



EIS 1334

AB020045

Proposed Timbarra gold project : Capricornia Prospecting Pty.
Ltd. : environmental impact assessment report

NSW DEPT PRIMARY INDUSTRIES



AB020045

DEPARTMENT OF MINERAL RESOURCES

PROPOSED TIMBARRA GOLD PROJECT

CAPRICORNIA PROSPECTING PTY LTD

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

NSW DEPARTMENT OF
MINERAL RESOURCES

27 MAR 1998

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PROPOSED TIMBARRA GOLD PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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FOREWORD

Capricornia Prospecting Pty Ltd, now a subsidiary of Ross Mining NL, proposes to mine gold and silver by open cut methods at a site located 27 kilometres east-south-east from the town of Tenterfield. The proposal is represented by the company's two applications, Mining Lease Application Nos 4 and 5 Inverell. Mining Lease Application No 4 Inverell represents the mine site proposal whereas Mining Lease Application No 5 Inverell represents the water supply pipeline corridor from the Timbarra River to the mine site.

The present known resources of gold will provide the proposed mining operation with a life ranging from four to six years. The company proposes to initially mine a proven resource of 7.26 million tonnes of ore from which 250,000 ounces of gold will be produced on site. The ore will be extracted by open cut mining methods, crushed, and gold recovered using heap leach technology. A further 1.6 million tonnes of ore is proposed to be mined subject to finalisation of the company's indrilling exploration program to prove up the resource.

During the site development and construction phase it is anticipated that the project would employ between 30 and 90 persons. During the production phase it is estimated that the project will employ approximately 75 full-time persons. As the initial development costs will be less than \$20 million the project does not qualify for a State Environmental Policy No 34 Development consideration.

The proposed Timbarra Gold Project is wholly within Tenterfield Shire's Local Government Area. Normally the Minister for Urban Affairs and Planning or Tenterfield Shire Council would be responsible for issuing approval under the planning legislation. However, at the time the project's EIS was placed on public display the normal planning instruments did not apply as there was no Local Environmental Plan. The responsibility for the grant of approval or consent rests with the Minister for Mineral Resources as the nominated determining authority under Part V of the Environmental Planning and Assessment Act 1979.

Tenterfield Shire Council is currently in the process of establishing a Local Environmental Plan within its Local Government Area. As the environmental assessment of the Timbarra Gold Project has reached an advanced stage of finalisation the eventual gazettal of Tenterfield Shire's Local Environmental Plan will be subject to the deferral of the project site from the plan.

The nomination of the Minister for Mineral Resources as the nominated determining authority for this proposal was agreed to by the Environment Protection Authority, National Parks and Wildlife Services and the Department of Land and Water Conservation. The agreement from the Department of Land and Water Conservation was conditional on the Minister for Land and Water Conservation retaining a concurrence role for the Crown land affected by the Project. The Crown land referred to is under a perpetual lease and identified as Portion 37 in the Parish of Maclean.

In following the requirements of Section 112(1) of the Environmental Planning and Assessment Act, 1979, the Minister for Mineral Resources gave his determination that the proposal has the potential to significantly affect the environment and directed that an environmental impact statement be prepared and furnished. The environmental impact statement was publicly advertised and exhibited by the Department of Mineral Resources from June 29 to August 14 1995 and public comments were invited and received during the exhibition period. Submissions and comments were also received after this date.

The environmental assessment process for this proposal has been subject to changes in legislation. A significant change is the enactment of the Threatened Species Conservation Act 1995. This Act nullified the need for National Park and Wildlife Service to issue a licence to the company in respect of its General (Section 120) licence application to take or kill endangered fauna.

The intention of the savings provisions of the Threatened Species Conservation Act was to exempt proposals such as the Timbarra Gold Project, that had received directions from the Department of Urban Affairs and Planning and prepared a Fauna Impact Statement prior to the enactment of this Act, from the need to prepare a species impact statement. Additional Regulations to the Threatened Species

Conservation Act were passed to clarify the savings provisions and confirm the exemption of the Timbarra Gold Project from the need to prepare a species impact statement.

A requirement of the Threatened Species Conservation Act 1995 and associated amendments to the planning legislation is for the Minister for Mineral Resources to consult with the Minister for the Environment prior to the granting of an approval to carry out an activity. This consultation has occurred and resulted in the adoption of additional special conditions (to those originally prepared by the Service for the superseded Section 120 licence) as recommended by the Director-General of the National Parks and Wildlife Service (See Appendix No. 4)

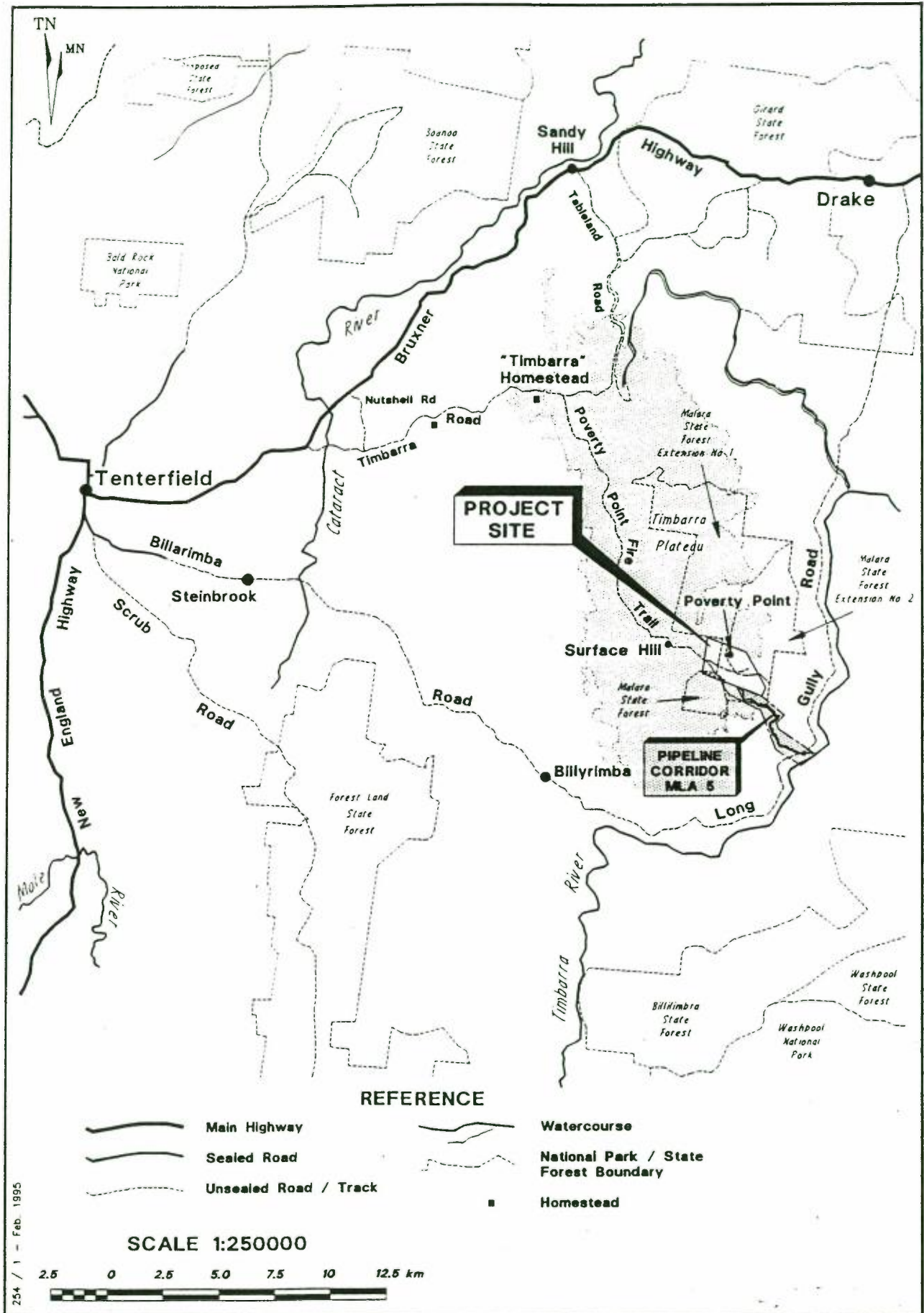
A draft copy of the environmental impact assessment report was forwarded to the Department of Land and Water Conservation, Sydney, on 22 February 1996 for perusal and comment in so far as it relates to Portion 37. Verbal agreement was reached and it was indicated a routine written reply would be sent in due course.

The Department of Mineral Resources has prepared this Environmental Impact Assessment Report in accordance with Clause 91 of the Environmental Planning and Assessment Regulations. This assessment report examines the environmental implications of the proposal and includes considerations of all submissions received. This report will be forwarded to Capricornia Prospecting Pty Ltd, to all relevant Government Agencies and placed on display at Tenterfield, Drake, Armidale and Sydney.

This report constitutes the Department's recommendations to the Minister for Mineral Resources for his consideration in making a final determination with respect to the subject application.



G G Lowder
Director-General
Department of Mineral Resources



DECISION OF THE MINISTER FOR MINERAL RESOURCES

Whereas -

1. Capricornia Prospecting Pty Limited is the applicant for Mining Lease Application Nos. 4 and 5 Inverell, lodged under the Mining Act 1992;
2. the applicant wishes to mine by open cut methods approximately 7.26 million tonnes of gold resource from the "Poverty Combined" and "Big Hill" open cuts. A further 1.6 million tonnes of gold resources are also planned to be extracted from four other identified open cuts; "Big Hill South", "CP-1", "Poverty North" and "Poverty Combined Extended". In addition to the mineral gold, the applicant also wishes to mine for silver;
3. the material mined will be processed on site by the applicant adopting cyanide heap leach methods;
4. the proposed operation is an "activity" within the meaning of Part V of the Environmental Planning and Assessment Act 1979, the Minister for Mineral Resources is a "Determining Authority" within the meaning of that Part and the applicant is a proponent within the meaning of that Part;
5. the Minister for Mineral Resources in considering the proposed activity examined and took into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity and concluded that the activity has the potential to significantly affect the environment;
6. no final decision was made to authorise the undertaking of the activity until:-
 - (a) the Minister for Mineral Resources obtained, examined and considered an Environmental Impact Statement entitled "Timbarra Gold Project

Environmental Impact Statement" in respect of the activity, prepared in the prescribed form and manner by the proponent;

- (b) a copy of the said Statement was forwarded to the Secretary, Department of Urban Affairs and Planning;
- (c) notice as provided for in Section 113(1) of the Environmental Planning and Assessment Act was given and the period specified in the notice had expired;
- (d) the Minister for Mineral Resources had examined and considered the representations made in accordance with Section 113(2) of the Environmental Planning and Assessment Act;
- (e) the Minister for Mineral Resources had complied with Section 113(3) of the Environmental Planning and Assessment Act by referring all representations received to the Secretary, Department of Urban Affairs and Planning;
- (f) the Minister for Mineral Resources had complied with Section 112B of the Environmental Planning and Assessment Act by consulting with the Minister for the Environment;
- (g) The recommendations of the Director-General, National Parks and Wildlife Service have been included in the lease conditions. Minor amendment was made to the recommendation made by the Director-General National Parks and Wildlife Service on the condition concerning dispute resolution so as to allow determinations to pass through the Minister for Mineral Resources;

7. no notices were served on the Minister for Mineral Resources by the Secretary, Department of Urban Affairs and Planning pursuant to Sections 112(1)(d) and (e) of the Environmental Planning and Assessment Act;

8. the Minister for Mineral Resources caused to have the applicant, through the Department of Mineral Resources, consult with the government agencies that made submissions to the Environmental Impact Statement, to discuss concerns raised. The coordinated meetings resulted in improvements to the proposals through the adoptions of recommendations and the inclusions of additional controls in the form of 'special conditions';
9. the Minister for Mineral Resources caused to have prepared by the Director-General, Department of Mineral Resources, for the purpose of Regulation 91 of the Environmental Planning and Assessment Regulation 1994, a document entitled 'Proposed Timbarra Gold Project', Capricornia Prospecting Pty Ltd' Environmental Impact Assessment Report (hereafter referred to as the report), and
10. the report contains a recommendation that the activity be authorised and subject to conditions.

Now therefore, I Robert Douglas Martin, Minister for Mineral Resources, having complied with the provisions of Section 112 of the Environmental Planning and Assessment Act 1979 and the regulations made thereunder and being satisfied that, with the safeguards proposed, the undertaking of the activity will not detrimentally affect the environment, have decided to approve the proposal subject to the conditions referred to in Annexure A and, pursuant to Section 53 (2) of the Mining Act, 1992, consider the offer of a mining lease in satisfaction of Mining Lease Application Nos. 4 and 5 Inverell to Capricornia Prospecting Pty Ltd subject to the lease conditions and the conditions referred to in the following schedule:

SCHEDULE

<u>Mining Lease Application</u>	<u>Term</u>	<u>Minerals</u>	<u>Conditions</u>
4 and 5 Inverell	10 years	Gold and Silver	Annexure A

Area

Combined area of about 409.28 hectares as shown on plans catalogued M 26795 R (397.2 hectares) and M 26807 R (12.08 hectares) in the Department of Mineral Resources

Dated this *Third* day of *April* 1996

Bob Martin MP

BOB MARTIN
MINISTER FOR MINERAL RESOURCES

ANNEXURE A

CONDITIONS OF AUTHORITY (ML) (1993)

Operations

- 1A. The lease holder must conduct operations on the subject area generally in accordance to the manner outlined and detailed in the Environmental Impact Statement prepared by R. W. Corkery and Co. Pty Limited titled 'Timbarra Gold Project' and dated April 1995, for the Project, except as modified by the following lease conditions and/ or an approved Plan of Management, and must not adopt any other method of operations without the prior written approval of the Minister and subject to any conditions he may stipulate.

In respect to fauna and flora, in addition to Conditions 103 and 104, the lease holder shall implement mitigation or amelioration measures provided for in either the Environmental Impact Statement and Fauna Impact Statement.

Notice to Owners and Occupiers

1. Within a period of three months from the date of this lease or within such further time as the Minister may allow, the lease holder must serve on each owner or occupier of private land and on each occupier of the Crown Land held under a pastoral lease within the subject area a notice in writing indicating that this lease has been granted and whether the lease includes the surface. The notice must be accompanied by an adequate plan and description of the subject area.

If there are ten or more owners or occupiers affected, the lease holder may serve the notice by publication in a newspaper circulating in the region where the subject area is situated. The notice must indicate that this lease has been granted; state whether the lease includes the surface and must contain an adequate plan and description of the subject area.

Plan of Management

3. (1) Mining operations must be conducted in accordance with a plan of management approved by the Director-General.
- (2) An application for approval of the proposed plan of management must be accompanied by a copy of the proposed plan and must be lodged with the Director-General:
- (a) within 12 months of the grant of this lease; or
 - (b) within such further period of time as the Director-General may allow.
- (3) A plan of management:
- (a) must describe where relevant the means by which it is proposed that the environment is to be protected in the course of the conduct of mining operations in relation to:
 - * the disposal of tailings and other waste products (including toxic wastes) arising from the conduct of mining operations
 - * the minimisation of pollution of air and water
 - * the minimisation of noise pollution

- * the prevention of soil erosion
 - * the rehabilitation of any land on which mining operations are conducted
 - * the manner in which it is proposed to rehabilitate waste rock and heap leach emplacements.
- (b) must contain the following particulars in relation to the land on which mining operations are to be conducted:
- * the approximate depth of the topsoil
 - * the nature of the vegetation
 - * the contours of the land as they were immediately before the conduct of mining operations were begun
 - * the manner in which it is proposed to remove, store and replace the topsoil
 - * plans and sections of the land indicating the location of the minerals to be mined
 - * a site plan of the land indicating the location of any mine workings, mine processing plant and other ancillary works on the surface of the land
 - * the methods to be used in the course of the conduct of mining operations
 - * the order in which mining operations are to be conducted on the various parts of the land
 - * plans and sections indicating the location of minerals that are not to be mined
 - * the nature of the vegetation proposed to be planted in the course of the rehabilitation of the land
 - * the contours of the land as they are proposed to be after rehabilitation of the land has been completed.
- (4) The Director-General may reasonably require a proposed plan of management:
- (a) to be amended in such manner, or in relation to such matter, as the Director-General may require; and
 - (b) to be resubmitted to the Director-General within such time as the Director-General may allow.
- (5) After considering an application for approval of a proposed plan of management, the Director-General:
- (a) may approve the plan; or
 - (b) may refuse the application.
- (6) (a) A management plan is to be reviewed within 12 months of the date on which it was last approved and at such other times as the Regional Inspector of Mines may direct.

- (b) The results of the review, including any amendments to the management plan arising out of the review, are to be lodged with the Director-General.
 - (c) The review must indicate the nature and extent of any mining or rehabilitation work carried out in the previous 12 months and the nature and extent of any mining or rehabilitation work proposed to be carried out during the period of 12 months following the review.
 - (d) The review must also indicate the extent (if any) to which it has become impracticable for mining and associated operations to comply with the plan of management and the reason why that is so.
- (7) The first Plan of Management after the grant of a mining lease shall contain a flow chart of the mining and metallurgical processes. This flowchart must be accompanied by a qualitative analysis of the risk to the environment posed by each step in the process, based upon either the Workplace Risk Assessment and Control (WRAC) methodology or on other methods satisfactory to the Department of Mineral Resources.

Where risks are significant, either because of high probability or because of severity of consequence, a plan for the elimination, minimisation or management of the risk shall be prepared. A copy of these management plans shall be incorporated into the Plan of Management documentation.

Where any major changes are made to the impact of the processes outlined above, or when so directed by the Regional Inspector of Mines, a qualitative risk assessment shall be conducted prior to implementation and a copy of the report supplied to the Department of Mineral Resources.

