<u>EVALUATION OF SANTOS</u>

<u>INTERESTS IN ALLUVIAL TIN EXPLORATION</u>

WP ID 0362H

10/1/83

INDEX

OUTLINE OF SANTOS INTERESTS IN TIN EXPLORATION

SANTOS has at present, a number of exploration licenses/leases giving it the right to explore for minerals, particularly Tin, in Tasmania.

The tenements granted by the licences/leases are held both directly by SANTOS and indirectly through SANTOS' 100% ownership of Tintas Pty. Ltd. which owns 100% of Hellyer Mining and Exploration Pty. Ltd. (Hellyer).

The following tenements have potential for hard-rock mining:

	Holder	Interest
- Blue Tier E.L. 9/76 (including Anchor Deposit)	Hellyer	38% *
- Gladstone M.L.s (8)	SANTOS	100%
- Fly-by-Night M.L.s (6)	Hellyer	100%

* 60% held by Renison Ltd.
2% held by Nargun Pty. Ltd. although SANTOS contributes 40% of costs until after a definitive feasibility study has been completed.

The future involvement of SANTOS in these tenements will be the subject of a further paper.

2. OUTLINE OF SANTOS INTERESTS IN TIN EXPLORATION ...

The following tenements have potential for on-shore alluvial mining:

	Holder	Interest
- Great Northern Plains E.L. 19/77	Hellyer	90% **
- MacGregors C.M.L. 42M/76	Hellyer	90% x
- Ringarooma River E.L. 17/82	SANTOS	100%

** 10% held by Mineral Holdings Australia Pty. Ltd.

x 10% held by Mineral Holdings Australia Pty. Ltd.

The following tenement has potential for off-shore alluvial mining:

	Holder	Interest
- Ringarooma Bay E.L. 42/80	SANTOS	75% xx

xx SANTOS has the right to earn 75% of this tenement subject to the expenditure of $225,000 - $75,000 by the end of June, 1983. It is possible that expenditure requirements could be renegotiated.

An indication of the location of the tenements is shown in Appendix B.

During the past three years the Company has committed $4.1 million to exploration for Minerals and assessment of prospects - the results of this commitment are the tenements held in Tasmania, one third eauity in a molybdenum project in Indonesia, of which CRA Indonesian Holdings Pty. Ltd. is the operator and holder of the balance of the interest, and a 40% interest in the uranium joint venture with URANERZ Australia Pty. Ltd. and AOG Minerals Ltd.

3. FUTURE EXPLORATION EXPENDITURE COMMITMENTS

SANTOS holds areas covered by both Exploration Licences (E.L.s) and Mineral Leases (M.L.s).

E.L.s are subject to both an annual rental and an annual expenditure commitment. The licence holder may apply to the Director of Mines to waive or reduce expenditure commitments in some circumstances. A refundable deposit may be required as a guarantee for observance of the conditions of the licence - SANTOS has at present $12,000 held by the Tasmanian Department of Mines as such a guarantee in respect of E.L. 19/77 and E.L. 42/80, and may be required to lodge further deposits on renewal of other tenements.

M.L.s are subject to an annual rental. There is no expenditure commitment, but leases contain a labour covenant which can generally be waived in lieu of a relatively minor expenditure. A deposit may be required to guarantee performance.

In general, for both E.L.s and M.L.s, the annual rental is a nominal figure whilst expenditure commitments for E.L.s can be quite large. Both vary according to the area involved and (in the case of E.L.s), the number of years of tenure.

3. FUTURE EXPLORATION EXPENDITURE COMMITMENTS ...

Over the next five years (assuming no changes to the Mining Act Regulations), it can be expected that SANTOS will be required to incur total expenditure of up to $696.2 thousand on its alluvial tenements as follows:

	On-shore Alluvial $(000)	Off-shore Alluvial $(000)	Total $(000)
- Exploration Licences			
. Rental	12.3	8.4	20.7
. Commitment	459.2 *	214.4	673.6
- Mineral Leases			
. Rental	1.9	NA	1.9
Total	473.4	222.8	696.2

* Includes $157,000 commitment for E.L.A. 17/82 which may be negotiated due to current depressed market conditions. E.L.A. 17/82 was offered subject to an expenditure commitment of $400,000 in the first 12 months of tenure and an undertaking to either relinquish the licence or proceed to development after a further six months - Expenditure to date has amounted to approximately $230,000.

An outline of yearly expenditure commitments to 1987 is contained in Appendix C.

4. GEOLOGICAL ASSESSMENT OF POTENTIAL OF EXISTING ALLUVIAL TENEMENTS

1. Onshore Alluvial (E.L. 19/77, E.L.A. 17/82 and C.M.L. 42M/76)

Drilling was carried out during 1981 and the first half of 1982. Some bulk sampling, preliminary engineering and environmental studies were also completed during 1982.

The area is considered to have good potential to host a moderate-sized low grade cassiterite ore body, also containing minor recoverable gold.

A two phase drilling programme would be required to determine the true potential of the area:

- Phase 1, 10 holes costing up to $18,000
- Phase 2, 27 holes costing up to $45,000

The area is considered by Exploration Department to have favourable conditions for mining.

4. GEOLOGICAL ASSESSMENT OF POTENTIAL OF EXISTING ALLUVIAL TENEMENTS ...

2. Offshore Alluvial (E.L. 42/80)

A series of widely-spaced drill holes was completed in part of the area during the mid 1960's and several holes intersected Tin mineralisation grading between 100 g/m^3 and 400 g/m^3 Tin metal. No other drilling has been carried out since.

A seismic/hydrographic survey in late 1981 indicated a volume potential of Tin-bearing sediment of 60 million m^3 with an additional volume potential in excess of 100 million m^3.

Geologically, the volume potential of the area is large, but the grade factor is essentially unknown. To determine the true potential of the area would require an 80 hole programme costing up to $200,000.

Exploration Department consider that Payzone characteristics and water depths appear amenable to a conventional dredging operation, but based on current information, weather conditions in Ringarooma Bay could cause significant operational downtime.

5. SUMMARY OF ESTIMATED RESERVES

The following outlines estimated reserves of Alluvial Tin interests as assessed by Exploration Department:

Tenement		Estimated Reserves
1. Onshore Alluvial	Possible :	27 million m^3 grading 10Sg/m^3 Tin metal
	Potential :	56 million m^3 grading 100g/m^3 Tin metal.
2. Offshore Alluvial	Possible :	Not calculated
	Potential :	60 million m^3 in which intersections of 100-450 g/m^3 Tin metal have been obtained. An additional volume in excess of 100 million m^3 has not been tested.

