 5 tonnes ROM ore required to produce 1 tonne Mg metal**

** **Assumed A$ = US$0.62**

6. PRE-DEVELOPMENT STUDIES and COSTS

Studies completed to date on the Main Creek magnesite deposits have been of an indicative or conceptual nature.

Insufficient data exists to prepare detailed reports.

Detailed data must be acquired and reported upon in order to make final decisions on development of the mine.

The overall cost of these studies will be greatly influenced by the preferred destination of the magnesite:

- a purpose built refinery, either in Tasmania or elsewhere
- as a feedstock to an existing refinery

A listing of the types of such pre-development studies is presented below, along with a "ball-park" estimate of costs.

(a) Resource Definition: ($2M)

The current inferred resource is based on a very small number of holes, especially in the case of the Bowry lenses (4 holes).

A detailed drilling program will be required to better define this resource and establish a mineable reserve of treatable ore.

Approximately 15 Mt should be so defined on, say, 50 m centres, over a block 500 m long by 200 m deep. This may require about 40 holes and 10,000 m of drilling.

The drilling would be accompanied by resource modelling and characterisation studies and, overall, may cost approximately $2M to complete.

(b) Mining, Crushing, Site and Infrastructure Studies: ($1M)

Once detailed resource data and core is available, detailed **mine planning** and costing studies can be completed, including an analysis of contractor DIY benefits ($0.2).

Ore handling, **crushing** and **loading** facilities need to be designed and costed, including an analysis of contractor versus DIY benefits ($0.2).

Site design and facilities require detailing, including provision of water supply, substation, offices, workshops, etc ($0.2).

A detailed **infrastructure** study will be required which addresses provision of power, road and rail freight and, possibly, port facilities. If the decision is made to build the refinery outside Tasmania, this study would be extended to cover shipping, receiving port facilities and port-refinery transport ($0.4).

(c) Environmental Studies: ($1M)

A detailed environment mangement plan will be required for both the mine and the refinery sites. If the refinery is outside Tasmania, this will involve dealing with two jurisdictions.

The EMP requires collection of base line data which NSR has flagged should commence as soon as possible because it may take up to 12 months to fully assemble.

The EMP must also be integrated with an overall development plan, and should include refinery site selection studies.

NSR estimated the EMP may cost $0.4M to prepare. However, that represents a best case scenario and it is considered prudent to expand this substantially to provide for unexpected circumstances. An estimate of $1M is proposed.

(d) Metallurgical Testing: ($5M)

To date, only very preliminary test work has been undertaken on two composite samples from the Main Creek deposit. No work has been undertaken on Bowry Creek deposits.

Naturally, the suitability of the magnesite feed is pre-requisite data for any decision on the refinery development.

Metallurgical test work would have to be undertaken initially on drill cores (item (a) above), but the need for mined bulk samples could emerge.

Bench scale test work would probably be followed by pilot plant scale tests, and it is difficult to estimate the cost of this work at this stage.

An estimate of $5M is suggested to complete both extensive bench scale testing of material from areas proposed for mining and possibly some pilot plant testing.

(e) Refinery Engineering Design: ($5M)

As with the metallurgical testing, this is a difficult item to quantify at this stage. The amount of design work will be influenced by what is available off the shelf; ie, from the suppliers of the refinery technology - eg, Alcan.

A "ball-park" figure of $5M is proposed. The final figure could be substantially more or less.

(f) Market and Partnership Development: ($1M)

GTR has two basic market choices:

- supply to a purpose built refinery
- supply to an existing refinery

Development of a purpose built refinery will probably require development of a partnership with a major organisation capable of marketing or consuming the magnesium metal produced.

Supply of magnesite to an existing refinery would require marketing on the basis of being able to deliver a demonstrably better feed product at a competitive price to the refinery's current feed.

This exercise will require time and money and a figure of $1M is suggested.

(g) Feasibility Study and Project Management: ($1M)

The outcomes of all the above studies will have to be integrated into a **definitive feasibility study**, incorporating appropriate financial analyses. This DFS should be such that a project "go/no-go" decision can be made.

Whilst all of the above studies can be undertaken by consultants, GTR will have to provide appropriate overall project management which would be a full time position for a senior person plus support staff.

A DFS and management budget of $1M is suggested. Appropriately co-ordinated, the above pre-development studies could be completed over a 12-month period as outlined below.

Pre-development Budget Summary:

	$'M
Resource definition	2.0
Mine, crushing, infrastructure studies	1.0
Environmental Management Plan	1.0
Metallurgical testing	5.0
Refinery engineering design	5.0
Market/partnership development	1.0
DFS and project management	1.0
TOTAL	$16M

Pre-development Schedule:

	1-6 mths	7-12 mths	13-18 mths
Resource definition	◄——►		
Mine, infrastructure study	◄——►	——►	
EMP	◄——	———	——►
Metallurgical testing	◄——	———	——►
Refinery design		◄——►	——►
Marketing	◄——	———	——►
DFS			◄——►

6. BACKGROUND REFERENCES

(a) "Main Creek Magnesite Project (Western Tasmania). Magnesite Resource Estimate, June, 1998" by Newnham Exploration & Mining Services, 10 June, 1998

(b) "Main Creek Magnesite Project, Tasmania. Conceptual Mine Planning Study" by BFP Consultants Pty Ltd, July, 1998

(c) "Main Creek Magnesite Project. Environmental Issues Report" by NSR Environmental Consultants Pty Limited, August, 1998.

(d) "Main Creek Magnesite Project. Infrastructure Issues, Options and Indicative Costs" by Newnham Exploration & Mining Services, July, 1998