Mining Methods

4. (a) For the area delineated on Plan of Portion ML 3 and catalogued M 26795R in the Department of Mineral Resources, the lease holder must restrict mining operations on the subject area to open cutting and must not adopt any other method of mining without the prior written approval of the Minister and subject to any conditions he may stipulate.
- (b) For the area delineated on Plan of Portion ML 1 and catalogued M 26807R in the Department of Mineral Resources, the lease holder must restrict mining operations on the subject area to the construction and maintenance of pipeline and pumping stations for water supply and must not adopt any other method of mining without the prior written approval of the Minister and subject to any conditions he may stipulate.

Drilling

7. If the lease holder proposes to drill a drill hole he must ensure:
- (a) all cored holes are accurately surveyed and permanently marked so that their location can be readily ascertained;
 - (b) all holes whether cored or otherwise are sealed so as to prevent collapse of the surrounding surface;

- (c) all flowing drill holes are permanently sealed with cement plugs to prevent surface discharge of groundwaters;
 - (d) that where any drill hole encounters natural or noxious gases it is plugged or sealed so as to prevent their escape;
 - (e) that where any drill hole encounters an artesian or sub,artesian flow that it is sealed effectively to prevent contamination of aquifers.
8. As soon as any drill hole ceases to be used it must be filled or plugged to the satisfaction of the Regional Inspector of Mines and the land in its immediate vicinity left in a clean, tidy and stable condition.

Blasting

9. The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the area of the subject lease does not exceed 10mm/second and does not exceed 5mm/second in more than 5% of the blasts at any dwelling or occupied premises outside the said area, unless approval has been granted by the Regional Inspector of Mines to exceed the said particle velocity or as otherwise determined by the Environment Protection Authority under the provisions of the Noise Control Act 1975.
10. The lease holder must ensure that the blast overpressure noise level generated by any blasting within the area of the subject lease does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of blasts, outside the said area, at any existing dwelling or occupied premises, as the case may be unless approval has been granted to exceed such levels by the Regional Inspector of Mines or as otherwise determined by the Environment Protection Authority under the provisions of the Noise Control Act 1975.

Safety

11. Operations must not be carried out in a manner that endangers the safety of any persons and stock in the vicinity of the operations. In particular, all shafts and excavations are to be appropriately protected, to the satisfaction of the Regional Inspector of Mines, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder are to be filled in or otherwise rendered safe to a standard acceptable to the Regional Inspector of Mines.

Topsoil replacement and Rehabilitation

12. (a) Any topsoil that is removed in the course of operations is to be set aside for replacement at a later date. Other soil, rock and residues are to be used to fill abandoned shafts and excavations as detailed in the Plan of Management and are to be covered by the topsoil previously removed.
- (b) The land over which the operations have been carried on:
- (i) is to be appropriately restored/ contoured and landscaped, to the satisfaction of the Regional Inspector of Mines, to ensure that the land is properly drained and protected from soil erosion; and
 - (ii) is to be planted with vegetation appropriate to the area and at a density acceptable to the Regional Inspector of Mines. Where the agreed final land use is to include native vegetation, indigenous species must be used in all revegetation programs, unless otherwise directed.

13. The lease holder must comply with any reasonable direction given by the Regional Inspector of Mines regarding the stabilisation and revegetation of any mine residue, tailings or overburden emplacements situated on the subject area.
16. On completion of operations the lease holder must rehabilitate all areas disturbed as a result of operations having been carried out within the subject area and must ensure that such areas are adequately maintained for such a period as is necessary to satisfy the Minister that long term rehabilitation standards and environmental safeguards have been fulfilled.

Power and Telephone Lines, Fences, Gates

17. Operations must not interfere with or impair the stability or efficiency of any telephone or power transmission line traversing the subject area without the prior written approval of the Minister and subject to any conditions he may stipulate.
18. Fences on or adjacent to the subject area must not be interfered with without the prior written approval of the owner thereof or the Minister and, subject to any conditions the Minister may stipulate.
19. Any gates within the subject area or any other gates used by the lease holder must be closed or left open in accordance with the requirements of the owner or occupier.

Dogs

20. The lease holder must not keep dogs on the lease area.

Firearms

21. Firearms must not be brought onto the subject area without the prior written approval of the Minister and subject to any conditions he may stipulate.

Roads and Tracks

22. (a) In the event of operations being conducted on the surface of any road, track or firetrail traversing the subject area or in the event of such operations causing damage to or interference with any such road, track or firetrail the lease holder, at his own expense, shall if directed to do so by the Minister provide to the satisfaction of the Minister an alternative road, track or firetrail in a position as required by the Minister and shall allow free and uninterrupted access along such alternative road, track or firetrail and, if required to do so by the Minister, the lease holder shall upon completion of operations rehabilitate the surface of the original road, track or firetrail to a condition satisfactory to the Minister.
- (b) Operations must not be carried out under any road at a depth less than twenty metres from the surface without the prior written approval of the Minister and subject to any conditions he may stipulate.
- (c) Notwithstanding that the lease holder shall have complied with this condition the lease holder must pay to the local Council, the Director-General, Department of Land and Water Conservation, the Commissioner for Western Lands or the Chief Executive Roads and Traffic Authority the cost incurred by such Council or Department or Commission or Chief Executive of making good any damage to any road caused by operations carried on by or under the authority of the lease holder or any person claiming through or under the lease holder.

- (d) AND THE LEASE HOLDER HEREBY COVENANTS with the said Council that the lease holder will pay to the said Council the cost incurred by the Council of making good any such damage caused as aforesaid and the lease holder hereby covenants with the said Director-General/ Commissioner/ Chief Executive that the registered holder will pay to the said Director-General/Commissioner/Chief Executive the cost incurred by the said Director-General/Commissioner/Chief Executive of making good any such damage caused as aforesaid.

AND IT IS HEREBY AGREED AND DECLARED that the amount to be paid by the lease holder under the provisions of this clause shall include in addition to the cost of all necessary labour and materials all costs and expenses reasonably incurred in and about the making of surveys and preparation of plans and specifications and estimates the supervision and inspection of the works and all administrative and overhead costs and expenses of the Council or the Department of Land and Water Conservation or the Commissioner for Western Lands or the Chief Executive Roads and Traffic Authority as the case may be related or attributable to the works undertaken to make good any damage caused to any road. A certificate under the hand of the General Manager of the local Council or the Director-General for Land and Water Conservation or the Commissioner for Western Lands or the Chief Executive Roads and Traffic Authority or the person for the time being acting as such Clerk, Director-General, Commissioner or Chief Executive as to the amount of the cost of making good any damage to any road shall in all respects and for all purposes be conclusive evidence of the amount of such cost and of the due determination thereof.

23. When designing access tracks the leaseholder will attempt to keep track positions and distances to a minimum so as not to cause any unnecessary damage to the land. Temporary access tracks must be ripped, topsoiled and revegetated as soon as possible after they cease to be required for mining operations. The design and construction of access tracks must be in accordance with specifications fixed by the Department of Land and Water Conservation.

Trees and Vegetation

27. (a) The lease holder must not fell trees, strip bark or cut timber on any private land, or Crown land held under a pastoral lease within the subject area, otherwise than in accordance with the consent of the owner or occupier of the land or, if the owner or occupier refuses consent or attaches unreasonable conditions to the consent, with the approval of a warden.
- (b) The lease holder must not destroy or injure any tree, sapling, shrub or scrub on any protected land, as determined by the Soil Conservation Act, 1938, except in accordance with an authority issued by the Department of Land and Water Conservation under Section 21D of that Act.
- (c) The lease holder must not cut, destroy, ringbark or remove any timber or other vegetative cover on any other land subject of this lease except in areas covered by the Plan of Management
28. All trees, shrubs and undergrowth which the lease holder cuts down, removes or damages for the purpose of the operations must be disposed of by the lease holder as directed by and to the satisfaction of the Director-General.

29. The lease holder must observe any reasonable instructions given by any responsible authority with a view to the eradication of noxious weeds. The lease holder must make all reasonable efforts to prevent the introduction and establishment of noxious weeds.

State Forests

30. (a) This lease does not confer the power to cut or remove any timber within Malara State Forest except such as directly obstructs or prevents the carrying on of the operations and the lease holder must obtain authority under the provisions of the Forestry Act, 1916 as amended, or any Act amending the same and the Regulations thereunder before making use of the timber so cut for other than in connection with the operations. The sanction of the District Forester or his deputy must be obtained before proceeding to cut any other timber within the said forest/s.
- (b) The lease holder must take all reasonable precautions against causing outbreak of fire on the said forest and must not burn off any grass dry herbage or surface litter except with the approval of the District Forester and must under the direction and control of the local Forest Officer stack and burn the heads of any trees destroyed during the course of the operations and the lease holder must not permit any fireplace to be constructed unless protected by stone wallings and fires lit therein must not be left unattended.
- (c) This lease is issued subject to any conditions and/or restrictions which may be prescribed in accordance with the provisions of the Forestry Act, 1916, as amended, or any Act amending the same and the Regulations thereunder and the Regulations under the Bush Fires Act, 1949.
- (d) Any necessary clearing must be done only with the prior permission of the District Forester or his deputy and compensation must be paid for any mature trees or semi-mature trees damaged or destroyed at the rate fixed by the Forestry Commission and such compensation must be payable on demand at the end of each calendar month.
- (f) The lease holder must not cause damage to forest roads or tracks by operating vehicles on the subject area during wet weather unless this damage is minimised and the road maintained in a satisfactory manner approved by the District Forester, except in areas where operations are approved by a Plan of Management
- (g) The Minister reserves the right to suspend operations if operations are causing unnecessary damage to any assets of the Forestry Commission as agreed by the District Forester and the Regional Inspector of Mines and following the issue of a show cause notice not exceeding a time limit of one week to the leaseholder.
- (h) On completion of operations the lease holder must restore, consolidate and make trafficable to the satisfaction of the Minister all roads and fire-breaks at present existing and which may be affected by the operations.
- (i) In the event of operations encroaching on or within 3 metres of any constructed road or fire-break the lease holder must provide a suitable deviation to the same standard as the previous road or fire-break and on the completion of operations lease holder must restore the road or fire-break to its original position and condition to the satisfaction of the Minister.

Settling Dams

31. Settling dams or other dams constructed on the subject area must be constructed, maintained and sealed to the satisfaction of the Regional Inspector of Mines.
32. The lease holder must provide and maintain efficient means to prevent contaminated waters discharging or escaping from the subject area onto surrounding areas.

Prevention of Soil Erosion

33. Except as outlined in an approved Plan of Management, operations must be carried out in a manner that does not cause or aggravate soil erosion or stream sedimentation. The lease holder must observe and perform any instructions given by the Director-General in this regard.
34. Run off from any worked area including the overflow from any depression or ponded area must be discharged in a manner that does not cause erosion or stream sedimentation.

Use of Cyanide

35. The lease holder must not use cyanide or any solution containing cyanide on the subject area except as authorised in the Plan of Management.
36. The use of cyanide on the subject area must be in accordance with the Mines Inspection Act, 1901.

Catchment Areas and Watercourses

37. (a) Operations must be carried out in a manner which avoids pollution of the Clarence River Catchment Area.
(b) If the lease holder is using or about to use any process which the Minister believes is likely to pollute the waters of the said Catchment Area the lease holder must refrain from using or cease using such process within twenty-four (24) hours of the receipt by the lease holder of a notice in writing requiring the lease holder so to do.
(c) The lease holder must comply with any regulations in force for the protection from pollution of the said Catchment Area.
42. Operations must not be carried out in or adjacent to any waters that are closed to fishing pursuant to the Fisheries and Oyster Farms Act, 1935, unless at least 7 days notice of the commencement of those operations have been given to the Director of NSW Fisheries.

Aboriginal Place or Relic

43. The lease holder must not knowingly destroy deface or damage any aboriginal place or relic within the subject area except in accordance with an authority issued under the National Parks and Wildlife Act, 1974, and must take every precaution in drilling, excavating or disturbing the land against any such destruction, defacement or damage.

Additional Rehabilitation

58. The lease holder must spread fertilizer of such type and in such quantity as may be directed by the Regional Inspector of Mines over the rehabilitated area to assist the growth of such grasses plants shrubs and/or trees as may have been planted in accordance with the conditions of the lease.

Resource Utilisation

66. (A) The lease holder must when required by the Regional Inspector of Mines to do so furnish such information relating to the responsible utilisation of the mineral resources of the subject area as the Regional Inspector of Mines may specify.
- (B) Where the Minister is satisfied on a report of the Regional Inspector of Mines that the method or system of working or processing employed in the development of or in any subsequent operations in any mine is such as to result in failure to recover minerals that would otherwise be economically recoverable at the time he may give notice in writing to the lease holder:-
- (i) stating the particulars in which it is considered the method or system of working or processing tends to such failure to recover minerals; and
 - (ii) requiring that such method or system of working or processing be abandoned or so modified as to remedy such failure to recover minerals;

Provided that:-

- (a) no such report shall be submitted to the Minister until it has been thoroughly discussed with and has incorporated the views of the lease holder;
 - (b) the notice must not specify the modification of the mining or processing method to be adopted by the lease holder.
- (C) The lease holder may object to any notice issued under this condition and on receipt of such an objection the Minister shall refer the objection to a Warden for inquiry and report under Section 334 of the Mining Act, 1992.
- (D) On receipt of the Warden's report the Minister shall determine the objection in accordance with the findings of such report and the lease holder must comply with the determination so made.

Control of Operations

67. (a) If a Regional Inspector of Mines believes that the lease holder is not complying with any provision of the Mining Act 1992 or any condition of this lease relating to the working of the subject area, he may, direct the lease holder to cease working the subject area and to rectify the situation.
- (b) The lease holder must comply with any direction given.

Working Requirement

68. The lease holder must either:
- (a) (i) for the first year ensure that at least 4 competent people are efficiently employed on the subject area on each week day except Saturday or any week day that is a public holiday,
 - (ii) for the second and subsequent years ensure that at least 18 competent people are efficiently employed on the subject area on each week day except Saturday or any week day that is a public holiday,

OR

- (b) (i) in the first year expend on operations carried out in the course of prospecting or mining the subject area, an amount of not less than \$100,000,
- (ii) in the second and subsequent years expend on operations carried out in the course of prospecting or mining the subject area, an amount of not less than \$450 000 during each year of the term of this lease.

Costs or expenses incurred which are not, in the opinion of the Minister, directly associated with the prospecting or mining operations shall not be accounted expenditure for the purposes of this condition. The Minister, may at any time or times after a period of 2 years from the date on which this lease or any renewal thereof has effect, by instrument in writing served on the holder of the lease, increase or decrease the number of people to be employed or the amount of expenditure to be expended under this condition provided that not more than one variation shall be made in any period of two years.

Reports

- 69. The lease holder shall provide, within a period of twenty-eight days after each anniversary of the date this lease has effect or at such other date as the Director-General may stipulate, of each year, a progress report(s) to the satisfaction of the Director-General containing the following:-
 - (a) Full particulars, including results, interpretation and conclusions, of all exploration conducted during the twelve months period;
 - (b) Details of expenditure incurred in conducting that exploration;
 - (c) A summary of all geological findings acquired through mining or development evaluation activities;
 - (d) Particulars of exploration proposed to be conducted in the next twelve months period;
 - (e) All plans, maps, sections and other data necessary to satisfactorily interpret the report(s).
- 70. (1) **Licence to Use Reports**
 - (a) In respect of reports prepared and to be prepared by or on behalf of the lease holder, and submitted to the Director-General pursuant to condition number 69 of this lease, the lease holder hereby grants to the Minister, by way of a non-exclusive licence, the right in copyright herein, to publish, print, adapt and reproduce the work in any form and for the full duration of copyright, subject to a period of confidentiality as outlined in sub-clause (2).
 - (b) The non-exclusive licence to do acts comprised in the copyright granted hereunder will operate as a consent to disclosure for the purposes of section 365 of the Mining Act 1992.
- (2) **Confidentiality**
 - (a) All exploration reports submitted in accordance with the conditions of this lease will be kept confidential while the lease is in force, except in cases where:

- (i) The lease holder has agreed that specified reports may be made non-confidential.
- (ii) Reports deal with exploration conducted exclusively on areas that have ceased to be part of the lease.
- (b) Confidentiality of reports will be continued beyond the termination of a lease in cases where an application for a flow-on title was lodged during the currency of the lease. The confidentiality will last until that flow-on title or any subsequent flow-on title, has terminated.
- (c) The Director-General may extend the period of confidentiality in respect of reports beyond the time(s) stipulated in sub-clauses (a) and (b) hereof.

(3) **Terms of the non-exclusive licence**

The terms of the non-exclusive copyright licence granted under sub-clause (1)(a) are:

- (a) The Minister may sub-licence others to publish, print, adapt and reproduce but not on-licence reports.
- (b) The Minister and any sub-licensee will acknowledge the lease holder's and any identifiable consultant's ownership of copyright in reports in any reproduction of reports, including storage of reports onto an electronic database.
- (c) The lease holder does not warrant ownership of all copyright works in any report and, the lease holder will use best endeavours to identify those parts of the report for which the lease holder owns the copyright.
- (d) There is no royalty payable by the Minister for the licence.
- (e) If the lease holder has reasonable grounds to believe that the Minister has exercised his rights under the non-exclusive copyright licence in a manner which adversely affects the operations of the lease holder, that licence is revocable on the giving of a period of not less than three months notice.