TIN QUOTA
No sales for 2 yrs?

6. ECONOMIC ASSESSMENT OF SANTOS' ALLUVIAL TIN INTERESTS

SANTOS Planning and Economics Group, Petroleum Engineering Department, have prepared a number of cash flows based on various alternative development propositions.

1. On-Shore Alluvial

A summary of the cash flows relating to on-shore Alluvial tenements is contained in Appendix D. The most realistic case, giving a discounted NPV of $2.5 million, was based on the following assumptions:

- total mine reserves of 45 million m^3,
- a Mine life of 6 years,
- capital investment of $4.8 million,
- a Tin price of $13,000 per tonne and gold price of $400 per oz.
- discount rate 15% on net cash flows after tax.

This case indicates that there is potential for the development of a moderate size low grade mining operation. Maximum net cash flow after tax in any one year would amount to approximately $3.0 million.

Examination of alternative cases indicates that the project would be uneconomic if:

- deposit could not be mined in 6 years,
- capital investment increased significantly,
- prices were below those stated,
- discount rate of more than 15% was required.

6. ECONOMIC ASSESSMENT OF SANTOS' ALLUVIAL TIN INTERESTS ...

1. On-Shore Alluvial ...

At present, export prices are below those required, export quotas are in operation, there are significant surplus stocks on the world market, and demand for Tin is expected to increase only relatively slowly to the end of the Century. It therefore appears unlikely that an early start up to this project is possible.

2. Off-Shore Alluvial

Whilst no reserves have as yet been calculated, a number of cases were examined to determine the recovery rate criteria necessary for economic development of this prospect. Two cases were selected as reflecting a reasonable model of the potential development - these are outlined in Appendix E. Results indicating the lowest recovery rate were based on the following assumptions:

- total mine reserves of 63 million m^3,
- mine production over 15 years at a uniform rate,
- capital investment of $23 million,
- operating cost inflation factor of 11% per annum,
- tin price escalation factor of 10% per annum after the first five years,
- discount rate of 15% on net cash flows after tax.

6. ECONOMIC ASSESSMENT OF SANTOS' ALLUVIAL TIN INTERESTS ...

2. Off-Shore Alluvial ...

The minimum Tin recovery rate reauired was 300 g/m^3. Exploration Department consider that such a result is possible, but that considerable exploration, as stated previously, would be required to prove the resource.

If such a recovery rate was achieved, the discounted net present value after tax of the cash flows as outlined, would amount to $11.6 million, with a maximum cash flow in any one year of approximately $12 million.

However, the case outlined does not consider the need for additional capital expenditure later in the 15 year project, to cater for plant replacement, which would have the impact of increasing the Tin recovery rate necessary for economic development.

In addition, any adverse changes to the assumptions would act to increase the Tin recovery rate required.

Further, the off-shore tenement is situated in an area subject to adverse weather conditions which could result in significant down-time (up to 20%) of the operation, and therefore, increased recovery rates would be required (360 g/m^3). Available data is insufficient to fully assess the impact of environmental aspects.

The project would have a higher risk factor than an on-shore alluvial project.

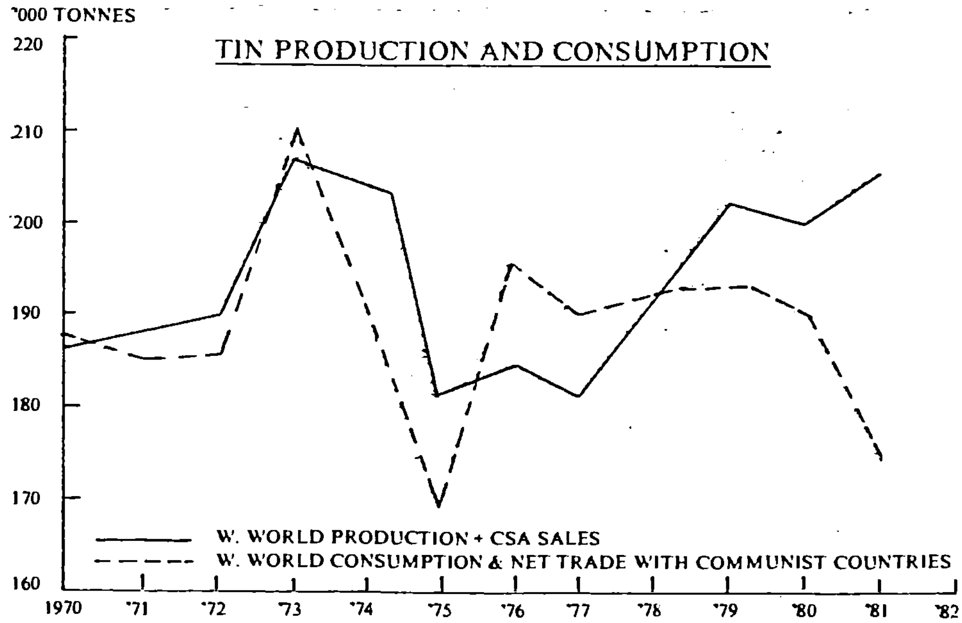
7. THE OUTLOOK FOR TIN

At present there is a surplus of Tin on the world market, as evidenced by:

- increase in size of International Tin Agreement buffer stock to 60,000 tonnes.

- 120,000 tonnes surplus requirements in USA strategic stockpile of 200,000 tonnes, with 25,000 tonnes authorised for sale by mid-1983.

- increase in surplus of production over consumption over the past two years (see graph below).



Source: Aberfoyle Ltd.

- expected maintenance of production controls during 1983.

7. THE OUTLOOK FOR TIN ...

The Metals Research Unit (London), of Shearson/American Express Limited, predicts in its Annual Review of the World Tin Industry for 1982/83 that the Tin market is going to remain depressed for the next three or four years and even export controls will take some years to eliminate surplus stocks. Whilst production/stocks remain in excess of consumption requirements, prices will remain depressed and the development of Tin mines will be deferred.

The Institute of Applied Economic and Social Research forecasts that over the next five years:

- World consumption of refined Tin will decrease,
- World mine production of Tin will decrease,
- Australian exports of refined Tin will increase from approximately 2,130 tonnes in 1982 to 2,180 tonnes in 1987. Exports of ore will fall from 6,450 tonnes in 1982 to 5,170 tonnes in 1987.
- Australia's share of world refined Tin exports will increase from 8% to 10% by 1987,
- Domestic consumption will increase marginally,
- Australian Mine production will fall from 20,570 tonnes in 1982 to 16,810 tonnes in 1987.