- 71. Operations must be carried out in a manner that interferes as little as possible with the natural flora or fauna, except as where operations comply with the Plan of Management.
- 72. The lease holder must take all reasonable precautions against causing an outbreak of fire and must comply with the provisions of and regulations under the Bush Fires Act, 1949, as amended and must not burn off any grass, foliage or herbage without the consent of the owner or occupier and the local fire authority.
- 73. The lease holder must not deposit any domestic garbage except in properly constructed containers which must be regularly removed by the lease holder from the subject area and the lease holder must maintain the area in a clean and tidy condition
- 74. Machinery and buildings must be removed from the subject area on the expiry or earlier termination of the lease and the area left in a clean, tidy and stable condition to the satisfaction of the Director-General.

Security

75. (a) Security, lodged by instalments at the times indicated below, must be lodged with the Minister by the lease holder for the purpose of ensuring the fulfilment by the lease holder of his obligations under this lease. If the lease holder fails to fulfil any one or more of such obligations the said sum may be applied at the discretion of the Minister towards the cost of fulfilling such obligations. For the purpose of this clause the lease holder shall be deemed to have failed to fulfil the obligations of this lease if he fails to comply with any condition or provision hereof, any provision of the Act or regulations made thereunder or any condition or direction imposed or given pursuant to a condition or provision hereof or of any provision of the Act or regulations made thereunder:
- (i) an amount of \$250,000 must be lodged prior to the grant of the lease;
- and
- (ii) an additional amount of \$2,850,000 must be lodged at least one month prior to the commencement of mining operations.
- (b) The lease holder must provide the security required by sub-clause (a) hereof in one of the following forms:
- (i) cash,
 - (ii) a banker's certificate or bond in such form and given by such surety as may from time to time be approved by the Minister.
- (c) The Minister may at any time or times hereafter vary either the amount or form or both the amount and form of the security required under sub,clauses (a) and (b). Where he has so varied the security he shall serve on the lease holder an instrument in writing requiring him, within a time specified in the instrument, to lodge a further security in such form as is specified in the instrument. After receipt of a further security the Minister shall release any security held in excess of that required.

Cancellation Report

77. Upon cancellation (in part or in full) or upon expiry the lease holder must lodge:-
- (i) Plans and sections showing the extent of workings on the area cancelled or subject of expiry;
 - (ii) Records of tonnage and grade mined and treated;
 - (iii) Records of concentrate and/or finished product produced;
 - (iv) Geological information including details of any remaining mineralisation.

SPECIAL CONDITIONS

Indemnity

78. The lease holder shall indemnify and keep indemnified the Crown from and against all actions suits and claims and demands of whatever nature and all costs, charges and expenses which may be brought against the lease holder or which the lease holder may incur in respect of any accident or injury to any person or property which may arise out of the construction, maintenance or working of any workings now existing or to be made by the lease holder within the boundaries of the subject area or in connection with any of the operations notwithstanding that all other conditions of this authority shall in all respects have been observed by the lease holder or that any such accident or injury shall arise from any act or thing which the lease holder may be licenced or compelled to do hereunder.

Management of Water, Chemicals and Sediment

79. (i) Monitoring

The lease holder must in a manner approved by an Inspector of Mines sample, analyse and monitor surface and ground water and sediments to check for contaminants or high sediment content.

- (ii) Control Measures

The lease holder must establish such bunding, dams, silt traps and/or other sediment control measures required by an Inspector of Mines to prevent or minimise the accidental loss of contaminated water from the area.

- (iii) Heap Leach and Other Treatment Areas

The lease holder must establish such controls at the heap leach area and other treatment areas to manage the movement of water, chemicals, sediment and/or other medium as required by and to the standard acceptable to an Inspector of Mines.

Watercourses

80. The lease holder shall obtain the necessary approvals from the relevant authorities before undertaking any operations which may directly or indirectly cause the pollution or siltation of any watercourse or waterbody.
81. The lease holder shall not reroute, dam or divert any water from any watercourse or stream until such time as a licence under the Water Act (1912 as amended) is issued by the Department of Land and Water Conservation.

Bold Top Mountain

82. The lease holder must not mine within 200 metre radius from the top of Bold Top Mountain.

Clearing

83. The lease holder must notify the District Forester at least 14 days prior to the commencement of any clearing operation within the State Forest.
84. The lease holder must ensure that any millable timber as determined by the District Forester or nominee is cross cut and taken to an appropriate landing for recovery by industry.

Timber Burning / Storage

- 85 Where the storage of timber is impractical and the procedure to burn is permitted, the lease holder must obtain approval from the Forestry Commission of NSW.
- 86 Whether or not a request for approval is made to the Forestry Commission of NSW, prior to the commencement of each stage of the project the lease holder must prepare and forward a plan to the Commission showing the possible volume of timber that would need to be stacked or stored.

Water Management, Erosion and Sediment Control Plan

87. A detailed Water Management, Erosion and Sediment Control Plan must be prepared and submitted prior to any construction or commencement of any stage of the development of the mine or associated works. This Plan is to be part of a Plan of Management to be approved by the Director-General. The lodgement of the Water Management, Erosion and Sediment Control Plan can be staged according to the project timetable. (Plans for areas where mining or associated activities are not occurring can be deferred until mining or activities are to commence.)

Prior to the preparation of the Water Management, Erosion and Sediment Control Plan, the lease holder shall liaise with the Environment Protection Authority and the Department of Land and Water Conservation.

Harvesting Plan / Clearing Logging Plan

88. The lease holder must prepare and submit either a Harvesting Plan or a Clearing/ Logging Plan prior to any construction or commencement of any stage of the development of the mine or associated works. The Plan is to form part of the Plan of Management to be approved by the Director-General. The lodgement of the Harvesting Plan or a Clearing/ Logging Plan can be staged according to the project timetable. (Plans for areas where mining or associated activities are not occurring can be deferred until mining or activities are to commence.)

Prior to the preparation of the Harvesting Plan or a Clearing/ Logging Plan the lease holder shall liaise with the Department of Land and Water Conservation and/ or the District Forester.

Topsoil Management Plan

89. Prior to any construction or commencement of any stage of the development of the mine or associated works, the lease holder must prepare and submit a Topsoil Management Plan. The Topsoil Management Plan is to be part of a Plan of Management to be approved by the Director-General. The lodgement of the Topsoil Management Plan can be staged according to the project timetable. (Plans for areas where mining or associated activities are not occurring can be deferred until mining or activities are to commence.)

Prior to the preparation of the Topsoil Management Plan the lease holder shall liaise with the Department of Land and Water Conservation.

Big Hill Open Cut / Waste Rock Emplacement

90. (a) The lease holder not commence any mining development within the Big Hill open cut or waste rock emplacement sites except as authorised by an approved Plan of Management.
- (b) The lease holder must ensure there is maintained an 'environmental flow' downstream of the Big Hill open cut and waste rock emplacement sites.

- (c) The design to ensure that there is an 'environmental flow' is maintained below the Big Hill project area, must be submitted to the Department of Land and Water Conservation.
- (d) No material of the Big Hill Waste Rock Emplacement should be placed within 40 metres of the banks of Duncans Creek.

The environmental flow referred to in part (b) and (c) shall be as determined and approved by the Department of Land and Water Conservation.

Heap Leach Pad and Associated Storage Dams

- 91. The lease holder shall ensure that all designs and works associated with the construction of the heap leach pads, the liquid storage and storm storage ponds (including methods and materials for lining) are carried out in accordance with professionally recognised engineering standards and practices appropriate for their construction and that such works are carried out under the supervision and control of a person or organisation with recognised experience in the field whose qualifications and experience are recognised by the Institute of Engineers, Australia.

At the completion of construction, the supervisor must sign off on the project verifying to the Department that the heap leach pads, the liquid storage and storm storage ponds were constructed to design and specification.

- 92. The lease holder shall conduct rehabilitation and revegetation trials on parts of the heap leach pad as soon as practicable and as recommended by the Plan of Management Committee.
- 93. Upon completion of mining operations the lease holder must, unless otherwise approved by the Director-General, ensure that the direction of surface runoff from the heap leach pad site as far as practical replicates that which existed prior to the commencement of operations.

Bush Fire Control

- 94. Prior to the commencement of operations the lease holder must liaise with Tenterfield Council's Fire Control Officer for the preparation of a Bushfire Management Plan for the site.

Environmental Officer

- 95. The lease holder must appoint a mine site environmental officer whose qualifications are acceptable to the Director-General and whose duties are specified in the Plan of Management.

Transportation of Goods

- 96. Prior to the commencement of operations the lease holder must liaise with the Tenterfield Shire Local Emergency Management Committee to discuss emergency issues which may affect the mine and transportation of goods to and from the mine.

Tenterfield Shire

- 97. The lease holder must comply with its undertakings with Tenterfield Shire Council as agreed to in the Tenterfield Shire Council's Timbarra Gold Project Agreement and detailed on Appendix No. 2 herein.

Approvals

98. The lease holder must obtain the necessary licence(s) under the Water Act (1912 as amended) prior to:
- a) the construction of a water storage on any watercourse;
 - b) the extraction of water from the Timbarra River or from any other watercourse;
 - c) the diversion of water from any watercourse;
 - d) putting in a bore.
99. The lease holder must not commence or continue any activity unless a Pollution Control Approval has been issued by the Environment Protection Authority.
100. Prior to the commencement of operations the lease holder must prepare and submit for approval by the Department of Urban Affairs and Planning a Final Hazards Analysis.

Community Liaison

101. The lease holder shall carry out an appropriate Community Liaison Programme in respect of major developments at the site.

Storm Storage Capacity

102. The lease holder must ensure that the total storm storage capacity within the intermediate liquor storage, the pregnant liquor storage, the barren liquor storage and storm ponds is not less than 140 ML.

FAUNA "SPECIAL CONDITIONS"

Definitions

The following definitions refer to Condition Nos 103, 104, 105, 106 and 107.

Threatened Species: means those species listed on Schedules 1 or 2 of the Threatened Species Conservation Act, 1995.

NPWS: means the NSW National Parks and Wildlife Service.

Manager, Northern Zone: means the Manager of the Northern Zone of the NSW National Parks and Wildlife Service.

region means Timbarra Plateau as defined in Figure 3.8 of the EIS

Ameliorative Measures

103. The lease holder should implement the following ameliorative measures:

1. Surveys of threatened species

Prior to the commencement of any clearing activities:

- (i) Surveys on the Timbarra Plateau should be undertaken according to the methods approved in Condition 103.1(ii) to ascertain the regional status of the following species:

- * Hastings River Mouse *Pseudomys oralis*
- * Eastern Chestnut Mouse *Pseudomys gracilicaudatus*

- * Stuttering Frog *Mixophyes balbus*
- * Brush-tailed Rock Wallaby *Petrogale penicillata*

- (ii) The Manager NPWS, Northern Zone should be consulted regarding appropriate survey methods.
- (iii) A written report should be provided detailing the results of the surveys and whether populations of the species listed in Condition 103.1(i) occur or are likely to occur in the region, also a description and assessment of potential threats to those populations. The report should include any further recommendations for amelioration of the impact of the proposed activities as a result of the surveys.
- (iv) If viable populations of the species listed in Condition 103.1(i) cannot be found on the Timbarra Plateau, other than on the lease area ameliorative measures should be provided.
- (v) The NPWS Manager, Northern Zone should be consulted before clearing activities occur in relation to threatened species habitat, for the species listed in Condition 103.1(i).

2. Eastern Bristlebird

- (i) Prior to the commencement of any clearing activities, a survey for Eastern Bristlebirds should be undertaken in potentially suitable habitat to ascertain the presence of the Eastern Bristlebird on and around the project site. The NPWS Manager, Northern Zone should be consulted regarding appropriate survey methods. Results should be provided in writing to the NPWS Manager, Northern Zone.
- (ii) If the Eastern Bristlebird is recorded, ameliorative measures should be provided and implemented to ensure the continued existence of the species. Such measures should be approved by the NPWS Manager, Northern Zone.
- iii) The NPWS Manager, Northern Zone should be consulted before clearing activities occur in relation to the Eastern Bristlebird habitat.

3. Square-tailed Kite

An inspection for Square-tailed Kite nests should be undertaken in all suitable habitat where clearing activities are proposed prior to any clearing activities taking place. The surveys should be conducted between August and October, the most likely breeding season. If an active nest of a Square-tailed Kite is recorded, any clearing activities should not occur within a 200 metre radius of the nest until breeding has been completed. If the nest tree itself is proposed to be cleared, consultations with the NPWS Manager, Northern Zone should then occur to determine further management actions.

4. Threatened Bats:

Yellow-bellied Sheathtail Bat, Beccari's Mastiff Bat, Eastern Little Mastiff Bat, Golden-tipped Bat, Greater Broad-nosed Bat, Great Pipistrelle, Large Pied Bat, Hoary Bat, Little Bent-wing Bat, Common Bent-wing Bat, Large-footed Mouse-eared Bat, Greater Long-eared Bat.

Prior to the commencement of any clearing activities:

- (i) Surveys for threatened bat species to locate roost and nest sites in areas where clearing activities are proposed should be undertaken. The NPWS Manager, Northern Zone should be consulted regarding appropriate survey methods.
- (ii) Results should be provided in writing to NPWS Manager, Northern Zone.
- (iii) If roost or nest sites of threatened bat species are recorded, ameliorative measures should be provided to NPWS Manager, Northern Zone for approval and implemented.

- (iv) The NPWS Manager, Northern Zone should be consulted before any clearing activities occur in relation to roost and nest sites.

5. Koala

A search for Koalas and for evidence of Koalas (scratch marks on trees, scats) should be undertaken immediately prior to any clearing activities. If a Koala or evidence of a Koala is recorded a survey should be undertaken within a 200 metre radius of the sighting to locate (further) individuals. Any Koalas located should be captured by experienced fauna carers and released in suitable habitat in the locality. Clearing activities should not occur within a 200 metre radius of the record until all Koalas have been relocated away from the area to be cleared or until such time as the animal(s) have moved away from the area to be cleared.

6. Masked Owl/Sooty Owl/Powerful Owl

Prior to any clearing activities, all old growth/hollow bearing trees should be inspected to ascertain if they are being used as roost or nest trees. If Masked Owl/Sooty Owl/Powerful Owl roost or nest trees are detected, then clearing activities should not occur within a 200 metre radius of a nest tree and a 100 metre radius of a roost tree before consulting the NPWS Manager, Northern Zone.

7. Predator Control Program

Prior to any clearing activities, a Predator Control Program to control foxes and cats on and around the project site should be prepared and implemented. The Predator Control Program should be carried out over the life of the project and should aim to mitigate likely impacts from Foxes, Dogs and Cats on local populations of threatened species; including the Hastings River Mouse and the Brush-tailed Rock Wallaby.

8. Threatened Species Management Plan

A Threatened Species Management Plan should be prepared for the mining lease area. The Threatened Species Management Plan should detail management actions proposed to ensure the protection and enhancement of Threatened Species habitat.

The Plan shall also address the management of the flora listed on the Rare or Threatened Plant Database (ROTAP) and not appearing on Schedule 1 or 2 of the Threatened Species Conservation Act 1995. These species include: Eucalyptus scias, Eucalyptus olida, Pultenaea pycnocephala and Acacia floydii.

Monitoring

104. An annual monitoring report on the implementation of the ameliorative measures detailed in Condition 103 and the vegetation rehabilitation program should be provided to NPWS Manager, Northern Zone.

Rehabilitation Plans

105. The lease holder shall provide to the Manager, Northern Zone, NPWS for comment, any rehabilitation plans, including plans for the propagation of rare flora.

Flora and Fauna Reports and Surveys

106. The lease holder shall provide the Manager NPWS, Northern Zone, with copies of any reports of flora or fauna carried out on the lease or local area.
107. The lease holder shall notify the Manager NPWS, Northern Zone of any sightings of additional species listed on either Schedules 1 or 2 of the Threatened Species Conservation Act

Dispute Resolution

108. In the event that the lease holder and the Manager, National Parks and Wildlife Service, Northern Zone cannot agree on the survey methodologies or their extent, results or ameliorative measures required in Condition Nos 103 and 104 the matter shall be referred by either party to the Director-General, Department of Mineral Resources for mediation between the parties. If mediation fails to resolve disagreement between the two parties the matter shall be referred by any party for determination by a person nominated by the Director of the Australian Museum who shall make appropriate recommendations to the Minister for Mineral Resources.

1. INTRODUCTION

Capricornia Prospecting Pty Limited (ACN 008 819 252) (hereafter referred to as the Applicant) seeks consent to conduct open cut and heap leach operations for the mining of gold and silver from an area on the Timbarra Plateau comprising about 397.2 hectares and situated 27 kilometres east-south-east from the town of Tenterfield. The proposal also includes a water supply pipeline corridor, 6.5 kilometres long (12.08 hectares), from the Timbarra River to the mine site.

The Applicant has conducted exploration activities over the region since 1988. The identification of a sizeable mineable resource resulted in the lodgement of Mining Lease Application Nos 4 and 5 Inverell. Mining Lease Application No 4 Inverell represents the mine site area whereas Mining Lease Application No 5 Inverell is for the water supply pipeline corridor from the Timbarra River to the mine site.

The Minister for Mineral Resources is prepared to consider the grant of a mining lease over the areas once the requirements of the Environmental Planning and Assessment Act (EP&A) 1979 have been satisfied.

Normally the Minister for Urban Affairs and Planning or the relevant council would be responsible for issuing approval or consent under the EP&A Act 1979. However, as the proposal is located within Tenterfield Shire where the normal planning instruments do not apply, as there is no Local Environmental Plan, the responsibility for the grant of approval or consent rests with the identified determining authorities.

Tenterfield Shire Council is currently in the process of establishing a Local Environmental Plan (LEP). The Department of Urban Affairs and Planning has advised that the eventual gazettal of the Shire's LEP will be subject to the deferral of the Timbarra Gold Project from the plan.