7. THE OUTLOOK FOR TIN ...

- Australian export prices will not change significantly from current levels as indicated below:

	Refined Tin $A/tonne	% Change
1980/81	11,116	
1981/82	10,857	(1.4)
1982/83	12,806	16.9
1983/84	12,871	0.5
1984/85	12,536	(2.6)
1985/86	12,454	(0.7)
1986/87	12,716	2.1

Reflecting the depressed state of the market, a number of Australian projects have been deferred, including planned expansions by Renison Ltd. and the Taronga N.S.W. open cut Tin mining joint venture. A number of small mines have closed.

8. MAJOR ISSUES

1. Resources/Expertise Available for Allocation to Tin Mining Operation

The capital reauired to establish a Tin mining operation could amount in total to $28 million:

- $5 million for an on-shore alluvial project,
- $23 million for an off-shore alluvial project.

Funding of such amounts by the Company should be no barrier to implementation.

The Company does not, at present, have any experience in the development and operation of a Tin mining venture. However, the projects are only relatively small and it is possible that experienced manpower could be purchased and expertise in the management of such ventures could be acquired in a relatively short period of time.

2. Whether Size of the Potential Projects Justifies SANTOS Involvement

The on-shore alluvial project would only be a small project with potential for cash flows which would be minor (2%) in relation to SANTOS' overall cash flows. In addition, the life of the project is also relatively short at approximately 6 years. As such, the project, on its own, does not warrant SANTOS involvement.

8. MAJOR ISSUES ...

2. Whether Size of the Potential Projects Justifies SANTOS Involvement ...

When combined with the off-shore alluvial project as outlined, which has greater potential to contribute to cash flows, the cash flows become more significant (approx. 10%) and appear more attractive for SANTOS involvement.

However, the problems associated with off-shore development, plus the fact that the data is not available to assess the off-shore reserves, indicates that the likelihood of development of an off-shore project is of higher risk than an on-shore project.

The possibility of eventual development of an off-shore project cannot be relied on to justify continued involvement in on-shore alluvial Tin exploration/mining, and unless expenditure of up to $200,000 is utilized to determine the true potential of off-shore tenements, continued involvement in off-shore areas cannot be recommended.

9. ALTERNATIVE ACTIONS

As the conditions necessary for economic development of the alluvial Tin deposits are not favourable at present, and are forecast to remain unfavourable in the short/medium term, there are a number of alternatives available to the Company:

- retain all alluvial tenements indefinitely and meet tenement commitments as required. Expenditure required would amount to up to $700,000 over the next five years, during which the Company's position, the market and the possibility of development can be periodically reassessed.

- retain all alluvial tenements and carry out an accelerated off-shore exploration programme, until sufficient additional exploration/environmental assessment, has provided the information on which to determine the true potential of the areas and then re-evaluate the Company's position. Expenditure required would amount to up to $200,000 over, say 6 months, after which a decision could be made on the basis of all available information. This approach ensures that the Company has fully satisfied itself as to the likelihood of finding significant reserves in the areas.

- divest all alluvial tenements immediately. This action runs the risk that there are significant reserves in the areas and by divesting, the Company loses all rights to their eventual development.

9. ALTERNATIVE ACTIONS ...

- divest some alluvial tenements, e.g. the on-shore tenements because of the relative size of their potential development. On their own, the relative size of the on-shore tenements is insignificant when compared to SANTOS existing operations. However, if the off-shore tenements prove that development potential exists, the on-shore tenements could form part of a larger operation which would be more attractive to the Company.

10. SUMMARY

1. SANTOS has a number of interests in hard-rock and alluvial (on-shore and off-shore) Tin deposits in Tasmania. This paper outlines the development prospects for the alluvial deposits. Hard-rock deposits will be the subject of a further paper.

2. The Company has spent $4.1 million on mineral exploration over the past three years. Of this, approximately $858,000 has been spent on evaluation of Tin tenements - $515,000 on alluvial deposits.

3. Future exploration expenditure commitments on alluvial deposits total $696,000 over the next five years - some reduction may be negotiable with the Tasmanian Government. The Company has $12,000 performance guarantee deposited with the Department of Mines. Further deposits could be required.

4. Geological assessment of the tenements indicates that there is potential for the discovery of low grade ore bodies of moderate size:

   - on-shore alluvial possible reserves are estimated at 27 million m^3 grading 108 g/m^3 Tin metals, with potential for 56 million m^3 grading 100 g/m^3 Tin metal,

   - off-shore alluvial possible reserves have not been calculated, but potential exists for 60 million m^3 in which intersections grading 100-450 g/m^3 Tin metal have been obtained.

10. SUMMARY ...

5. To determine the true potential of the tenements would require drilling programmes of the following magnitude:

   - on-shore alluvial. Two phase programme of 37 holes costing up to $63,000,

   - off-shore alluvial. Eighty hole programme costing up to $200,000.

6. Economic Assessment indicates that under certain conditions, on-shore and off-shore development is possible. The key factors being price and grade of Tin recovery:

   - on-shore alluvial. Potential exists for a relatively small short term operation, yielding a maximum net cash flow after tax in any one year of approximately $3.0 million,

   - off-shore alluvial. Potential exists for a moderate size operation, yielding a maximum net cash flow after tax in any one year of approximately $12.0 million.

     This project however, has significantly greater risk associated with it than the on-shore prospect because of environmental factors associated with off-shore mining.

10. SUMMARY ...

7. The current outlook for Tin, particularly prices and demand, indicates that development of the tenements could not proceed in the short/medium term.

8. Funding of the projects should not be a barrier to eventual project implementation.

9. The Company does not at present have experience in the development and operation of an alluvial Tin mining operation. However, the projects under consideration are not particularly large and expertise could be purchased and/or acquired in a relatively short period of time.

10. Size of the on-shore project is insignificant in relation to SANTOS' expected cash flows (representing approximately 2% in the best year of operation of project). When combined with the off-shore project size becomes more attractive. However there are a number of problems which increase the risks associated with off-shore development.

The possibility of eventual off-shore development cannot be relied on for any length of time, to justify continued involvement in on-shore mining/exploration and unless expenditure of up to $200,000 is utilized to determine the true potential of the off-shore tenements, continued involvement can not be recommended.

10. SUMMARY ...

11. There are a number of alternative actions available to the Company in the face of unfavourable conditions for immediate development:

- retain all alluvial tenements indefinitely and meet tenement commitments as required,

- retain all alluvial tenements and carry out an accelerated exploration programme until additional exploration/environmental assessment has determined the true potential of the areas and then re-evaluate the Company's position,

- divest all alluvial tenements,

- divest some alluvial tenements.