At the time when the Environmental Impact Statement (EIS) was placed on public display the identified determining authorities concerning this proposal included; the

Department of Mineral Resources, the Department of Land and Water Conservation, the Environment Protection Authority and National Parks and Wildlife Service. The authorities have all agreed to the nomination of the Minister for Mineral Resources as the nominated determining authority for this proposal. However, the agreement from the Department of Land and Water Conservation is conditional to the Minister for Land and Water Conservation retaining a concurrence role for the Crown land affected by the Project. The Crown land referred to is currently under a perpetual lease and identified as Portion 37 in the Parish of Maclean.

On 3 February 1995 an on site Planning Focus Meeting was held to inspect the area and review the proposal. This meeting was attended by representatives of the relevant government agencies. On 17 February 1995 the Company lodged Mining Lease Application Nos 4 and 5 Inverell.

The Environmental Impact Statement (EIS) was completed by the Applicant and lodged with the Department of Mineral Resources on 18 April 1995.

Although an EIS had been prepared the provisions of Part V of the EP&A Act 1979, required a determination from the Minister for Mineral Resources, as a determining authority, that the conduct of the activities proposed by Capricornia Prospecting Pty Limited has the potential to significantly affect the environment and the environment of any protected fauna and that an EIS and Fauna Impact Statement (FIS) needed to be prepared and furnished.

The Minister for Mineral Resources gave his determination on 26 June 1995 that the proposal has the potential to significantly affect the environment and the environment of any protected fauna and that an EIS and FIS need to be prepared and furnished.

Copies of the EIS were forwarded to Tenterfield Shire Council and relevant government agencies. The EIS was placed on public display on 29 June 1995. The advertising of the EIS appeared in the Tenterfield Star and the Land on 29 June and 6 July 1995. The notices which appeared in the papers specified that the display and submission period ended up to and including 2 August 1995. As the notice that

appeared in the Land did not fulfil the requirements of the EP&A Act 1979, a State-wide paper issued daily, notices appeared in the Sydney Morning Herald on 14 and 21 July with the display period extended up to and including 14 August 1995. Additional notices also appeared in the Land and the Tenterfield Star on 3 and 4 August 1995, respectively, advising of the revised submission and display period up to and including 14 August 1995.

The Department of Mineral Resources received submissions from Government Agencies, interest groups and individuals by the August 14 deadline. A number of submissions were received up to and including 31 August 1995 that were accepted for consideration by the Department of Mineral Resources.

Copies of submissions received on the EIS were forwarded to the Applicant and its environmental consultants for comments on the issues raised. As required under the provisions of Section 113(3) of the EP&A Act 1979, copies of all submissions received were forwarded to the Department of Urban Affairs and Planning.

The Applicant and its consultants completed a draft response to the issues raised in submissions received on the EIS. The Department of Mineral Resources coordinated meetings with the relevant government agencies to discuss the agencies' concerns. Through these coordinated meetings improvements were made and the Department has accepted the recommendations of 'Special Conditions' by the agencies to form part of the lease conditions.

The National Parks and Wildlife Service undertook the assessment of the company's FIS in order to process its General (Section 120) Licence Application to 'take or kill' endangered fauna. However, with the recent enactment of the Threatened Species Conservation Act 1995, the Service can no longer issue a Section 120 licence for activities associated with this mining proposal. As a result of this Act a licence is no longer required for damaging the habitat of the threatened species, if the damage is essential for the carrying out of a development or activity in accordance with a development approval.

To assist the Department of Mineral Resources with its environmental assessment the Service forwarded sections of the Director-General's draft report and experts' reports on the Fauna Impact Statement for information.

The intention of the savings provisions of the Threatened Species Conservation Act was to exempt proposals such as the Timbarra Gold Project, that had received directions from the Department of Urban Affairs and Planning prior to the enactment of this Act, from the need to prepare a species impact statement. However, due to various interpretations of this legislation, the Regulations to the Threatened Species Conservation Act was passed to clarify the savings provisions and exempt the Timbarra Gold Project and other proposals from the need to prepare a species impact statement.

The resulting requirement of the Threatened Species Conservation Act 1995 and amendments to the planning legislation is for the Minister for Mineral Resources to consult with the Minister for the Environment prior to the granting of an approval to carry out an activity. This consultation has occurred and the recommendations made by the Director-General of the National Parks and Wildlife Service have been incorporated in the proposed lease conditions as 'Fauna Special Conditions'.

The Part V chronological process for Mining Lease Application Nos. 4 and 5 Inverell is outlined in **Appendix 1**

In accordance with the provisions of Clause 91 of the Environmental Planning and Assessment Regulation this Assessment Report has been prepared by the Department of Mineral Resources. The conclusions and recommendations of the Department of Mineral Resources, based on its assessment of the proposal, are stated in Chapters 6 and 7 of this report and comprise the Department's advice to the Minister for Mineral Resources for his determination.

2. THE APPLICANT

Capricornia Prospecting Pty Ltd, the Applicant, is a wholly-owned subsidiary company of Ross Mining NL, a significant Queensland-based gold producer with considerable expertise in heap leach technology. Ross Mining NL has been listed on the Australian Stock Exchange since September 1987.

At the time of the EIS submission, Capricornia Prospecting Pty Ltd was a wholly-owned subsidiary of Auralia Resources NL. Acquisition of Auralia Resources NL by Ross Mining NL took place in September 1995.

Since pouring its first gold bar in March 1989, the Company has lifted its gold production at its four Queensland mines to in excess of 70 000 ounces per year. The Company plans to commence gold production at the Solomon Islands' first gold mine in 1997 - 1998 and lift its total gold production to over 150 000 ounces per year.

The Company's first mine developed in Queensland at Belyando was a heap leach operation similar to that proposed at Timbarra. The Company would bring to the Timbarra project experience from that project and its commitment towards responsible environmental management.

3. PROJECT DESCRIPTION AND PROPOSED SAFEGUARDS

3.1 Introduction

The project description has been drawn from the EIS for the project and also reflects the adjustments and refinements that have been incorporated by the Applicant into the project as a result of:

- (i) the issues raised in submissions to the EIS and during consultation regarding the issues; and

- (ii) the operational experience of Ross Mining NL, the new owner of Capricornia Prospecting Pty Ltd.

3.2 Location

The Timbarra Gold Project incorporates two component areas referred to throughout this document as the Project Site and the Pipeline Corridor. The Project Site is located on the upper surface and eastern margin of the Timbarra Plateau, approximately 27 km east-south-east of Tenterfield (Figure 1)

The area is characterised by granite outcrops and slopes which range from 1° to 50°. The granite tors of Bold Top Mountain are the highest topographic features in the area.

Access to the Project Site will be from the Bruxner Highway via two existing unsealed roads. These roads will be upgraded as part of the project development/construction phase in accordance with an agreement between the Applicant and Tenterfield Shire Council (Appendix 2).

The nearest residences are located approximately 3.5 km from the nearest point of the proposed mining activities.

The Project Site lies within the catchment of the Timbarra River, a major tributary of the Clarence River. The Project Site itself incorporates the catchments of four ephemeral creeks which flow to the Timbarra River.

Land uses on and in the area of the Project Site include cattle grazing and forestry, both private and State.

3.3 Land Tenure

The Project Site (EIS Figure 2.1) covers an area of 397.2 ha and incorporates areas of Malara State Forest, Malara State Forest No. 1 and No. 2 Extensions and Crown Land under Perpetual Lease, within the Parishes of Bloxsome and Maclean and the County of Clive. The boundary of the Project Site corresponds to Mining Lease Application Area (MLA) No. 4 (Inverell).

The Pipeline Corridor, a narrow strip of land approximately 6.5 km long and 20 m wide, lies within Malara State Forest No. 1 Extension and freehold land within the Parish of Maclean and County of Clive and freehold land within the Parish of Malara and County of Drake. The Pipeline Corridor is located within MLA 5 (Inverell).

3.4 Mining History

The Project Site and surrounding areas were the subject of mining activities almost continuously from the 1850s through to the 1940s. Early miners used a range of methods depending on the ease of accessing the gold. Initially, alluvial deposits were targeted within the rivers and creeks. However, by the late 1870s the emphasis had changed to sluicing gold from the deeply weathered granites on the plateau itself. These techniques were subsequently supplemented by underground mining and the use of crushing, milling and cyanidation works.

The landscape within the Project Site and surrounds was significantly modified by these early mining activities. Evidence of the former mining activities such as sluicing scars, sections of water races, and domestic sites are present on the Project Site but are considered to be of low archaeological and historical significance.

3.5 Exploration History

Since the cessation of gold mining activities in the early 1940s, numerous companies including Utah Development Corporation Limited, Newmont Pty Ltd and Australian Oil and Gas Minerals Limited have explored the Timbarra Area.

The Applicant's initial exploration programme commenced in 1988. This 2 year programme involved reverse circulation drilling of 46 holes totalling 1 569 m, jackhammer drilling, regional sampling and mapping air photo interpretation, metallurgical testing, multi-element analysis and petrology.

A second programme, undertaken over the 1990 to 1994 period, involved soil sampling and further reverse-circulation drilling.

3.6 The Resource

Based on the Applicant's exploration programme undertaken to date, total gold resources for the Timbarra Gold Project are 14.45 million tonnes (Mt) grading 0.80 g/t gold and containing 373 000 ounces of gold. Of this resource, approximately 50 per cent (7.26 Mt) can be economically extracted by open cut methods and is classified as "reserves".

The reserves are centred upon two discrete deposits within the Project Site referred to as "Poverty Combined" and "Big Hill" (EIS Figure 2.2). The Poverty Combined deposit contains approximately 1.7 Mt of ore grading 0.82 g/t gold and the Big Hill deposit, approximately 5.56 Mt of ore grading 0.95 g/t gold.

Exploration activities have also identified potentially economic gold mineralisation in four areas within the Project Site referred to as "Big Hill South", "CP-1", "Poverty North" and "Poverty Combined Extended". Subject to further exploration, some or all of these potentially economic deposits may also be reclassified as reserves. A further 1.6 Mt of ore grading from 0.7 g/t to 0.87 g/t gold may be mined from these areas. These areas are included in the areas for which approval is sought to mine.

Two low grade deposits, namely "Miserable Swamp" and "Lushes Hill" (Figure 2.2), have also been identified but are excluded from areas for which approval is sought under the Environmental Planning and Assessment Act, 1979.

3.7 Geology

Gold mineralisation in the Timbarra area occurs in "tombstone" adamellite (granite) in association with aplite sills. The granite is devoid of the usual indicative signs of mineralisation such as quartz veining, shearing and sulphides. The low grade mineralisation is generally associated with weakly developed chloritic sericite alteration in the Stanthorpe Adamellite.

Gold has been recorded only in its free form with no sulphide ores present. The ore is benign with no above normal concentrations of metals such as copper (Cu), lead (Pb), zinc (Zn), bismuth (Bi), silver (Ag), molybdenite (Mo) or arsenic (As) and no potential for leachate generation.

Weathering is generally restricted to 5 m with oxidation present to 80 m in association with tight fracture zones.

3.8 Open Cut Mining Methods

The Applicant will employ conventional open cut mining techniques to mine the ore and waste rock from each of the Poverty Combined and Big Hill deposits and any of the potential deposits developed.

All merchantable timber on areas to be disturbed by project activities will be logged prior to the commencement of on site development activities. Clearing of the remaining vegetation and soil stripping will be undertaken progressively in advance of mining. The vegetation and soil materials will either be placed directly on surfaces awaiting rehabilitation, or stockpiled on areas of former, existing or future disturbance, e.g. drill pads, tracks, emplacement surfaces.

Wherever possible, seeds will be collected from felled trees for rehabilitation purposes. Topsoil will be stored to a maximum height of 1.5 m and subsoil to a maximum height of 3m.

Detailed open cut designs, optimisation of pit shells and production schedules were developed by external consultants using appropriate computer models.

The Poverty Combined Open Cut will be irregular in shape with maximum dimensions 300 m x 350 m and a maximum depth of 40 m below the existing surface. Mining will be undertaken in two stages and yield 1.0 Mt ore and 1.7 Mt waste rock (stripping ratio of 0.6:1 (waste rock:ore)). Stage 1 will have a life of 5 months and Stage 2, 7 months.

The Big Hill Open Cut will be oblate elliptical in shape with maximum dimensions 400 m x 250 m and a maximum depth of 130 m below natural ground level. Development of the Big Hill Open Cut will be undertaken in two stages following the completion of Stage 1 of the Poverty Combined Open Cut and yield 5.56 Mt ore and 4.68 Mt waste rock at a stripping ratio of approximately 0.8:1.1 (waste rock:ore). The Big Hill Open Cut has a mine life of 3 years.

Development of the Big Hill Open Cut will necessitate the diversion of Duncans Creek upslope of the open cut. The diversion will have minimal impact on flows downstream of the open cut and minimise flows into the open cut.

Ore will be mined at approximately 2 Mtpa and involve operations up to 24 hours a day, 6 days a week. Ore will be trucked both to the crushing plant and the run of mine (ROM) stockpile. Annual waste rock production will range from 1.1 Mt to 2.0 Mt.

Although up to 10 m of the surface materials may be weathered and amenable to free digging, the irregularity of the extent of weathered material present as a result of prior mining activities and the presence of large floaters will necessitate some blasting from the outset of mining operations. Ore and waste rock will be loaded into dump trucks using a hydraulic excavator.

Within each open cut, ore and waste rock will be removed in successive 5 m slices, with expected 5 m to 16 m wide benches developed at expected vertical intervals of 5 m to 30 m. The overall slopes of the Big Hill Open Cut will range from 40° to 63° to the horizontal and of the Poverty Combined Open Cut from 36° to 75° to the horizontal.

Drainage and water management controls will be employed where required to minimise the potential for erosion and downslope sedimentation.

Development of the project will necessitate the construction of haulroads within each of the open cuts, between the open cuts and their respective waste rock emplacements and between the open cuts and the ROM stockpile and crushing area. The haulroads have been positioned to optimise the amount of cut required and avoid sensitive areas. The design and use of the roads will include safeguards to minimise any fauna barrier effects and the risk to individuals.

3.9 Blasting

Blasting will be used from the outset of mining operations.

The Applicant will ensure adequate control measures are put in place to ensure that:

- the generation of flyrock and dust is minimised;
- ground vibration levels are within acceptable limits;
- noise and air vibration levels are within acceptable limits; and
- the safety of employees, contractors and visitors is not threatened.

These will be achieved through the use of state-of-the-art blasting technology and blast designs.

Blasts will be designed to ensure a minimum possible charge weight of explosive per delay in order to ensure over-blasting does not occur. The average size of blasts in ore

and waste rock will be 8 000 t and 6 000 t respectively and employ a maximum instantaneous charge (MIC) of approximately 70 kg. An MIC of 70 kg will ensure the continued stability of the granite tors on Bold Top Mountain.

Blasting will employ bulk explosives and non-electric initiation. Blasting frequency will typically range from two to five blasts per week. Given the considerable distance to the nearest residences, blasting will satisfy the relevant Environment Protection Authority's (EPA) criteria at the nearest if initiated at any time of day or day of the week.

3.10 Waste Rock Emplacement

Waste rock from Stage 1 of both the Poverty Combined and Big Hill Open Cuts will be trucked to the Poverty Combined and Big Hill Waste Rock Emplacements respectively. The Poverty Combined Waste Rock Emplacement is located immediately north-west of the open cut and will cover an area of approximately 4.7 ha. The Big Hill Waste Rock Emplacement is located to the east of the Big Hill Open Cut and to the east of Duncans Creek and covers an area of approximately 10 ha.

Waste rock from Stage 2 of the Poverty Combined Open Cut will be managed using a combination of in-pit and out-of-pit emplacement whereas all waste rock from Stage 2 of the Big Hill Open Cut will be placed in the worked-out Stage 1 Open Cut area.

Waste rock from any of the potential deposits developed will be disposed of by in-pit placement in available mined-out open cuts.

The two waste rock emplacement sites were selected because of their proximity to their respective open cuts, their accessibility, their comparatively limited potential impacts on flora and fauna, they do not sterilise ore reserves and once rehabilitated, will readily blend with the surrounding landform.

Site preparation for each of the waste rock emplacements will include:

- the construction of drainage diversion and controls such as gabion rock barrier filters and silt fencing. Emphasis is to be placed on off-stream erosion and sediment controls;
- campaign removal of vegetation. Two clearing campaigns will be undertaken during the development of the Poverty Combined Waste Rock Emplacement and four clearing campaigns during the development of the Big Hill Waste Rock Emplacement; and
- stripping of all available topsoil material which can be safely removed. Wherever possible, the topsoil will be placed directly on surfaces awaiting rehabilitation.

The waste rock will be hauled from the respective open cuts by haul truck, tipped onto the prepared area and spread in thin layers using a bulldozer. The emplacements are to be developed from the lower perimeter face and retreat upslope to enable the progressive rehabilitation of batter slopes in maximum 10 m high sections.

With the exception of the upper 40 m of the Big Hill Waste Rock Emplacement which will have a slope of 1:1.7 (30°), all the external batters of the emplacements will be constructed with a maximum batter slope of 1:3 (18°). A 10 m wide intermediate berm will be installed on the downslope edge of the Big Hill Waste Rock Emplacement.

Although the Applicant proposes to initiate progressive rehabilitation of the emplacement surfaces, final rehabilitation of the Big Hill and Poverty Combined Waste Rock Emplacements will not be possible prior to Quarters 2 and 4 of Year 4, respectively.

The concentrations of metals within the Timbarra waste rock are low and consistent with the natural range observed in unmineralised granites across the New England Region of NSW, including stream sediments, and will not pose any risk to the environment.

3.11 Ore Processing and Gold Recovery

Extraction of gold from the ore will use the heap leach method.