11. CONCLUSIONS/RECOMMENDATION

On balance, a strong case exists for divesting of all interests in alluvial Tin because, on current information, the likelihood for eventual development in the medium term appears remote and even if development did proceed, the contributions to the Company's cash flow would be relatively small.

However, because reserves information is based on relatively little exploration, divestment before the true potential of the areas is known also amounts to a risk - the risk that significant Tin deposits in the areas do exist.

The Company should therefore act to reduce the risk before considering divestment. Because the off-shore tenement has greater potential to contribute significantly to cash flows, initial efforts should be concentrated there.

Based on the above conclusion, it is recommended that:

- a selective, accelerated exploration programme and environmental study be carried out in the off-shore alluvial tenement Ringarooma Bay E.L. 42/80,

11. CONCLUSIONS/RECOMMENDATION ...

- such programme to be completed by June 1983 at a cost to be approved by the Exploration Committee - sufficient to assess the true potential of the tenement and the environmental aspects affecting development, but not more than $200,000,

- a review of the programme be provided to the Board at the July meeting, including (depending on the results) recommendations relating to both the on-shore and off-shore tenements.

If the Company is not prepared to commit funds to such exploration/environmental assessment, then steps should be taken to divest the interests.

THE STRUCTURE OF THE WORLD TIN MARKET * APPENDIX "A"

The Tin market is small compared to other metals, with world production running at about 200,000 tpa compared with 8 million tpa for Copper. S.E. Asian producers and Bolivia account for 79% of world production. Australia produces about 10-12000 tpa of Tin concentrates ranking fifth in the world and 5,500 tpa of Tin metal, ranking sixth in the world.

Presently, economically-recoverable world Tin reserves are about 10 million tonnes of metal, of which less than half are in the proved and probable category representing 12-15 years consumption. Total indicated recoverable world reserves would last less than 50 years.

About 40% of the worlds Tin production is used for Tin plate, 25% for solder, with the remainder used for Tin chemicals, including organotins and Tin alloys such as bronze and brasses. Tin plate is widely used in the food and beverage industries, but faces strong competition from aluminium and plastics.

The greatest growth area is seen in organotins, though a recent study of major Metals by the Chemical Bank of New York sees Tin demand growing at less than 1.0% per year to the year 2000, with declining growth in the developing and newly industrialized economies as well as in the developed economies.

* Source : Tin Future - Dr. Brian Martin, Mining Monthly, June 1982.
The Tin Industry : information and news - compiled by Associated Tin Smelters Pty. Ltd., December, 1982.

THE STRUCTURE OF THE WORLD TIN MARKET ...

Tin producers (excepting Australia) are developing countries, while the consumers are the developed countries, most notably the USA.

Separating the producers from the consumers is the International Tin Agreement (ITA) which has existed in varying forms for 26 years. The ITA is an Agreement between governments of more than 30 countries, of which six are producing members and the remainder consumer members. The governing body is the International Tin Council (ITC), in which each member State is represented.

The objectives of the ITA are to:

- achieve a long term balance between world consumption and production of Tin.

- alleviate serious difficulties arising from an actual or anticipated surplus or shortage of Tin.

- prevent excessive fluctuations in the price of, and earnings from, Tin.

Through the ITC, a Buffer Stock of Tin is managed and Export quotas can be imposed on the producers with the sole aim of maintaining real Tin prices at a stable level. This stock is financed by contributions of both producer and consumer member countries.

THE STRUCTURE OF THE WORLD TIN MARKET ...

Throughout its history there has been a major area of disagreement between the developing country producers and the main consumer, the USA, members of the ITA. This disagreement has been over the small size of the Buffer Stock in relation to the USA's 200,000 tonne strategic stockpile of Tin and the sales made from this strategic stockpile which effectively makes the USA a Tin producer. This has meant that the objectives of the ITA have been difficult to achieve.

For example, from early 1977, until late 1981, the Buffer Stock had been exhausted, with no official means of controlling the ceiling price of Tin. The price of Tin increased significantly due to artificial support of the price in late 1981. In the past 12 months however, the size of the Buffer Stock has skyrocketed and prices have fallen sharply. From 1015 tonnes at the end of 1981 the Stock rose to 49,385 tonnes at 30 June 1982 and is now believed to have reached about 60,000 tonnes. In addition, the USA strategic stockpile has 120,000 tonnes surplus to requirements. Export controls have also been implemented in circumstances of a serious surplus of Tin on world markets in order to preserve the floor price. If these controls were not operating at present to restrict supplies, it seems likely that Tin prices would fall very sharply and few Tin producers could break even.

OUTLINE OF AUSTRALIAN TIN DEVELOPMENTS

About 70% of Australia's Tin production comes from underground mines associated with the Devonian-Carboniferous granites of the Tasmanian Waratah district (the remainder comes largely from placer deposits in NSW, Queensland and WA).

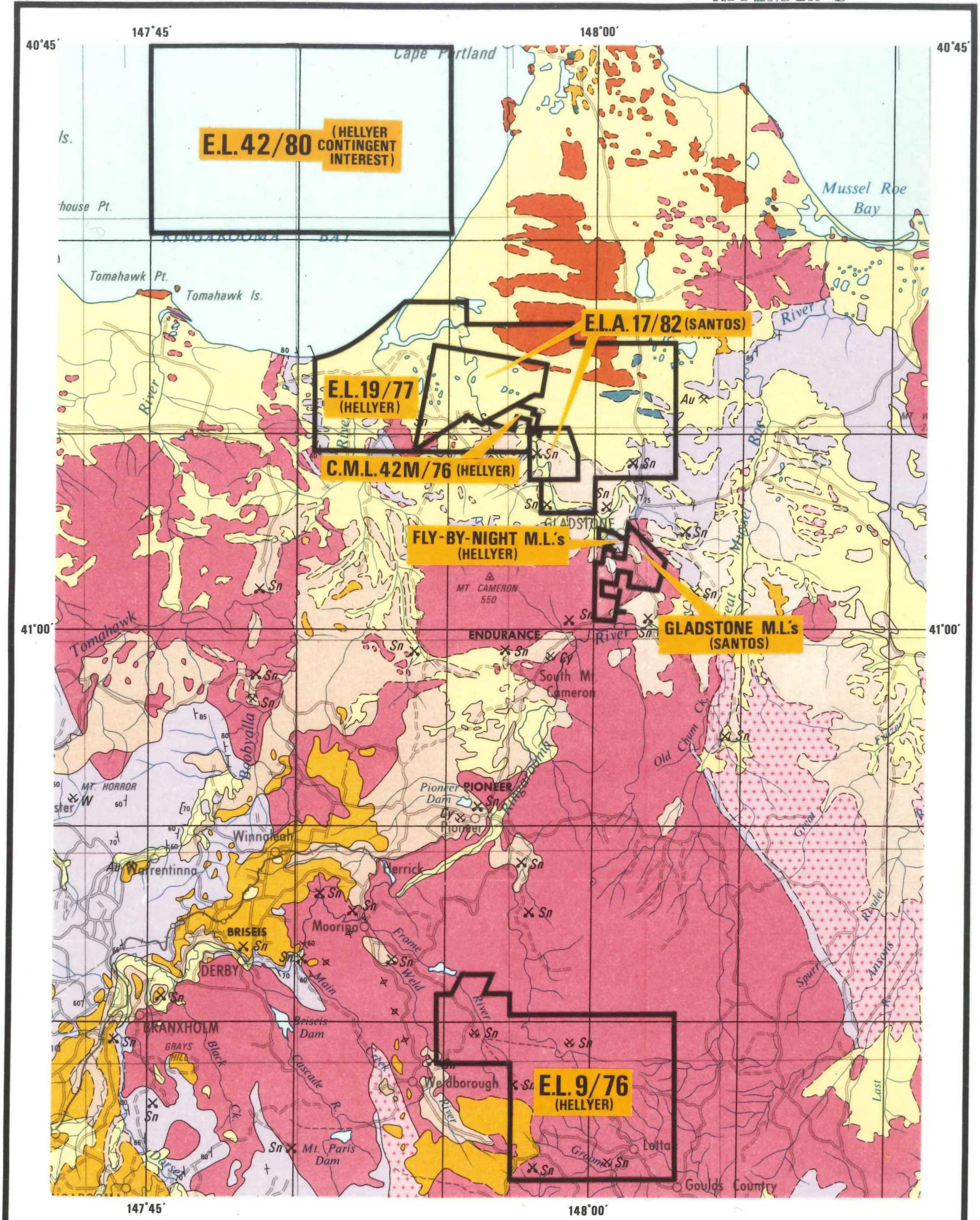
During the mining boom of the 1960s the number of Australian Tin mines doubled, and the production quadrupled in some cases with mine mechanisation.

By the end of the 1960s, Australia became a net Tin exporter, and in 1971 joined the 4th ITA as a Tin producer.

Renison Goldfields has proved plus-probable reserves of 15.6 million tonnes of 1.1% ore in Tasmania from which it produces Tin at Renison Bell - the worlds largest and lowest operating cost underground Tin mine. The other large mine in Tasmania is Aberfoyle's Cleveland mine, which ships only a small proportion of its concentrates to ATS for smelting.

The Associated Tin Smelters Pty. Ltd. in Sydney smelts 30-40% of Renison's production from Renison Bell.

Malaysian smelters take a high proportion of Australian Tin-in-concentrates. There is at present no Tasmanian Tin smelter, mainly because the construction and labour costs per tonne of smelted Tin are presently deemed uncompetitive with the $A900-1,200 per tonne of the Malaysian smelter.



SANTOS LTD. & HELLYER
NORTH EAST TASMANIA
MINERAL PROJECTS

SANTOS

HELLYER MINING & EXPLORATION PTY. LTD.

SCALE

5 0 5 10 15

KILOMETRES

APPENDIX C

MAA 1.03

SANTOS

MEMO TO: P. RCBINSON Date 24.12.82

FROM: S. :LEE

SUBJECT: TASMANIAN TIN LICENCES - HOLDING CHARGES:

Tasmanian mineral exploration tenements are administered on an annual basis related to the date of grant of the tenement (rather than on a calander basis). There are two basic forms of tenement involved in the SANTOS/Hellyer tin projects:

(1) Exploration Licences (E.L.s): These can cover up to 250 km² and tenure is generally limited to 10 years. They are subject to an annual rental and an annual expenditure commitment. The licence holder may apply to the Director to waive or reduce expenditure commitments in some circumstances. A deposit may be required as a guarantee for observance of the conditions of the licence. The deposit is refunded when tenure ceases if the conditions of the licence have been observed.

(2) Mineral Leases (M.L.s): These are limited to a maximum of 100 ha and are generally granted for a term of 21 years. The lease is subject to an annual rental. There is no expenditure commitment but leases contain a labour covenant which can generally be waived in lieu of a relatively minor expenditure. A deposit may be required as a guarantee of compliance with the lease conditions (refundable).

In special circumstances, consideration will be given to renewal of an E.L. beyond the 10 year limit by the grant of a Retention Area. These licences are subject to special conditions which are determined individually on the merits of each case.

The table overleaf summarizes anticipated rentals and expenditure commitments for the various SANTOS/Hellyer tenements (assuming no changes to the Mining Act Regulations occur in that time.) Rentals and commitments vary according to the area involved and the number of years of tenure (in the case of E.L.s). The exact amount to which the Company may be required to commit in any one calendar (budget) year will depend partly on the date on which the tenement was granted.
As mentioned above, E.L. expenditure commitments may be negotiable with the Director of Mines. There is quite a strong possibility of this in the case of some of the SANTOS/Hellyer alluvial tenements.

*O/5204

In the case of E.L.A. 17/82, the original tender commitment was for an expenditure of $400,000 in the first 18 months of tenure, after which the licence would be relinquished or the Company would proceed to development. Expenditure to date has amounted to approximately $243,000 (subject to audit) and so if the licence was granted early in 1983, the commitment for 1983 would nominally be for approximately $157,000. However, under the circumstances, this may be open to negotiation.

S.D. Lee.