Ore from the open cuts will be crushed in a modular crushing plant. The crushed ore will be mixed with cement and polymer to form agglomerates of fine and coarse particles (>6 mm) and the agglomerates stacked on an impervious 1.5 mm thick High Density Polyethylene (HDPE) liner over a prepared heap leach pad foundation. The heaped agglomerates will then be irrigated with a weak (350 ppm) sodium cyanide solution using wobbler sprinklers. Wobbler sprinklers produce a low profile spray with large droplets and minimise the potential for misting and wind drift.

The cyanide solution containing the dissolved gold will be directed by HDPE barriers and drains to HDPE-lined process water ponds. Depending on the gold content, the solution will either be re-irrigated over another section of the heap to dissolve more gold or will be passed to an adsorption/desorption plant where the gold will be recovered from the cyanide solution. Gold recovery will use a combination of adsorption onto activated carbon, desorption from the carbon using caustic soda and electrowinning.

The heap leach pad, covering an area of approximately 29 ha in the north-western corner of the Project Site, has a capacity for 9.1 Mt agglomerated ore if constructed in three 8 m high lifts.

Heap leach pad preparation will involve the removal of the vegetation, topsoil, subsoil and any materials, e.g. peat, which have an inadequate bearing capacity to support the heap. The cleared surface will then be modified through a balance of cut and fill to provide minimum slopes consistent with operational requirements and compacted using a vibrating roller. Geotextile fabric will be laid in any area where the foundation condition is considered to pose a threat to liner integrity or in frequently trafficked areas.

Following foundation preparation, and prior to liner installation, external and internal earthen barriers will be installed to contain all leach solution and to isolate individual leach cells.

The HDPE liner will be delivered to site in rolls and heat welded and tested to ensure a continuous barrier to solution leakage. A layer of low grade ore will be used as an "overliner" to provide protection of the liner against perforation during subsequent ore stacking operations.

Development of the heap leach pad area and liner installation will be undertaken in stages. Completion of liner installation will occur approximately 18 months after commencement of operations.

The heap leach pad, process water ponds and adsorption/desorption plant lie within a closed water management system. The process water ponds and the Storm Pond will have a combined storage capacity, over and above normal operating volumes, of 140 ML which is sufficient to contain all runoff for a 1 in 400 year 72 hour rainfall event. A contingency plan to manage any overflow will be adopted should an event larger than this occur. This will involve pumping the excess water to the Big Hill Open Cut.

The heap leaching activity will incorporate a range of additional safeguards to minimise the potential for pollution, including:

- bunding around all areas to prevent run-on water and to collect and divert any spillages of reagents or process chemicals;
- groundwater monitoring nests and a groundwater interception trench downslope of the heap leach pad; and
- construction of perimeter bunds around the upper leach heap surface to reduce wind velocities and temporary cessation of operations if unacceptable wind drift is observed.

On completion of processing activities, the Applicant will flush the heaps to reduce the cyanide level to less than 0.05 mg/L and detoxify/neutralise all cyanide within the process water ponds.

Ore processing and gold recovery activities will be undertaken 7 days per week, 24 hours per day.

3.12 Water Requirements

Approximately 450 ML of water is required annually for the Project to account for evaporation, agglomeration and saturation losses, and for dust suppression, washdown and domestic purposes. An additional 12.2 to 15.3 ML is required at the commencement of operations to establish a base storage within the process water ponds.

Annual water requirements will be sourced from a combination of the Timbarra River, ground and surface water inflow to the open cuts and surface runoff from the leach pad area, with the contribution from each source varying over the life of the Project. Under average rainfall conditions, water extraction from the Timbarra River will be required in Year 1 (235 ML) and Year 2 (33 ML) only. Only if rainfall conditions are below average will it be necessary to pump from the Timbarra River throughout Years 2 to 4.

In order to ensure maintenance of flows to downstream water users, water extraction from the Timbarra River will only be undertaken when the daily flow within the river exceeds 60 ML. Over the 44 years of record of river discharges at Billyrimba, daily flows have exceeded this level on approximately 90 per cent of days.

A pumping station comprising a generator-powered electrical submersible pump and diesel powered axial turbine pump is to be located adjacent to the Timbarra River to supply river water to the Project. The generator and diesel pump are to be installed in an insulated container or shed to minimise any potential noise impacts.

The water will be pumped 900 m vertically to the Project Site via a 6.5 km long 150 mm diameter pipe positioned within the Pipeline Corridor. Where the Pipeline Corridor follows the Poverty Point Fire Trail the pipe will be positioned on or immediately adjacent to this fire trail. Installation of the pipeline will require negligible earthworks.

3.13 Chemicals/Fuel

Diesel fuel, explosives and a range of chemicals will be used on the Project. The principal chemicals include sodium cyanide, cement, hydrated lime, hydrochloric acid, caustic soda, organic carbon, polymers and antiscalants. All chemicals and fuel are to be handled and stored as directed by the Department of Mineral Resources and the WorkCover Authority.

Prior to the commencement of Project operations, the Applicant is to submit a Final Hazard Analysis to the Department of Urban Affairs and Planning which:

- identifies all hazards associated with the Project;
- analyses the hazards on and off site to people, property and the environment and the likelihood of occurrence;
- quantifies the risks; and
- incorporates a Spill Response Plan. The Spill Response Plan is to be developed in consultation with Tenterfield Shire Local Emergency Management Committee.

3.14 Safety/Security

A range of safeguards has been incorporated into the project design to ensure the safety of the Applicant's and contractor's employees and members of the public or visitors to the mine during and after mining operations cease. Additional specific safeguards have been incorporated into Project design to minimise any potential impact on local fauna (see Section 3.15).

The safeguards include:

- restricting access alterations to the site by relocating and/or closing existing tracks;
- installing manproof fencing around the heap leach pad areas, Process Water and Storm Ponds and the adsorption/desorption and crushing areas. The fencing will also incorporate metal sheeting to exclude small animals from process waters;
- installation of netting over Process Water Ponds and drains;
- creating a rock barrier around the open cuts;
- installation of appropriate signs;
- employee induction, training and safety awareness programmes; and
- compliance with the requirements of Mines Inspection Act, 1901 and Dangerous Goods Act, 1975.

3.15 Water Management

A water management system has been designed which will ensure:

- adequate water for mining, processing and dust suppression requirements;
- water and effluents from mining and ore processing are contained in accordance with statutory requirements;
- site water management and control structures are consistent with rehabilitation objectives and minimise impacts on flora and fauna habitats;
- water draining from the site when mining and processing operations cease is non-polluting.

Detailed plans for water management, erosion and sediment control (WMESCPs) for each component of the Project are to be submitted for approval to the Department of Mineral Resources and Department of Land and Water Conservation prior to the commencement of specific activities. (See Condition No. 87, page 13 of Annexure A).

Clean Water

All runoff from undisturbed areas will be classified as clean water and will flow along existing natural flow and drainage lines or constructed diversions towards the Timbarra River. Diversions will incorporate appropriate treatments such as rock riffles, energy dissipators or rock lining, depending on the gradient and susceptibility to erosion. Culverts and appropriate headworks will be installed where appropriate.

Dirty Water

All runoff from disturbed catchments will be directed by natural drainage lines, or graded or excavated drains to:

- gabion rock filters prior to discharge to natural drainage lines;
- sumps within the area of and/or within the open cuts;
- a sedimentation pond;
- areas of natural vegetation via silt fencing.

Emphasis will be placed upon the use of off-stream sediment controls.

Contaminated Water

All contaminated or potentially contaminated water will be retained within a "closed" system that will have sufficient storage capacity for a 1 in 400 year, 72 hour rainfall event.

Bunds will be constructed around all areas where environmentally hazardous chemicals, e.g. fuels, process chemicals and reagents etc., are stored or used. The bunded areas will incorporate sumps to enable spillage collection and return to process.

Specific design controls will be applied to the construction of the heap leach pad and to containment of leach solution, including:

- pad base preparation and compaction;

- installation of a perimeter and internal containment system; and
- installation of monitoring bores and an interception trench.

All routine maintenance of equipment will be undertaken within the workshop or contractor's area and any spillages will be cleaned up immediately. Water in the workshop area will be passed through an oil trap.

Fuelling of low mobility equipment will take place within the confines of the open cuts.

3.16 Ecology

Development of the project will necessitate the clearing of 80 ha of native vegetation.

The Applicant will implement a range of control measures and safeguards recommended by its consultants in order to avoid or mitigate any potential impacts from the Project. Development of these measures followed detailed flora investigations and one of the most detailed and extensive fauna studies undertaken in NSW.

Safeguards and control measures will include:

- staged clearing of areas to be disturbed and, where practical, the immediate direct transfer of topsoil and biomass for use in rehabilitation;
- specific surveys immediately prior to clearing to ensure individual fauna are not injured;
- clear definition of all areas of surface disturbance prior to site clearing;
- definition and protection of areas of potentially sensitive vegetation;
- a progressive rehabilitation programme which results in re-instatement of native vegetation communities across the existing and proposed areas of disturbance and emulate naturally occurring landforms, substrates and vegetation communities as closely as possible and which minimises the areas of disturbance at any one time;

- only local seed sources will be used for direct seeding in the rehabilitation programme. Where practical, seed supplies will be harvested from areas cleared during clearing operations;
- in times of low seed availability or difficulties with field germination propagation of the local native species will be undertaken. This may include propagation of rare plant species;
- environmental awareness education will be incorporated into general work procedures for all employees;
- a wheel-wash facility on the site access road for all vehicles approaching the Project Site to minimise the risk of introducing weeds and plant diseases on vehicle tyres;
- a weed control programme; and
- bushfire management programme control to ensure that the frequency of bushfires does not increase as a result of the Project's development and the rehabilitation areas are not subject to adverse effects from uncontrolled fires.

Additional specific management procedures will be introduced for each of the Schedule 12 species known to occur on or in the vicinity of the Project.

3.17 Site Access

Access to the Project Site will be from the Bruxner Highway along the unsealed Timbarra Road and Poverty Point Fire Trail.

Upgrading of the Timbarra Road/Poverty Point Fire Trail will be required to enable the safe passage of project-related and private vehicles and will be undertaken under the terms of an agreement between the Applicant and Tenterfield Shire Council. The agreement identifies construction of the road to Council's standards for Local Roads. Council will be responsible to co-ordinate the Part 5 assessment (under the Environmental Planning and Assessment Act, 1979) for the road upgrading.

The Department is in receipt of a copy and is satisfied with the contents of the agreement (see Appendix No. 2).

On finalisation of road design details to Council's requirements, the Applicant will submit a WMESCP to the Department of Land and Water Conservation for assessment.

A flora survey of those sections of the access road requiring clearing is to be undertaken prior to the upgrading of the access road.

Road upgrading works will include:

- (i) pavement sealing adjacent to the two residences fronting onto Timbarra Road to minimise potential dust nuisance; and
- (ii) the upgrading and sealing of the Timbarra Road/Bruxner Highway intersection.

Additional measures to be implemented will include:

- installation of appropriate speed and safety signs along the road and at the intersection with the Bruxner Highway;
- restricting project-related vehicles to 60 kph;
- selective tree planting adjacent to selected sections of the access road;
- use of a bus to transport employees to the Project Site from Tenterfield; and
- installation of fencing to avoid stock/vehicle interaction.

Over the life of the project, maintenance of Timbarra Road and the Poverty Point Fire Trail will be the Applicant's responsibility.

3.18 Rehabilitation and End of Mine Life Strategy

Rehabilitation of areas of disturbance is to be undertaken progressively over the life of the mine, as feasible, in order to maximise the benefits to be obtained from the available soil and biomass resource removed during Project development and to minimise erosion and generation of sediment-laden water.

At the end of mine life, the Applicant proposes to leave the site as a low maintenance, geotechnically stable landform which is amenable to a nature conservation land use and blends with the surrounding landforms and comprises vegetation communities which emulate those naturally occurring on similar landforms and soil types in the area and provides habitats amenable to local fauna.

Open Cuts

At the end of mine life, the Poverty Combined Open Cut will comprise either a shallow water holding depression or a free-draining landform, depending on the extent of in-pit placement of waste rock achievable.

The Big Hill Open Cut will be left as a void which will fill with water over a period of 16 to 20 years. Selective waste rock emplacement will create a range of final water depths and irregular shallows within the former open cut.

Rehabilitation of the benches within the open cut will be undertaken progressively as the open cut is deepened and involve the placement of topsoil and large rocks to provide Brush-tailed Rock Wallaby habitat. The benches will be seeded with locally-occurring shrub and small tree species found on the site with similar aspect and soil.

Minor blasting of former haulroads will be undertaken to create scree slopes, thereby increasing long term fauna accessibility to the water body.

Overflow from the water-filled void will be via an engineer-designed rock-lined drainage channel.

Waste Rock Emplacements

Rehabilitation of the Poverty Combined and Big Hill Waste Rock Emplacements will be undertaken progressively over the life of emplacement development and will involve the creation of an irregular topsoiled surface with exposed rocks, logs and other biomass which will provide areas of micro-relief suitable for the establishment of native vegetation and the provision of faunal habitat. Drainage of the upper surfaces will be directed away from batter surfaces.

The soils and biomass used on each of the emplacements, and on specific areas of each emplacement will be determined on the basis of locally occurring vegetation, aspect, elevation and moisture regime.

Spent Ore Heaps

On completion of leaching, the spent ore heaps will be flushed to remove the remaining cyanide and the heap sides reduced to a maximum slope of 18°. A 1 m high bank will be installed around the perimeter of the upper surface to collect surface flow and prevent discharges over final batter faces.

Following drainage installation, soil (subsoil and/or topsoil) and biomass will be spread over the surface and seeded with species from suitable vegetation communities.

The necessity for subsoil replacement on the spent ore in addition to topsoil will be determined by field trials to be established within 6 months of the commencement of Project operations. Pot trials will be undertaken to determine the pH sensitivity of locally occurring species and their ability to successfully establish on neutral to mildly alkaline soils, and the necessity for ameliorative treatments.

Plant and Equipment

Rehabilitation strategies to be employed over the remaining areas of disturbance include:

- removal of buildings and equipment;

- removal and/or burial of concrete foundations;
- ripping the process water pond liners and backfilling, contouring and revegetating;
- ripping, contouring, topsoiling and seeding hardstand areas and roads; and
- installation of drainage controls.

The management procedures to be applied to Storm Pond, Storage Dam and Sediment Dam are to be detailed in a Decommissioning Plan prior to the cessation of activities on the Project Site.

4. REVIEW OF SUBMISSIONS

Submissions Received from Statutory Authorities and Concerned Parties

A total of 66 submissions were received from:

- Government Authorities;
- Community Interest Groups; and
- Individuals.

Of the 66 submissions received 36 represented identical submissions based on a petition format (containing approximately 185 signatures) and, for the sake of submission overview, have been grouped under the Community Interest Groups as 'Drake/Tabulam District Residents'.

The Department of Mineral Resources sought the response of the Applicant to each of the issues raised. In responding to issues, the Applicant grouped their response into ten separate sections. **Table 4. A** lists the author of the submissions and the issues raised in each respective submission.

This section incorporates the response of the Applicant as provided by the Applicant. The Applicant's responses have been examined by technical officers of the Department of Mineral Resources and considered to accurately cover all issues raised and support the response given.

SUBMISSIONS	SECTION 8 : SOCIAL AND ECONOMIC ASPECTS							SECTION 9 : REHABILITATION					SECTION 10 : CONSULTATION	
	8.1	8.2	8.3	8.4	8.5	8.6	8.7	9.1	9.2	9.3	9.4	9.5	10.1	10.2
Blackford, B.S. and Cockburn, K.														
Bleakley, Judy														
Chaplin, H.M., Volein, A.M. and Smith, G.W.														
Clarence Catchment Management Committee								•						
Clarence Environment Centre			•			•	•	•			•		•	•
Combe, Michael	•				•								•	•
DLaWC (Soil Conservation Service)									•	•	•	•		
DLaWC (Water Resources)														
Drake Environment Association													•	•
Drake/Tabulam District Residents			•			•	•	•	•			•	•	•
Elworthy, Peter							•	•	•					
Environment Protection Authority									•					
Forest Protection Society Limited	•							•						
Heinz, Marilyn								•						
Johnston, Janelle			•			•		•					•	•
Jubullum Local Aboriginal Land Council														
Mitchelson, E.			•										•	
North Coast Environment Council Inc.														
NSW Aboriginal Land Council													•	•
NSW ALC (Moombahlene LALC)														
NSW National Parks and Wildlife Service									•					
National Parks Association of NSW							•	•						
North-East Forest Alliance							•	•	•	•	•		•	
O'Rourke, D. and B.K.														
Predo, Linda														
Richmond/Clarence Greens			•										•	
Stanford, Adam and Peter and Watt, Brian	•							•					•	
State Forests Northern Region			•						•			•		
Tenterfield Shire Council														
The Big Scrub Environment Centre Inc.								•		•			•	•
U.C.A.R.E. Tabulam Inc.								•						

4.1 ARCHAEOLOGY

PRE-EUROPEAN ARCHAEOLOGY

4.1.1 Issue : Access to Aborigines

The principal concerns expressed relate to the availability of Aboriginal access to Bold Top Mountain and adequate consideration of the concerns of Aboriginal groups and individuals.

The Applicant supports the concept of continued access to the summit of Bold Top Mountain by the local Aboriginal Community. However, given the Applicant's responsibilities for the safety of the public as well as its workforce under the requirements of the Mines Inspection Act, 1901 (as amended), it is considered appropriate that such access be "controlled" during the life of the project. Controlled access would necessarily involve a system of prior notification of an intended visit to ensure arrangements can be made for a Company representative to accompany the visitors through project operations, to ensure their safety, and if necessary, to allow the Applicant to re-schedule any operations that might pose a potential safety hazard.

Long term access would not be interrupted.

4.1.2 Issue : Bold Top Mountain Buffer Zone Dimensions

The concerns identified relate to the vulnerability of the potential Aboriginal Place on the summit of Bold Top Mountain, impacts from blasting and the need for a substantial buffer zone.

The Applicant fully supports the need for a buffer zone around the summit of Bold Top Mountain. A conservative approach to assessing the radius of such a buffer was adopted in the EIS Section 4.10 (Pages 212 and 213). Such an approach determined a buffer of 200 m would be appropriate, that is, based principally upon project ground

vibration levels. This distance meets the "initial" requirements established in discussions with Sam Daley, Eric Walker and Dallas Donnelly (although never officially ratified by Aboriginal representative Eric Walker) and meets the archaeological requirements for adequate protection of the site. It is not proposed to fence the buffer zone around the summit of Bold Top Mountain. However, defined marker points would be erected or created at intervals of approximately 50 m to clearly identify the boundary of the buffer zone. The boundary of the buffer zone would be surveyed by a registered surveyor and a copy of the plan lodged with the Department of Mineral Resources.

It is noted that the Applicant expects the blasting-related impacts to be contained in a shorter distance less than 200 m.

4.1.3 Issue : Disruption and Damage to Several Sites on and near the Mine

Concerns raised include the impact of the mine on the Aboriginal sites and impact on the Aboriginal community, and feared damage and disruption to the sites.

The summit of Bold Top Mountain would be protected from physical disturbance or damage by the buffer zone identified within the EIS Section 4.10. All other sites identified in the submissions to the EIS are outside the boundaries of MLA 4 and MLA 5.

4.1.4 Issue : Establishing the Cultural Significance of Aboriginal Sites in the Vicinity of Bold Top Mountain

This issue relates to a request for a further more comprehensive study to determine the significance of the Aboriginal sites in terms of Aboriginal history, and to assist in establishing the buffer zone around the summit of Bold Top Mountain.

The Applicant accepts the summit of Bold Top Mountain has cultural significance to the Aboriginal Community. They endeavoured through open discussions at Tabulam and Drake with representatives of the Jubullum Aboriginal Community to discuss an

appropriate buffer zone acceptable to both parties. No agreement was reached given the insistence of the Aboriginal Community of a 5 mile buffer zone that would effectively prevent the entire project from proceeding.

4.1.5 Issue : Lack of Scientific Credibility

A lack of scientific credibility in Appleton and Burke (1995) is suggested and that the archaeological investigations were not sufficiently comprehensive.

There is no reasonable basis given for these comments. It should be noted that National Parks and Wildlife Service are the Authority empowered to judge the credibility of a report. They have not identified a lack of scientific credibility in the work undertaken by Appleton and Burke.

4.1.6 Issue : Insufficient Regard for Archaeological Significance

Concerns relating to insufficient regard for archaeological significance of Bold Top Mountain and the pipeline corridor were raised.

The buffer zone and identification of the summit of Bold Top Mountain as a potential Aboriginal Place requiring protection is considered to be sufficient regard to the archaeological significance of the mountain. The summit of Bold Top Mountain would be protected by the buffer zone (See 1.1.2) and all other identified sites are outside the boundaries of the Mining Lease Applications lodged by the Applicant.

4.1.7 Issue : Portion 57

Issues raised include the need for further study to assess the significance of Portion 57 to the Aboriginal people, and land tenure.

The boundaries of Portion 57 are an artifact of white man's land divisions and do not relate to Aboriginal boundaries. Should the engraving sites within the northern section of Portion 57 be likely to be the subject of a Land Claim, the Applicant would propose

that the boundaries of Portion 57 be re-defined to include the sensitive area but exclude the non-sensitive area comprising the southern half of the portion. It is also noteworthy that:

- (i) Collins (1991) found no sites within the area of MLA 4, including that Portion of MLA 4 within Portion 57; and
- (ii) Bold Top Mountain does not lie within Portion 57.

4.1.8 Issue : Native Title

The concerns relate to the lack of tenure history given in the EIS and the suggestion that Native Title has not been extinguished in the area of the mine site.

The statements pertaining to Native Title being extinguished that were presented within the EIS Section 3.12.4 were based on advice from Hopgood and Ganum, Solicitors for the Applicant. The Department of Mineral Resources has examined the submission presented and is satisfied that Native Title has been extinguished through the grant of pastoral leases and freehold title detailed in the submission.

POST EUROPEAN

4.1.9 Issue : Historical Significance of Poverty Point

This issue relates to the suggestions that the scientific, archaeological and public/cultural significance of the old mine workings at Poverty Point has been understated, the sites be photographed, properly documented and the fire places be relocated to a historical museum. Visitation to the area was also raised.

The history of Poverty Point is of interest to a range of people to varying degrees. These interests range from fossicking for bottles and other artifacts, to appreciating the achievements of the miners in handworking the granite, in constructing races, flumes

and dams, and in the endurance of the miners over many years in coping with the rugged environment.

The miners' stories, in so far as they can be recalled, are related in Isabel Wilkinson's book, "Forgotten Country", and the remains of their technical achievements are now recorded in text and photographs in the historical section of Appleton and Burke (1995). However, the flumes are gone, the races significantly eroded, the tunnels collapsed or unsafe, and any artifactual remains that might have once been present have been scavenged. The features now remaining at Poverty Point comprise a series of predominantly unstable worked surfaces, piles of rubble from retaining walls and earth dams, broken glass left by the scavengers, rusting corrugated iron-sheeting, and the litter left by post-mining period visitors. The former Poverty Point Mine is actively eroding and degrading as a spectacle, and its condition precludes any consideration that it might be preserved, or made safe for the public as a "gazetted" public recreation area.

The Applicant's extensive knowledge of the Project Site gained throughout the exploration programmes conducted suggest that other known tunnels lie outside the Mining Lease Applications.

A fireplace (chimney base and hearth) has little significance out of its context and is of very limited interest. At Poverty Point, the collectors have left nothing but brick fireplaces typical of any of the early 1900's. To remove and reconstruct such a feature would take many hours and the agreement of a museum to giving up floor space to an edifice of little meaning or significance.

Finally, it should be noted that while every archaeological site can be said to be unique to its location, it cannot be argued that the mine is a unique example of a Tablelands gold mine. Other former gold mines exist throughout the tablelands, of which some are preserved through their occurrence in National Parks, and others, remain protected by their relative inaccessibility.

The submission that there should be a regional and large scale thematic study is not a practical one and would entail something in the order of a three year study such as might be considered for a doctorate thesis.

Based on the results of investigations and the assessment of significance undertaken in accordance with the guidelines identified by Kerr 1985 and published by the National Trust of Australia, NSW, Appleton and Burke (1995) consider that the old mine workings at Poverty Point are not of sufficient significance to warrant their preservation.

4.2 HYDROGEOLOGY

4.2.1 Issue : Potential Contamination of Groundwater by Cyanide

The principal issues raised include potential groundwater infiltration if the liner under the ore heaps splits; leaching of cyanide into Timbarra River and tributaries and wetland near the heap leach pad, and groundwater contamination by fuel or cyanide spills.

Hydraulic testing conducted by Coffey Partners International Pty Ltd (1994) indicated that the permeability of soils and the bulk rockmass is low. Test pumping showed that the yields of bores are poor (pumping rates during testing were generally less than 1 L/s, and often less than 0.5 L/s), that the fractured rock has low permeability and that fracture systems (zones) are poorly interconnected.

Surveying of groundwater levels in 88 exploration bores throughout the area showed that groundwater gradients are steep (particularly in the Big Hill area), thereby providing further evidence that bulk rockmass (aquifer) permeability is low.

Given the low permeability of materials (soils and rocks) at the site, the potential for transport of cyanide in the groundwater from mining and ore processing operations is also considered to be low.

Provided containment systems for the heap leach pad and process water ponds are properly designed, constructed, monitored and maintained, the potential for cyanide pollution of groundwater would be minimal. Accordingly, a groundwater interception trench is proposed downgradient of the north-western boundary heap leach pad and liquor storage ponds as shown in Figure 10.15 by Water Studies Pty Limited and Coffey Partners International Pty Ltd (1995).

4.2.2 Issue : Integrity of Containment Systems

The principal issues relate to the integrity of the HDPE liner for the life of the project and beyond, the effects of groundwater and ground "shift"/subsidence under weight of the heaped ore and the effect of white ants on the liner.

The leakage (if any) that may occur through High Density Polyethylene (HDPE) liners and foundations cannot be readily quantified and is a function of the:

- design of containment systems (liners and sub-grade);
- preparation of the sub-grade;
- care in installation of the HDPE liner and welding of the liner; and
- care in placement of ore on the heap leach pad.

Engineered systems to control leachates and groundwater movement using HDPE liners are used frequently in the mining and waste management industries. HDPE liners are used in the lining of landfills, artificial ponds and lagoons, tank farms and tank liners, sewerage lagoons, evaporation ponds and heap leach pads, and, if properly designed and constructed, are very effective in the containment of contaminated water. HDPE has also been used as part of engineered grout curtains to control the movement of groundwater in many civil construction projects.

Section 2.6.4.2, 2.6.4.3 and 4.2.4 (Pages 173 and 174) of the EIS identify a range of industry accepted procedures which would be adopted on the Project prior to, during and after heap leach pad liner installation in order to minimise the potential for liner damage and the loss of leachates.

With respect to the issue of the integrity of containment systems, it should be remembered that it is in the Applicant's own interests to:

- design and construct for no leakage;
- closely monitor containment systems for leakage;
- have contingency measures in place to cater for leakage; and
- respond rapidly with remedial measures in the event of leakages,

as leakage has a significant and serious impact on gold production. Details of the contingency and remedial measures would be detailed in the procedures manuals developed on site. The containment systems, monitoring, contingency and remedial measures for contaminated or potentially contaminated water to be employed on the project, and identified in Section 4.2.4 (Pages 173 and 174) of the EIS, have been designed by Lycopodium Pty Limited and Coffey Partners International Pty Ltd, companies experienced in the design of heap leach operations and monitoring systems for groundwater pollution.

HDPE liners of 1.5 mm thickness are also proposed for the lining of the process water ponds i.e. pregnant liquor storage (PLS), the intermediate liquor storage (ILS) and the barren liquor storage (BLS) ponds. These process water ponds would also have a geotextile membrane beneath the HDPE liner. A HDPE liner of 1.0 mm thickness is proposed for the Storm Pond.

Termites can eat through plastic, however, this invariably occurs only in order to reach a substantial source of their staple food, i.e. cellulose. As there would be no cellulose within the ore heap, no impact on the HDPE liner would be expected. There are no known examples of such an occurrence in industry.

The liner itself is constructed of HDPE, does not have a cellulose component and would therefore not be a source of food in itself.

without risk of rupture and become a secondary impedance separating the leachate from the environment, all organic and loose colluvium be removed from the watercourse areas to expose residual soils or rock, and that excavated areas be backfilled with engineered fill. Over the remaining areas, it was recommended that the site be proof rolled by a vibrating roller of a minimum static weight of 12 tonnes, and any soft spots excavated and replaced with engineered fill.

Limited permeability testing was undertaken on reworked soil samples to simulate the permeability of the leach pad and process water ponds following preparation and prior to liner installation. The measured permeabilities of the three samples tested range from 1.5×10^{-6} cm/sec to 1.7×10^{-7} cm/sec when compacted to 98 per cent MDD (standard) at optimum moisture content and are considered to be in the low to very low range. For comparison purposes, permeabilities of a range of naturally occurring materials are presented in Table 4.1.

The Applicant would undertake the necessary testing, with independent certification, to ensure the heap leach pad is constructed in accordance with the required specifications.

TABLE 4.1
Permeability (cm/sec)

1×10^1	1×10^0	1×10^{-1}	1×10^{-2}	1×10^{-3}	1×10^{-4}	1×10^{-5}	1×10^{-6}	1×10^{-7}	1×10^{-8}
Very High		High		Moderate			Low *		Very Low
Representative Materials									
Clean gravel		Clean sand and sand and gravel		Fine sand		Silt, clay and mixtures of sand, silt and clay		Massive Clay	
Vesicular and scoriaceous basalt and cavernous limestone and dolomite			Clean sandstone and fractured igneous and metamorphic rocks		Laminated sandstone shale, mudstone			Massive igneous and metamorphic rocks	
* Timbarra laboratory permeability									

In conclusion, it has been assessed that the concerns regarding foundation bearing capacity and liner integrity are unfounded.

4.2.4 Issue : Adequacy of Groundwater Controls (Interception Trench)

This issue considers the adequacy of the groundwater interception trench downslope of the heap leach pad, especially during extreme rainfall.

The groundwater interception trench comprises a trench dug into the weathered granite with the base of the trench sloping to a collector sump. Agricultural pipes would be placed in the base of the trench, and the trench backfilled to within 1 m of the surface with filter gravel. The remainder of the trench would then be backfilled with low permeability soil. Groundwater would be directed via the filter gravel and agricultural pipe to the sump, from where it would then be pumped as required. Because the trench is completely backfilled, its operation is unaffected by surface water from extreme rainfall events.

Leakage (if any) from the heap leach pad and process water ponds would migrate with the groundwater from these areas, downgradient to the north-west. Any contaminated groundwater would then be picked up in the groundwater interception trench and pumped from the collector sump for return to the process water ponds and re-use in the heap leach process. Routine monitoring of groundwater pumped from the sump for cyanide levels would be implemented as recommended by Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) and would form part of the Applicant's groundwater quality monitoring programme.

The procedures to be employed in the event of any evidence of cyanide contamination within the groundwater interception trench are also identified within the EIS Section 4.2.4 (page 174). Such procedures are routinely applied by the heap leach industry throughout Australia and overseas.

4.2.5 Issue : Seepage from Big Hill Open Cut

This issue relates to the potential seepage of contaminated water into the groundwater system from the Big Hill Open Cut through fractures in the granite bedrock.

The contingency plan for storage of cyanide-containing water in the event that the identified storm storage capacity within the ILS, PLS, BLS and Storm Pond system is exceeded is considered to be an environmentally sound option given:

- (i) hydraulic testing has shown the permeability of the rock mass in the area of the Big Hill Open Cut is low and fracture zones in the rock mass appear to be poorly connected;
- (ii) the Big Hill Open Cut would have a significant capacity for storage over and above storm inflows from its own catchment. Even if used for contingency storage, the regional groundwater table would still be elevated with respect to the water level in the open cut and consequently, the predominant groundwater movement would likely be towards the open cut rather than away from it. Hence, any cyanide-containing water would essentially remain captive to the open cut excavation and would be likely to have a minimal (if discernible) impact on the groundwater regime; and
- (iii) the water directed to the Big Hill Open Cut would only remain in the open cut for a comparatively short period as it would be preferentially used in the ongoing processing of the ore and gold recovery.

Notwithstanding the validity of the proposal as identified in the EIS, the Applicant is cognisant of the concerns expressed in the submissions and the operational implications of directing additional water into an active mining area. As a consequence, the Applicant would increase the total storm storage capacity within the ILS, BLS, PLS and Storm Ponds by approximately 25 ML to 140 ML, that is, a capacity sufficient to

contain a volume of water generated in a 1 in 400 year, 72 hour storm event. See also Issue 3.2.

4.2.6 Issue : Adequacy of Groundwater Monitoring Systems

This issue principally relates to the adequacy of groundwater monitoring systems to detect leaks in the leach pad liner and from other related mining activities.

The groundwater monitoring system as identified within the EIS and Water Studies Pty Ltd and Coffey Partners International Pty Limited (1995) has three major components:

- selected open mineral exploration holes within which groundwater levels are to be monitored on a monthly basis;
- the groundwater interception trench which would be pumped as required, and from which pumped volumes would be recorded and routine weekly analysis of groundwater samples for cyanide levels would be undertaken; and
- a network of “nested” monitoring bores located in the vicinity of and downgradient from the process water ponds and heap leach pad. Each monitoring bore “nest” would comprise three piezometers, the shallowest slotted at the water table around the colluvium/residual soil boundary, one in the weathered granite and the third slotted in the more competent granite at depth. Routine analysis of cyanide levels would be undertaken on groundwater samples from each monitoring bore “nest”.

It is noted that the frequency of monitoring in both the groundwater interception trench and “nested” monitoring bores would be regularly reviewed in conjunction with the Environment Protection Authority and the Department of Mineral Resources to ensure the accumulated results are meaningful.

The monitoring system detailed above is considered more than adequate to monitor the impact of mining operations on groundwater levels and groundwater quality, and provide adequate early warning of any failure of the proposed containment systems.

The differences between the number and location of “nested” monitoring bores as identified in EIS Figure 4.1 and Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) Figure 10.15 is a result of a minor drafting error in EIS preparation. However, in both instances, the number and locations are indicative only with the ultimate number and positioning of the bores to be subject to ratification by the Department of Land and Water Conservation.

4.3 HYDROLOGY, EROSION AND SEDIMENT CONTROL

4.3.1 Issue : Storm and Rainfall Data

This issue relates to the possible inadequacy of the EIS in addressing all available climatic data, the use of Tenterfield data which is not relevant to Timbarra, under-estimation of the potential for cyclonic and extreme precipitation events and lack of information on timing, frequency, duration and size of storm/flood events.

Rainfall is currently measured at three locations within 30 km of the Project Site. The sites at Tenterfield and Drake are registered recording stations with the Bureau of Meteorology whilst the records kept at “Timbarra” Homestead are kept privately. Another station located at Girard State Forest, approximately 25 km north of the Project Site and a similar distance east of Tenterfield, ceased operation in 1968. Table 4.2 shows the periods of record at these stations and the distance from the Project Site.