Tenement (Holder)	Area	Granted	Next Expires		1983	1984	1985	1986	1987
E.L. 9/76 (Hellyer)	76km²	1/9/76	28/2/83	Rental	$1,330	$1,520	$1,710	$1,900	(11th year)
				Commitment	$38,000	$38,000	$38,000	$38,000	-
E.L. 19/77 (Hellyer)	115km²	11/4/78	10/4/83	Rental	$1,725	$2,012.50	$2,300	$2,587.50	(10th year) $2,875
				Commitment	$57,500	$57,500	$57,500	$57,500	$57,500
E.L.A. 17/82 (SANTOS)	21km²	Application Pending	-	Rental	$52.50	$105	$157.50	$210	$262.50
				Commitment	$2,100 ($157,000 - see notes)	$2,100	$4,200	$4,200	$4,200
C.M.L. 42M/76 (Consolidated) (Hellyer)	153ha	1/11/76	31/10/97	Rental	$382.50	$382.50	$382.50	$382.50	$382.50
				Commitment	N.A.	N.A.	N.A.	N.A.	N.A.
E.L. 42/80	134km²	20/12/80	19/12/82 Renewal applic. pending	Rental	$1,005	$1,340	$1,675	$2,010	$2,345
				Commitment	$26,800	$26,800	$26,800	$67,000	$67,000
Gladstone M.L.s (SANTOS)	619ha	1/12/81	30/11/02	Rental	$832.30	$832.30	$832.30	$832.30	$832.30
				Commitment	N.A.	N.A.	N.A.	N.A.	N.A.
Fly-by-Night M.L.s (Hellyer)	95ha	Various 1967-77	Various 1988-99	Rental	$188	$188	$188	$188	$188
				Commitment	N.A.	N.A.	N.A.	N.A.	N.A.

APPENDIX D
Hvm 2.15

ON-SHORE ALLUVIAL
OPTION 2 CASE 2 IS
CONSIDERED MOST REALISTIC.

SANTOS

MEMO TO: I.A.J. WRIGHT Date 9/9/82

FROM: D.H. HERON

SUBJECT: TASMANIAN TIN PROJECT

Ref: PE: 1264 WP: 1634N

A preliminary economic analysis was conducted on the Tasmanian Tin dredging project with the data presented in Simon Lee's memo dated 12/8/82 (Ref: ME336/82).

1. Discussion

(i) Base Cases

This analysis consists of two options:

(a) Option 1

It assumed a total volume mined of 43.2 million ~~tonnes,~~ cu metres commencing in 1983 with a mine life of 9 years. A capital investment in plant and equipment of $2.5 million with dredge lease and dry plant costs of $1.11 million p.a. and 0% operating cost inflation.

(b) Option 2

It assumed a total volume mined of 45 million ~~tonnes~~ cu. metres, commencing in 1983 with a mine life of 6 years. A capital investment in plant and equipment of $4.790 million, with the same equipment and operating costs as Option 1.

The following combinations of prices and discount rates were run against both of these options:

	D.R.	Tin Price/Tonne	Gold Price/oz.
Case 1	0.15	11000	300
Case 2	0.15	13000	400
Case 3	0.15	15000	500
Case 4	0.20	11000	300
Case 5	0.20	13000	400
Case 6	0.20	15000	500

The two options described above and the six variations in tin/gold price and discount rates represented 12 base cases.

It should be noted that the price of both gold and tin were assumed constant for the analysis.

(ii) Variation to Base Cases (i.e. Sensitivity Analysis)

(a) As Requested

A sensitivity analysis was conducted on Options 1 and 2 Case 2, at a discount rate of 15% to note the effect of:-

A 50% increase in capital costs.

Writing off past exploration expenditure of $1.3 million compared to the $2.1 million quoted in your memo. (See Comments below).

A combination of both of the above.

(b) Additional Cases

A brief review of tin prices revealed that the price of tin has cycled between approximately $15,300 and $11,800 since January this year. Options 1 and 2 case 2, discussed above assume a tin price of $13000 per tonne and appear to be the realistic cases. In a more formal analysis, a greater understanding of the cyclical nature of the price of tin would be required. Four additional runs were made against these cases, assuming the following:

A 50% increase in capital cost with 11% inflation.

A 50% increase in capital cost, 11% inflation and writing off past exploration expenditure of $1.3 million.

2. Results

(i) Base Cases

The results of the twelve base cases are summarised in Table 1. Option 2 Cases 3 and 6 are the most profitable with a ROR of 45.5%, but are based on a price scenario that is not realistic in today's metal price markets. As well, the non-inclusion of inflation on operating costs is questionable, which renders the most profitable cases as being questionable at best,

The sensitivity cases are developed to address these problems and provide a case most likely to be the "real life" measure of the project.

(ii) Sensitivity Analysis

The results of the sensitivity analysis conducted are presented in Table 2. Note that the effect of a 50% capital increase and 11% inflation rendered the project uneconomic. These sensitivity analyses therefore indicate the sensitivity of this project to capital overruns, operating cost inflation coupled with static prices. If these conditions prevail then the economics of the project can be improved by a combination of the following:

(1) Improved grade recoveries.
(2) Higher production.
(3) Longer mine life.
(4) Improved price.

Therefore in your further analysis these points should be again reviewed.

3. Comments

(i) Tax

With regard to writing off past exploration expenditure please note that the difference between the $1.3 million used in these studies and for $2.1 million quoted in your memo is due to the advise by D. McLean that $0.8 MM probably relates to overseas expenditure which is not deductible for Australian income tax purposes. The order of deductibility as advised by taxation is as follows:

Helliyer - 100%:	$0.3 million in the 1st year of production.
SANTOS:	$1.0 million over the life of the project on a straight line basis.

(ii) Customs/Duty

The question of Customs/Duty has not been fully evaluated. There may be problems of importing this equipment if it is second hand, and this issue should be resolved.

(iii) Startup Date

We question whether the startup date for the project i.e. mid 1983 is realistic. Given the history of these projects, we believe your start date is optimistic.

(iv) Inflation

The 11% inflation figure is based upon current "Budget" philosophy. We believe that inflation on the Tasmanian Tin project may be significantly greater than this, and would have to precised in further evaluation.

(v) Capital Costs

Delineation drilling costs may need to be included to prove up reserves. Your previous enquiries indicated that there were not sufficient reserves existing to provide a mine life of 10 years.

(vi) Data

The data given in your memo dated 12/8/82 is represented in the appendix with minor additions or alterations noted.

D.H. Heron

D.H. HERON

CC:
S. Lee
D. McLean
G. Widmer
I. Bishop

Attachments:

Table 1	-	Base Case Results
Table 2	-	Sensitivity Analysis Results
Appendix	-	Mine Data

IB/rms

WP: 1634N

TABLE 1

TASMANIAN TIN PROJECT - BASE CASES

NUMBER	OPTION	CASE	TIN *1 PRICE	GOLD *2 PRICE	D.R.	P.V. (000's)	ROR	P.I.	PAYOUT
1	Option 1	Case 1	11000	300	0.15	-957.9	4.3	0.6	-
2		Case 2	13000	400	0.15	1187.7	28.2	1.5	Year 6
3		Case 3	15000	500	0.15	3233.0	43.6	2.3	Year 4
4		Case 4	11000	300	0.20	-1234.0	4.3	0.5	-
5		Case 5	13000	400	0.20	499.8	28.2	1.2	Year 7
6		Case 6	15000	500	0.20	2146.6	43.6	1.9	Year 5
7	Option 2	Case 1	11000	300	0.15	-2.9	17.3	1.0	-
8		Case 2	13000	400	0.15	2255.2	32.9	1.5	Year 5
9		Case 3	15000	500	0.15	5091.4	45.5	2.1	Year 4
10		Case 4	11000	300	0.20	-756.0	17.3	0.8	-
11		Case 5	13000	400	0.20	1396.1	32.9	1.3	Year 5
12		Case 6	15000	500	0.20	3522.5	45.5	1.7	Year 4

*1 $/tonne

*2 $/oz.