Of the rainfall stations listed on Table 4.2 the “Timbarra” homestead is the closest station to the Project Site and is considered to best represent the local rainfall at the Project Site. Unfortunately, the length of record at the “Timbarra” homestead (7 years) is insufficient for long term simulation of surface runoff behaviour on the Project Site. Thus, for the purposes of the water management investigations for the project, rainfalls from a nearby station with a sufficiently long record had to be transposed and adjusted to represent long term rainfall behaviour at the Project Site. These adjustments were made according to the monthly ratios of rainfall between the two stations, as explained in Sections 3.3 (page 8) and A2 (page 70) of report prepared by Water Studies Pty Ltd

and Coffey Partners International Pty Ltd (1995). This document was referenced in the EIS and placed on exhibition with the EIS.

TABLE 4.2

Locations and Periods of Record of Rainfall Stations
Within 30 km of the Project Site

Station Name	Station Number	Period of Record	Distance from Project Site (km)	Direction from Project Site
Tenterfield	056 032	1871-Present (124 years)	27	West-north-west
Drake	057 005	1891-Present (104 years)	24	North
Timbarra Homestead	Private	1987-Present (7 years)	14	North-west
Girard State Forest	057 009	1934-1968 (34 years)	25	North

Only the rainfall data at Tenterfield and Drake were considered for this transposition. Girard State Forest data was not considered suitable for two reasons:

- (i) the period of record at Girard (34 years) was too short for transposition; and
- (ii) there was no common period of record with the "Timbarra" homestead.

The average annual rainfall at the "Timbarra" homestead is 1 069 mm for its 7 years of data. Table 4.3 shows a comparison of average monthly rainfalls and the ratio of average monthly rainfalls between Tenterfield, Drake and the "Timbarra" homestead for the common 7 year period of records.

TABLE 4.3

Comparison of Rainfalls at Tenterfield, Drake, Girard State Forest and the "Timbarra" Homestead - 1987-1993

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tenterfield Average Monthly Rainfall (mm)	123.9	84.3	68.4	95.4	61.3	33.1	50.8	42.0	41.9	66.0	69.2	124.0	876.2
Drake Average Monthly Rainfall (mm)	166.8	159.5	135.2	200.9	85.7	45.5	62.2	42.7	18.4	47.9	86.2	161.7	1306.9
Timbarra Homestead Average Monthly Rainfall (mm)	141.3	117.1	123.1	154.1	79.4	52.3	55.8	32.9	26.0	50.4	72.0	144.6	1069.4
Girard State Forest Average Monthly Rainfall (mm)	285.6	211.2	209.7	91.6	73.5	96.5	84.7	52.6	52.4	94.1	97.6	162.2	1425.2
Ratio of Timbarra Homestead and Tenterfield Monthly Rainfalls	1.14	1.39	1.80	1.62	1.29	1.58	1.11	0.78	0.62	0.76	1.04	1.17	1.22
Ratio of Timbarra Homestead and Drake Monthly Rainfalls	0.85	0.73	0.91	0.77	0.83	1.15	0.90	0.78	1.41	1.05	0.84	0.89	0.82

Based on data given in Table 4.3 for the 1987-1993 period, it is apparent that annual rainfall on the Project Site is distinctly higher than at Tenterfield and is distinctly lower than at Drake and at Girard State Forest. Using the monthly rainfall ratio between the "Timbarra" homestead and Tenterfield and the "Timbarra" homestead and Drake as shown in Table 4.3, the long term average rainfall on the Project Site is estimated at 1021 mm if based on Tenterfield data and 960 mm if based on Drake data. To be conservative, Tenterfield data was used as the basis for all comparative analyses

undertaken for the EIS. It is also noted that there is an acceptable correlation between monthly rainfalls at Tenterfield and the "Timbarra" homestead ($R^2 = 0.72$, where R^2 = coefficient of determination, i.e. the proportion of observed variance).

On the basis of the information presented in **Table 4.3** and discussed above, Water Studies Pty Ltd consider that they have made best use of available information on rainfalls in the study area by placing more significance and reliance on data collected at the "Timbarra" homestead than that available from the alternative stations.

All surface water analyses, including rainfall-runoff behaviour of the Project Site catchments and behavioural analyses of the Project Site storages have been undertaken using a 100 year sequence of historical daily rainfall data for the Project Site. The data used would therefore include a range of wet as well as dry years, and would also incorporate any cyclonic type event that would have occurred in the area during the last 100 years. Thus, the sequence of data used would have incorporated the full range of potential rainfall conditions for the study area.

With regard to information on storm events of varying frequency and duration, the information that was deemed necessary for the analyses undertaken is presented in Section 6.2 (page 23) of Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995).

It is accepted that it would have been useful had the Applicant collected rainfall and climatic data at the Project Site once the exploration programme commenced. However, it should be noted that data collected at the site would still have been too short for long term surface water analyses and Water Studies Pty Ltd would have had to adopt the same methodology as for the "Timbarra" homestead data. In addition, it is unlikely that a few years data from the Project Site would have resulted in significantly different findings to those reported in the EIS.

4.3.2 Issue : Size of the Storm Pond and Contingency Plan to Handle Potential Discharges

This issue relates principally to the adequacy of the Storm Pond and contingency plan to cope with discharges; that the pond should have been designed for greater than a 1:100 year storm; impacts of a discharge, inter-connection of process water ponds to the Storm Pond, and lack of detail on pumping excess water to the Big Hill Open Cut.

The potential for discharge from the process water ponds and the Storm Pond, although highly unlikely, is an issue that is of considerable concern to the community and this concern is acknowledged.

The design and performance of these ponds and the contingency plan in the unlikely event of a discharge are addressed in Section 4.2.5.2 of the EIS and Section 6 of Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995). The following discussion refers to the descriptions provided in these two reports.

It should be noted that full development of the heap leach pad would not be achieved until after 18 months of mining operations. However, the excess storage over and above normal operating volumes with the process water ponds and the Storm Pond was designed to have a capacity equivalent to the surface runoff volume generated from a fully developed heap leach pad during a 1 in 100 year 72 hour storm event (i.e. 115 ML), which is the accepted design standard for such ponds. A 1 in 100 year, 72 hour storm event is the maximum 72 hour rainfall that is likely to occur in any one 100 year period. The capacity required to cater for 1 in 100 year 72 hour storm event during Stage 1a and 1b as identified in EIS Figure 2.6 (i.e. at least the first 18 months of the mining operations) would be considerably less than 115 ML.

For the ponds to discharge, a prolonged wet period that generates a cumulative nett surface inflow volume greater than the surface runoff volume generated during a 1 in

100 year 72 hour storm would have to occur. To assess this, a daily simulation of the storage behaviour in the Process Water and Storm Ponds over a 100 year period of historical rainfall was undertaken. This simulation of the storage behaviour in the Process Water and Storm Ponds over a 100 year period showed that the ponds would not discharge when the heap leach pad was not fully developed. The probability of exceeding the 115 ML storm storage capacity in one of the two years before full development of the heap leach pad is therefore insignificant.

Under fully developed conditions, the probability of exceeding the 115 ML storm storage capacity in any one year, i.e. the likelihood of having a prolonged wet period which generates in excess of 115 ML nett inflow, was found to be negligible. Considering that the heap leach pad would operate under fully developed conditions for only about 2 years, this was assessed as an acceptable risk particularly since an adequate contingency plan would be in place to handle an unlikely overflow event.

As described in both the EIS Section 4.2.5.2 and Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) Section 6.07, any discharges from the process water ponds and Storm Pond system would contain residual cyanide levels that are higher than acceptable for release into natural waterways. Although a subsequent critical review of likely cyanide levels in any discharge from the Storm Pond has indicated that the concentration would be in the order of 3 mg/L Sodium Cyanide (NaCN), it is still considered unacceptable to direct any cyanide-bearing discharge into the wetland area downstream. Accordingly, a contingency plan was designed to provide an alternative containment mechanism.

Under the contingency plan identified in the EIS, in the highly unlikely circumstance of a potential discharge event developing, water would be pumped from the Process Water/Storm Pond system to the Big Hill Open Cut. By the time the heap leach pad is fully developed (i.e. after 18 months of mining operations), the Big Hill Open Cut would have a storage capacity of approximately 650 ML which would be well in

excess of the volume required to handle surface runoff from its own catchment, together with any surplus water pumped from the Process Water/Storm Pond.

Although Water Studies Pty Ltd consider that the storm storage capacity has been sized adequately and adequate contingency plans have been put in place to handle an unlikely overflow event, in view of the considerable community concern, the Applicant proposes to increase the storm storage capacity from 115 ML to 140 ML, i.e. an increase of 25 ML. This increase is greater than the 22.5 ML maximum predicted volume that would need to be discharged from the largest rainfall event over the 100 year period of simulation. In addition, such an increase would provide the process water ponds and Storm Pond system with a design capacity to cater for 1 in 400 year, 72 hour storm event and reduce the probability of spill in any one year from the fully developed heap leach pad to significantly less than 1 per cent.

4.3.3 Issue : Contingency Pipeline Route

This issue relates to the lack of detail presented in the EIS on the infrastructure and operation of the pipeline to Big Hill Open Cut which is required as part of the storm water contingency plan.

The pumping of cyanide-contaminated water to the Big Hill Open Cut in the event that contingency plan implementation is required would utilize the water supply line to be installed between the Big Hill Open Cut and the adsorption/desorption plant area. This water supply line would be installed once mining in the Big Hill Open Cut was sufficiently advanced to require accumulated surface runoff to be pumped out. Water from the Big Hill Open Cut would be used preferentially before water pumped from the Timbarra River.

Prior to contingency pumping commencing, the Mine Manager would personally close and tag all appropriate valves to prevent the water being directed towards the Poverty Combined Open Cut, the Storage Pond or the Timbarra River.

4.3.4 Issue : Extraction of Water from Timbarra River for Mine Site Use

The issue relates to the reduced flow and water quality in the Timbarra River, impacts on downstream users and aquatic life, that no minimum flow levels have been set for cessation of pumping or maintenance of environmental/riparian flows and that there has been no consideration of drought conditions and current low flows.

The heap leach process make-up water requirements identified in the EIS Section 2.9.4.1 and Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) Section 4.07 reflected the absolute maximum off-take situation, and as such were highly conservative. In the response to the various submissions received, process make-up water requirements were critically re-evaluated in terms of laboratory tests on the ore, the Applicant's operational experience and information from other mine sites, and a critical appraisal of evaporation losses from spray irrigation systems.

The heap leach process make-up water demand is made up of water for evaporation losses and agglomeration, and saturation uptake during leaching. Table 4.4 identifies the percentage loss rates identified in Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) and the revised rates after critical review. Table 4.4 shows that the average annual demand for heap leach process make-up water is 370 ML/year or approximately 50 per cent of the original "worst-case" estimate of 706 ML/year.

TABLE 4.4

Original and Revised Estimates, Heap Leach Make-Up Water Demands -
Timbarra Gold Project

Loss	Original Report ^a		Revised ^b	
	%	ML/Year	%	ML/Year
Average Annual Evaporation Loss (Application Rate : 6 L/hr/m ² over 5.08 ha)	10	445	8	210
Agglomeration	6	121	4	80
Saturation	7	140	4	80
TOTAL:		706		370 ^c
<p>^a Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995)</p> <p>^b Based on a critical review of laboratory data, data from other mine sites and the performance and losses of spray irrigation systems</p> <p>^c Maximum likely requirement</p>				

Table 4.5 shows the revised average annual total make-up water demand for the project to be 450 ML/year or 14.3 L/s, compared with the initial "worst-case" estimate of 780 ML or 25 L/s.

On the basis of the revised average annual make-up water demand, under average annual conditions water from the Timbarra River would only be required in Year 1 (235 ML) and Year 2 (33 ML) of project operations, with the make-up water requirements over the remaining life of the project derived from a combination of sources including the process water ponds and surface runoff and groundwater inflows into the open cuts.

In Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995), the number of days of pumping from Timbarra River at a rate of 2.5 ML/day ranged from 200 in

Year 1 (498 ML) to 36 in Year 4 (92 ML). However, based on the revised make-up water requirements, and assuming average conditions, the number of days of pumping from the Timbarra River (at a rate of 2.5 ML/day) would be 94 days in Year 1 and 13 days in Year 2. Should Year 1 and Year 2 of project operations be wetter or drier than average, these requirements may, however, decrease or increase accordingly. Similarly, should drier than average conditions be encountered for extended periods in subsequent years, there may also be a requirement to pump from the Timbarra River in Years 3 and 4.

TABLE 4.5
Average Annual Make-up Water Demand -
Timbarra Gold Project

Use	ML/Year
Heap Leach Process	370
Haul Road Dust Suppression	51
Crushing Area Dust Suppression and Plan Wash Down	16
Domestic Use	6
Net Losses, PLS, ILS, BLS Ponds	4
TOTAL:	Say 450

Table 4.6 shows the minimum monthly flows in the Timbarra River over a 44 year (November 1951 to May 1995) period of record at Billyrimba (GS 204 033) and over a 26 year (August 1969 to May 1995) period of record at Drake (GS 204 046). As the data shown in Table 4.6 is current up to May 1995, it therefore includes the extended dry period over the last few years which has been a particular issue of concern to downstream residents and water users.

TABLE 4.6

Minimum Monthly Flows (ML) in the Timbarra River at Billyrimba and Drake

Location	Period of Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Billyrimba	Nov 1951 - May 1995	264	1 032	876	271	327	754	831	423	453	7	27	1 061
Drake	Aug 1969 - May 1995	555	2 724	1 186	406	1 248	1 663	1 397	777	734	122	115	1 946

The catchment areas of the Timbarra River at the Billyrimba and Drake gauging stations are approximately 1 000 km² and 1 700 km² respectively. At the proposed project pumping station, the Timbarra River commands a catchment of some 1 350 km². The Project Site represents less than 0.2 per cent of the Timbarra River Catchment. An analysis of flows at Billyrimba and Drake shows a reasonable correlation between both monthly flows ($R^2 = 0.77$) and annual flows ($R^2 = 0.69$). Additionally, the data shows that the monthly and annual flow volumes at Drake are approximately double the equivalent volumes at Billyrimba.

The Department of Land and Water Conservation (Water Resources) has advised the Applicant that they intend to set a threshold limit on it's pumping water from the Timbarra River related to the flow at Drake. The Department has suggested that the pumping would not be allowed once the discharge at Drake fell below 60 ML/day. This level is based on the 80 percentile flow level established by the Department.

A detailed analysis of daily flows at the Drake gauging station (Table 4.7) indicates that the daily flow fell below 60 ML/day on 883 (or 9.6 per cent) of the days in the 26 year period of record. Throughout 19 of the 26 years during which records were kept, the daily flow level was below 60 ML/day for less than one month each year. The discharge never fell below 60 ML/day throughout 10 of the 26 years.

TABLE 4.7

Number of Days Daily Flow Fell Below 60 ML/d in the Timbarra River at Drake

Year	Drake*	Year	Drake*
1969	0	1983	11
1970	76	1984	0
1971	7	1985	0
1972	0	1986	31
1973	0	1987	3
1974	0	1998	0
1975	13	1989	0
1976	0	1990	0
1977	4	1991	75
1978	13	1992	24
1979	33	1993	178
1980	165	1994	212
1981	20	1995**	0
1982	18		
No. of Years Flow Fell Below 60 M/ Day - 16 Total No. of Days - 883 Percentage of Total No. of Days of Record - 9.6%			
* 26 Year Period of Record (1969 - 1995) ** Only Up to May 1995			

The two major water uses from the Timbarra River downstream of Billyrimba are for the day-to-day needs of the Tabulam Aboriginal Community and irrigation of a maximum of 30 ha of land near the confluence with the Clarence River. Additionally, there are a small number of residents scattered along the river who depend on Timbarra River water for their day-to-day needs.

According to the Australian Bureau of Statistics, the population of the Tabulam Community was 165 during the 1991 census. However, according to NSW Aboriginal Land Council, the Tabulam Community consists of some 300 people. Based on the higher population figure and an average per capita water consumption rate of 250 litres per day, the average daily consumption of this community is approximately 0.08 ML/day. During the consultation with the Tabulam Community, the Applicant was

advised that the community is licenced to pump up to 4 ML/day from the Timbarra River.

The Department of Land and Water Conservation advises that the average annual use of water from the Timbarra River for irrigation of 30 ha is approximately 180 ML (or 0.5 ML/day). However, given the seasonal variations in irrigation water requirements, the daily irrigation water requirement would be expected to range from 0 ML/day to 1.5 ML/day. Thus, the total current annual average daily water use from the Timbarra River downstream of Billyrimba is in the order of only 0.6 ML with a seasonal range of between less than 0.1 ML/day and approximately 1.0 ML/day. It should also be noted that almost all of this water is extracted downstream of the Drake gauging station.

As indicated previously, the proposed maximum rate of pumping from the Timbarra River under average annual conditions is 2.5 ML/day, with an estimated 94 days of pumping required in Year 1 and 13 days of pumping required in Year 2 to satisfy the revised make-up water demand.

On the basis of the above flow data, downstream water usage and estimated project-related pumping requirements, it is apparent that harvesting of water for the project from the Timbarra River would not adversely affect downstream users.

4.3.5 Issue : Design of Erosion and Sediment Controls and Drainage Works

The issues raised principally relate to the necessity for detailed water management, erosion and sediment control plans, the ability of structures to deal with extreme precipitation events, and preparation of a Plan of Management generally known as an Mining, Rehabilitation and Environmental Management Plan (MREMP).