Note:

DR - Discount Rate

PV - Present Value

ROR - Rate of Return

PI - Profitability Index

WP: 1634N

TABLE 2

TASMANIAN TIN PROJECT - SENSITIVITY ANALYSIS

NUMBER	OPTION	CASE	TIN *1 PRICE	GOLD *2 PRICE	D.R.	P.V. (000's)	ROR	P.I.	PAYOUT
13	Option 1	Case 2	+ 50% Capital		0.15	103.6	17.6	1.0	Year 9
14	Option 1	Case 2	W/O *		0.15	1476.4	30.8	1.6	Year 5
15	Option 1	Case 2	Both of the above		0.15	380.6	19.5	1.1	Year 8
16	Option 2	Case 2	+ 50% Capital		0.15	501.0	19.5	1.1	Year 6
17	Option 2	Case 2	W/O *		0.15	2907.8	35.0	1.6	Year 4
18	Option 2	Case 2	Both of the above		0.15	836.3	21.0	1.1	Year 6
19	Option 1	Case 2	+50% Cap/11% Infl		0.15	-5487.1	-	-0.5	-
20	Option 1	Case 2	+50% Cap/11% Infl/ WO*		0.15	-5487.1	-	-0.5	-
21	Option 2	Case 2	+50% Cap/11% Infl		0.15	-2076.8	4.7	0.7	-
22	Option 2	Case 2	+50% Cap/11% Infl/ WO*		0.15	-1770.4	6.9	0.8	-

* WO - write off past exploration expenditure of $1.3 million.

WP: 1634N

APPENDIX
TASMANIAN TIN PROJECT DATA

MINE DATA

		Option 1	Option 2
	Overburden mining rate	3,600,000 cu.m. pa	6,000,000 cu.m. pa
	Overburden mining costs	$0.50/cu.m.	$0.40/cu.m.
	Pay zone mining rate	1,800,000 cu.m. pa	3,000,000 cu.m. pa
	Pay zone mining costs	$0.80 per cu.m.	$0.80 per cu.m.
	Capital startup costs	$2,500,000	$4,790,000
	(plant)	(1,505,000)	(3,795,000)
	(vehicles)	(995,000)	(995,000)
*1	Operating charges	$1,110,000 pa	$1,110,000 pa
	Mine life	9 years	6 years
*2	Production - 1983	50%	50%
	- 1984	100%	100%
	- 1985	100%	100%
	- 1986	100%	100%
	- 1987	100%	100%
	- 1988	100%	50%
	- 1989	100%	0%
	- 1990	100%	0%
	- 1991	50%	0%
	Tin Grade (overburden + pay zone)	95 gms/cu.m.	95 gms/cu.m.
	Gold Grade (overburden + pay zone)	2 mg/cu.m.	2 mg/cu.m.
*3	Smelting/sales cost	$555 per tonne Sn	$555 per tonne Sn.

Royalty: 2.5% of Gross Revenue

*1 $550,000 in 1st year.

*2 Final year at 50% production

*3 $250,000 in 1st year.

ON-SHORE ALLUVIAL

SANTOS

MEMO TO: J.H. WIDMER Date 12 August 1982

FROM: S.D. LEE Ref: ME336/82
HM.2.15

SUBJECT: TASMANIAN TIN PROJECT - CASH FLOWS

I would like to run some more cash flows for the two dredging options perviously considered, but with several changes to the parameters.

For both options, please run the following variations:

(a)	Discount Rate = 15%	(1)	Tin price = $11,000 per tonne Sn Gold price = $300 per oz Au
		(2)	Tin price = $13,000 per tonne Sn Gold price = $400 per oz Au
		(3)	Tin price = $15,000 per tonne Sn Gold price = $500 per oz Au
(b)	Discount Rate = 20%		The 3 price categories listed above.

For variations (a) (2) and (b) (2) please also run the program with the following separate changes (ie. one at a time):

(i) Capital and start-up cost over-run of 50%.
(ii) Write off past exploration expenditure of $2.1 million.

For all cases the following will apply:

Tin grade = 95 grams Sn per cu.m. on total volume mined (overburden + pay zone)
Gold grade = 2 mg Au per cu.m. on total volume mined (overburden + pay zone)

(1 oz = 31.103 g)

Royalty = 2.5% of gross revenue.
Smelting/sales cost = $500 per tonne Sn.
Capital write off : 100% over mine life.
Operating cost inflation - 0%

<u>OPTION 1</u> (Asia Stannun Dredge alone)

Overburden mining rate = 3,600,000 cu m p.a.
Overburden mining cost = $0-50 per cu m

Pay zone mining rate = 1,800,000 cu m p.a.
Pay zone mining cost = $ 0-80 per cu m

Capital and start-up costs = $2,500,000

Operating changes (incl. dredge lease, dry plant operation & reclaimation)

= $1,110,000 p.a.

Mine Life = 8 yrs : 1983 : 50% production.
1984 - 1990 : 100% production.
(the nominated dates are arbitrary)

OPTION 2 (Asia Stannum + 2 x Neumans)

Overburden mining rate = 6,000,000 cu m p.a.
Overburden mining cost = $0-40 per cu m.

Pay zone mining rate = 3,000,000 cu m p.a.
Pay zone mining cost = $0-80 per cu m,

Capital start-up costs = $4,790,000 p.a.

Operating changes = $1,110,000 p.a.

Mine Life = 5 hrs : 1983 : 50% production.
: 1984 - 1987 : 100% production.

Please contact me if I have omitted any details you require or if you wish to discuss any details.

S.D. Lee
Senior Geologist (Minerals)

SDL:smh

OFFSHORE ALLUVIAL.

APPENDIX E

SANTOS

MEMO TO: A.J. WRIGHT Date 20/12/82

FROM: D.H. HERON

SUBJECT: OFFSHORE TASMANIAN TIN PROJECT

REF:PE:1850:WP:2226N
FILE: 300.4

A preliminary economic evaluation has been carried out on the Offshore Tin Project to provide an order-of-magnitude estimate of the economical tin recovery rates, as based on the several project cases noted below.

In the analysis, mine data was verbally provided by Mr. S. Lee, and all technical and economic assumptions used are listed in Attachment A.

Therefore, this analysis is not a definitive study on the profitability of the prospect, in which case it would require more precise mine data, detailed engineering capital and operating cost figures etc.

Analysis

After reviewing the data and results from a number of alternatives with the Minerals Group, two cases were selected that were considered a reasonable model of the potential development for this tin prospect and these cases are summarized as follows:- the Base Case as being the most realistic outcome and the Alternative Case, which presents a more optimistic view in terms of tin reserves as well as the mine operational life.

1. Base Case

This assumes a total mine reserves of 50 MMm^3, producing at a uniform rate over ten years, with an initial capital investment of $25m (1983 dollars).

This case is run against two tin price/operating cost inflation scenarios:

(a) 11% p.a. operating cost inflation without price escalation
(b) 11% p.a. operating cost inflation with tin price escalates at 10% p.a. from the 6th year.

2. Alternative Case

This assumes a total mine reserves of 63 MMm^3, producing at a uniform rate over a longer mine life of fifteen years, with an initial capital investment of $23m.

This case is run against the two price/operating cost inflation scenarios as in the base case.

Key Assumptions

1. Project Lead Time

The lead time to production is 12 months from 1/1/83 which envisages development drilling, Management approval, design and procurement, Federal and State approvals and installation for production by 1/1/84. As well, there has been no provision for a "learning curve" in bringing the mine to full production. Any delay in the production date and/or, at full production rates would increase the minimum tin recovery rate.

2. Capital Expenditure

For both cases, the capital expenditure is assumed to be expended in the beginning of the project (1983) and there is no breakdown of expenditure in plant, hire charges etc. Further delineation drilling costs are not included.

3. Operating Cost/Price Escalation

(i) The operating costs inflation is based on current corporate philosophy. For a dredging operation in an offshore environment, the actual inflation for operating costs (hence total technical costs) could be significantly higher. However, in the absence of a more definitive analysis to identify the inflation components for offshore activity, the 11% p.a. for operating cost inflation was used.

(ii) As regards price inflation, a review of the tin price trend over the last 10-50 years would indicate that the tin price when considered in a depressed world economy will result in low increases (i.e. less than inflation) in the price of tin over the analysis period. In view of the depressed tin price in the past two years and the likelihood of further decline in tin price (in real terms) and in order to reflect certain degree of risk in the investment, the tin price escalation is phased in after the sixth year of production.

4. Tax

The evaluation is carried out as a "stand alone" project and no corporate tax losses are included in the tax calculations.

5. Evaluation Data

The mine data as originally given did not include gold revenue and royalty, on the assumption that they would offset each other. As they do not infact cancel out in the cash flow, both have been included in the net cash flow calculations.

Results

The results of the two cases are summarised in Tables 1 and 2. The comments on the results are as follows:

(i) Base Case

On the basis of a present value benefit cost ratio of 1.5*, the results indicate that, with operating cost inflation and tin price escalation, the minimum tin recovery rate that would make the project economically attractive is 400 g/m^3. Without the tin price escalation, the minimum tin recovery rate increases to 440 g/m^3, reflecting a somewhat marginal effect of the assumed price escalation.

(ii) Alternative Case

The minimum tin recovery rate is lower than the base case, given the assumed improvement in tin prices, the increase in total reserves, and lower production cost and capital investment. For the two inflation scenarios considered, the minimum tin recovery rates are 300 g/m^3 and 380 g/m^3 respectively. The effect of tin price escalation on the minimum recovery rate is greater than that of the base case, as the period of escalation is longer at ten years.

Note however, that in this exercise, no additional capital expenditure has been included at some later stage of the 15-year project horizon to cater for major plant replacement, which would likely be the case in an actual operation; the impact of such additional capital investment would be to raise the minimum tin recovery rate.

* NOTE Present value benefit cost ratio is defined as the ratio of discounted net cash-in after tax to discounted capital investment. A value of 1.5 is adopted for the ratio in this evaluation exercise and has been consistently applied in all the cases run. The 0.5 factor is included to reflect the inherent risks in this project.

D.H. Heron
Manager - Petroleum Engineering

CCW:smh

cc: S. Lee
G. Widmer
C. Cheong

OFFSHORE TASMANIAN TIN PROJECT

SUMMARY TABLES

Table 1 Base Case

	OPERATING COST INFLATION	TIN PRICE ESCALATION	BENEFIT COST RATIO	MIN. TIN RECOVERY g/m^3
1.	11% p.a.	0%	1.5	440
2.	11% p.a.	0% for 5 yrs then 10% for 5 yrs.	1.5	400

Table 2 Alternative Case

	OPERATING COST INFLATION	TIN PRICE ESCALATION	BENEFIT COST RATIO	MIN. TIN RECOVERY g/m^3
1.	11% p.a.	0%	1.5	380
2.	11% p.a.	0% for 5 yrs, then 10% for 10 yrs.	1.5	300

THIS IS CONSIDERED A REALISTIC TARGET FOR RINGAROOMA BAY.

Based upon tin @ $14,000/tonne.

ATTACHMENT A

MINE DATA

1. BASE CASE

"THEORETICAL" CASE BASED ON RESERVE POTENTIAL.

Tin Reserves	-	50MMm^3
Tin Production	-	5MMm^3/year for 10 years (commencing 1984)
Tin Price	-	$14,000/tonne (1983)
Gold Price	-	$500/oz gold recovered
Gold recovery rate	-	2 mg/m^3
Capital Costs	-	$25m, phased in 1983
Discount Rate	-	15% p.a.
Operating Costs	-	$2/$m^3$ of volume mined
Unit Smelting Costs	-	$500/tonne

2. ALTERNATIVE CASE

"INDUSTRY AVERAGE" CASE BASED ON 1980 PRODUCTION DATA.

Tin Reserves	-	63MMm^3
Tin Production	-	4.2 MMm^3/year for 15 years (commencing 1984)
Tin Price	-	$14,500/tonne (1983)
Gold Price	-	$500/oz gold recovered
Gold recovery rate	-	2 mg/m^3
Capital Costs	-	$23m, phased in 1983
Operating Costs	-	$1.40/$m^3$ of volume mined
Discount Rate	-	15% p.a.
Unit Smelting Costs	-	$500/tonne

Other Economic Data

For both cases:

Investment allowance	-	18% of total capital investment
Royalty	-	2.5% of gross profit