An Environmental Impact Statement (EIS) is a planning document which describes a project and the proposed design and operational safeguards in sufficient detail to enable its readers to gain an appreciation of the nature and extent of activities planned and for assessing the potential impact of the proposed activities on the surrounding environment. It is not designed nor intended to be a detailed engineering document. In

accordance with this objective, the EIS presented an initial conceptual plan of the proposed erosion, sediment control and drainage measures. As noted in Section 2.1.3 (page 17) of the EIS, the Applicant has committed to the preparation of staged Water Management Erosion and Sediment Control Plans (WMESCPs) prior to the commencement of particular on-site activities. Any details not included in the conceptual plans shown in the EIS would be identified and addressed during the preparation of the detailed plans. A condition within the mining leases which requires the preparation of WMESCPs prior to the commencement of specific activities is considered appropriate.

Given the range of activities proposed in association with the project, it is considered appropriate that separate WMESCPs may be submitted which cover each or a combination of the following segments of project activities:

- the access road;
- heap leach pad/processing area;
- Poverty Combined Open Cut and Waste Rock Emplacement;
- Big Hill Open Cut, Waste Rock Emplacement and haul road (including creek crossings);
- Poverty Point Fire Trail, pumping station and pipeline; and
- Potential Mine area developments.

The Applicant also recognises that one Mining Lease condition would require the preparation of an MREMP. This document would incorporate other detailed design information which may not be required within the WMESCPs.

It should be also noted that the Applicant is fully committed to providing adequately designed and constructed on-site and in-stream erosion and sediment control measures during clearing, construction, operation and rehabilitation phases of the project.

4.3.6 Issue : Impact of Mine on Local Hydrology

The issues raised relate to the impact of runoff, sediment and pollutants (especially cyanide - CN); water extraction, construction of water storages and waste rock emplacements and altered flow requirements to Timbarra River and other streams.

The impact of mining on the local hydrology has been discussed and assessed in Section 4.2.5 of the EIS and Section 11 of Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995).

Mining activity would have some impact on the local hydrology, principally through a marginal reduction in surface runoff from the site as some of the runoff from the heap leach pad area and catchments draining to both open cuts is collected and diverted into the process water system. It should be noted, maintenance of environmental flow regimes would be maintained as far as practicable, particularly in Duncans Creek. However, localised impacts would generally be contained to the life of the project because:

- most of the local runoff diverted into the process water system during mining operations would again become local runoff when mining ceases;
- at the completion of mining, the temporary loss of 7 ha from the Williams Creek catchment would again contribute runoff within this creek; and
- after 16-20 years, the Big Hill Open Cut would fill and overflow.

The temporary loss of 7 ha from the Williams and McLeans Creeks due to the Poverty Combined Open Cut and waste rock emplacement amounts to less than 1 per cent of the combined catchment area of these creeks. The impact of this loss on downstream reaches of these creeks would therefore be negligible.

The catchment area of Duncans Creek upstream of the Big Hill Open Cut represents approximately 11 per cent of the contribution of the Duncans Creek Catchment to the Timbarra River. The Applicant now proposes to divert the bulk of the upstream runoff (approximately 80 per cent) around the Big Hill Open Cut. Thus, over the period of mining and void backfilling, runoff into Duncans Creek would be reduced by about 2 per cent. Given that this reduction is well within the natural variability in rainfall and surface runoff in these catchments, the impact of such a reduction is also assessed as acceptable.

Water Studies Pty Ltd do not consider the interruption of flows within Duncans Creek by the Big Hill Open Cut as proposed within the EIS would create a lasting adverse impact upon the riparian and aquatic fauna habitat downstream. However, as discussed above, in view of the considerable community concern on this issue, the Applicant now proposes to divert the bulk of the upstream runoff away from the Big Hill Open Cut to maintain flows to the downstream reach of the creek. This proposal would result in the increase from 10 to 12 years to 16 to 20 years in the period required to fill the Big Hill Open Cut on cessation of mining. Details of the diversion would be provided in the WMESCP and/or MREMP as part of proposed drainage works identified in the Response 4.3.4. The Applicant no longer plans to rely on water recovered from the Big Hill Open Cut for processing water.

The impact of mining on Project Site runoff was quantified using a daily rainfall-runoff model (see Appendix A in Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) for details). The impact of mining on surface runoff from the site has been addressed in Sections 5, 6, 7 and 8 of the same document. Given that the Project Site represents less than 0.2 per cent of the Timbarra River catchment, containment of surface runoff from the Project Site catchments would have an insignificant impact on Timbarra River flows for the reasons presented in Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) -- Section 11.

The possibility of cyanide entering the river during flood events is negligible particularly given the assessment presented in Response 4.3.2.

4.3.7 Issue : Impact of Mining on the Wetland Area Downstream of the Heap Leach Pad

This issue relates to the positioning of the heap leach pad adjacent to a wetland area, the impact of discharges and cyanide contamination on the wetland, and the final drainage of the heap leach pad area.

The management measures identified in the EIS Sections 2.6.4 and 4.2.4 and reiterated in Responses 4.2.1, 4.2.2, 4.2.3 and 4.2.4 of this document would ensure that leakage of contaminated water from the heap leach pad into the downstream wetland area is prevented. Similarly, the combination of contingency plans and the enlargement of the storm storage capacity from 115 ML to 140 ML, would ensure that the potential for discharge from the process water and Storm Ponds is minimised and, in the unlikely event that such a situation did arise, that the discharge does not enter the wetland area.

At the end of mining activities, the EIS proposed to divert runoff from the upper surface of rehabilitated heap leach pad area into McLeans Creek catchment. Given the concerns expressed regarding the long term exclusion of these flows from the wetland area, it is considered appropriate that a condition requiring the redirection of these flows into the wetland area as part of the rehabilitation works be imposed within any approval conditions. Restoration of the flow path would minimise any long term impact on the wetland.

4.3.8 Issue : Impact of Flooding and Extreme Precipitation on Mining Activities

This issue relates to the claimed lack of information regarding timing, frequency and size of flood events and the claimed lack of consideration of extreme precipitation events in design of waste rock emplacements and heap leach pads.

The possibility of an extreme precipitation event has been taken into account when designing the mine layout and sizing the Project Site storages (e.g. process water ponds and Storm Pond capacities, pump capacities, etc.). Similarly, the impact of extreme precipitation on specific areas such as waste rock emplacements and heap leach pad areas would be taken into account during the detailed design of erosion and sediment controls, drainage works etc. at the site, which would be undertaken during the preparation of the WMESCPs and MREMP. All erosion and sediment controls and drainage works would be designed using relevant rainfall intensity— frequency -- duration data given in Australian Rainfall and Runoff (1987).

It should also be noted that it is in the Applicant's own interest to protect Project Site facilities if/or when an extreme precipitation event occurs.

4.3.9 Issue : Start-Up Water Demand of the Mine Site

The issue relates to the water requirements for the operation and total start-up water demand.

The start-up water requirement for the project would comprise two component parts:

- (i) a volume to establish a base storage within each of the process water and Storm Ponds. Section 2.9.4.1 of the EIS identified this base storage start-up demand as between 12 200 m³ and 15 250 m³; and

- (ii) a volume required for the progressive agglomeration, saturation and leaching of the initial four cells. This volume is required to achieve a steady-state make-up water requirement. In Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995) Section 4.08, a volume of approximately 305 000 m³ over the initial 31 week period was identified for this purpose.

Following a critical review of this requirement in light of the Applicant's experience and current industry practice, the period to achieve steady-state conditions has been reduced to 21 weeks and the total water demand over this period has been reduced to approximately 115 000 m³.

4.3.10 Issue : Water Licencing Requirements

These issues relate to concerns expressed by the Department of Land and Water Conservation regarding water licencing requirements, construction of the heap leach pad, waste rock emplacements, storages/ponds, creek crossings and the restriction of flows in Duncans Creek for a period after decommissioning.

The Applicant acknowledges the need to obtain licences under the Water Act (1912) and Rivers and Foreshores Improvement Act (1948) for extraction of water, pumping works, excavation and filling within 40 m of any watercourse, permission to divert a natural watercourse, water storage construction on watercourses and excavation and pumping from its open cut mines. As indicated in Section 2.1.3 of the EIS, the Applicant would apply for all necessary licences prior to the commencement of on-site activities.

The Applicant has already lodged an application for a Water Licence under Section 10 of the NSW Water Act 1912 with the NSW Department of Land and Water Conservation (formerly Department of Water Resources) for a licence to construct and use the water pumping works and associated water pipeline and to take, use and

dispose of water. The application was lodged prior to the embargo upon the issue of water licences and is therefore eligible for grant should the project proceed. The Department of Land and Water Conservation have advised that they would determine the conditions which would attach to any licence issued following determination of the Applicant's Mining Lease Applications. The Department is to further examine (on-site) the location of the potential water retention structures proposed to determine whether they also require licencing.

4.3.11 Issue : Surface Water Quality Monitoring

This issue relates to the necessity for and perceived failure of the EIS to adequately address a reliable and effective monitoring system to detect pollution of nearby waterways.

Three surface water quality monitoring programmes have been undertaken within the Timbarra River and its tributaries to establish a baseline data base for the assessment of the environmental impact of the mine. Details of the programme, which dates back to August 1987, is provided in Section 3.6.1.2 of the EIS.

The Applicant has also undertaken to establish a comprehensive surface water monitoring programme at seven sites on key streams that have the potential to be affected by mining and processing operations. Details of the selected sites, the method of monitoring and the parameters that would be monitored are given in Section 4.2.7 of the EIS and Section 12 of Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995).

The sites for surface water quality monitoring, extent of analyses and frequency of monitoring would be regularly presented in the MREMP Annual Reports and reviewed by the , Department of Land and Water Conservation and Department of Mineral Resources.

4.3.12 Issue : Details and Accuracy of Models Used

This issue relates to the accuracy and detail of the models used to calculate stormwater/waste water generation under a range of conditions.

Full details of the models used in surface water analyses, together with their calibration and expected accuracy are given in Appendices A and B of Water Studies Pty Ltd and Coffey Partners International Pty Ltd (1995).

4.4 FLORA

4.4.1 Issue : Conservation Value of Specific Communities

This issue relates principally to the high conservation value of the vegetation communities within the Project Site, particularly the wet heath and wetland/sedgeland communities, the required assessment of conservation significance of the New England Blackbutt/Red Bloodwood community and the regional representation of these communities.

Community 3 -- New England Blackbutt/Red Bloodwood

The conservation significance of each of the vegetation communities on the Project Site as presented in the EIS Table 3.9 represents a summary of relevant information contained in Greenloaning Biostudies (1995) and was derived from a number of sources. A list of these sources was unintentionally omitted from EIS Table 3.9. More detail on each community is presented in Greenloaning Biostudies (1995) Table 4.

In Greenloaning Biostudies (1995) Table 4, the New England Blackbutt/Red Bloodwood community has been assigned a moderate conservation rating. Harden (1991), records Red Bloodwood (*Eucalyptus gummifera*) as having a broad distribution which covers the coastal regions plus the northern and central tablelands. The areas identified as this community within the Project Site are primarily not within the proposed areas of disturbance and are therefore not threatened by the project. Of the total 14 ha identified as occurring on the Project Site less than 1 ha is proposed to be disturbed.

Community 9 and 10 -- Wet Heath Communities

A preliminary assessment of the Tin Swamp vegetation types, based on current data (Binns, 1994), indicates the vegetation of Tin Swamp corresponds with Communities 9 and 10 on the Project Site.

4.4.2 Issue : Conservation Status of the Project Site

This issue relates to the conservation value of the Timbarra Plateau and refers to the high biodiversity and the presence of a number of ROTAP species.

It is stated in Greenloaning Biostudies (1995), Section 4.4.3 (pages 30 and 31), that the overall value of the Project Site as a vegetation unit is moderately high. The criteria and basis for this evaluation are also provided on page 30. The value of individual communities within the Project Site has, however, also been derived separately and two communities (Communities 9 and 10) have been given a high conservation rating. Greenloaning Biostudies (1995) Table 4 and Section 4.4.3 (Page 30), clearly identify the derivation of these ratings.

4.4.3 Issue : Conservation Significance of Individual Plant Species

This issue relates to the high conservation status of a number of plant species and the impact of clearing and the mine development.

Acacia floydii

References considered to be to unscientific and subjective claims regarding logging impact are unscientific statements. The information in Greenloaning Biostudies (1995) is provided in the context of using all available data and Binns' personal observations based on a considered scientific opinion.

The inference to be drawn from the information on logging disturbance of *A. floydii* occurrence is simply that *A. floydii* appears to regenerate adequately after disturbance. The level of disturbance would obviously be greater in the proposed mining and mine facilities areas, but the level of effort to propagate, regenerate and rehabilitate habitats would also be greater than required for a selective logging operation (Ref: Section 2.12 of the EIS and Section 4.5 (page 35 of Greenloaning Biostudies (1995)).

The proposed flora reserve within the Malara State Forest extension has been included as a proposed reserve within the Tenterfield Management Area EIS. This reserve

would be excluded from logging and subjected to a planned burning regime as detailed in the EIS (Tenterfield Management Area). Such reserves are subjected to some grazing.

Eucalyptus olida

The current status of the reserve (Binns, 1995) designed to conserve this species on the Malara Plateau is as discussed for *Acacia floydii* in the previous text.

A statement regarding the significance of loss of *Eucalyptus olida* identifies an obvious typing/writing error. To clarify the original intent of the author, refer to Greenloaning Biostudies (1995), Section 4.5 (Page 37, Paragraph 1).

The second sentence should read:

“However given the wider distribution of the species’ (i.e. within the Local Area and Region, as defined in Greenloaning Biostudies (1995) -- Figures 1 and 2), the overall impact of the loss would be considered to be moderate (in terms of survival of the species).”

It should be noted that Greenloaning Biostudies (1995) Section 4.5 (Page 36 and Table 6), discuss the significance of impact on *Eucalyptus olida* as a species, and not in the context of the significance of Community 2 of which *Eucalyptus olida* is a significant component.

The comments regarding the regenerative capacity of *Eucalyptus olida* were not intended nor are considered to be misleading. Rather, as there is no known available information on the regenerative capacity of the *Eucalyptus olida* after gold mining, the references to the species regenerating well after disturbance and foliage harvesting in Greenloaning Biostudies (1995) Section 4.4 (Page 27, were included to present the extent of available information. To further clarify this issue:

“*Eucalyptus olida* also appears to be tolerant of a range of conditions indicated by its occurrence on low ridges and rocky outcrops on the Project Site and

“Eucalyptus olida also appears to be tolerant of a range of conditions indicated by its occurrence on low ridges and rocky outcrops on the Project Site and within the Local Area (see Greenloaning Biostudies (1995) 2) (R. Dyason, pers. comm, A. Martin pers. obs.). It would therefore be expected that the species would regenerate within a broader range of conditions than immediately adjacent to the existing Communities 9 and 10.”

Rehabilitation and propagation measures for Eucalyptus olida are discussed in Greenloaning Biostudies (1995), Section 4.5 (Pages 32-35).

Eucalyptus scias ssp apoda

This species is to be protected from any disturbance from the proposed mining operations and associated activities. Ongoing monitoring work on the Project Site would include the recognition and implementation of any required protective measures for any additional populations of the species.

The measures would be undertaken in consultation with the NPWS.

Pultenaea pycnocephala

Further monitoring of this species would be undertaken as part of the Applicant's ongoing vegetation monitoring programme. Propagation of the species is discussed in Greenloaning Biostudies (1995) Section 4.5 (Page 35).

No information was available regarding the tolerance or responses of this species to any form of disturbance. As part of the preliminary rehabilitation measures, trial plots incorporating germination/planting of this species would be undertaken.

Known locations of the species within the Project Site but outside the proposed areas of disturbance would be protected.

Syzygium oleosum

As the majority of the Timbarra Plateau and adjoining eastern fall of the Divide have not been surveyed, it would seem most probable that *Syzygium oleosum* would also occur along other medium to low altitude gullies supporting sub-tropical rainforest elements similar to Duncans Creek.

One likely area of occurrence is Williams Gully, the lower reaches of which were not fully sampled during the previous field surveys within the Project Site. It should be noted, however, that only a small proportion of Community 5 supporting *Syzygium oleosum* (2 ha or <10 per cent) is proposed to be cleared, more than 90 per cent would remain and be protected from disturbance. Mitigation measures for this species are presented in Greenloaning Biostudies (1995) Section 4.5 (Pages 35 and 37).

A review of the records from the North East Forest Biodiversity Study would be undertaken as soon as these records become available to determine whether there have been any further records of this species. At the time of preparation of this response, no other confirmed records of the species are known from the region.

Old Growth New England Blackbutt Forest

It would be expected that old growth stands would occur in other steep inaccessible locations along the edge of the Timbarra Plateau. The value of old growth stands is acknowledged and formed part of the basis of the fauna habitat assessment presented in Greenloaning Biostudies (1995) Section 5.1.7 (Pages 44 and 45).

Two of the best representations of old growth forest observed within the Project Site and Study Area, i.e. in the north-western sector and within the original Malara State Forest in the south-west, would not be affected by the project.

With regard to *Syzygium oleosum*, recent records indicate that the species occurs in Boonoo, Ewingar and Gilbralter Range State Forests, and Gilbralter Range and

Washpool National Parks. Specific sites within these locations have not been confirmed as yet but the general locations listed all fall within the region defined by **Figure 1** of the Flora and Fauna Impact Statement.

No useful data on the occurrence and distribution of old growth forest in the region has been located at this stage.

Eucalyptus rubida

The recorded occurrence of *Eucalyptus rubida* in Community 2 was based on a tentative herbarium identification from a small amount of sample obtained. Collection of additional material was undertaken in October 1995 and was confirmed to be the rare sub-species of *E. rubida* subsp. *barbigerorum*. Approximately 6 specimens were located in the western swamp area on the edge of Community 2. The specimens comprised immature and mature trees and juvenile suckers.

4.4.4 Issue : General Flora Impacts

This issue relates to the disturbance to the area, direct impacts on flora through clearing and mining activities, and long term degradation.

The EIS and Greenloaning Biostudies (1995) identify a range of mitigation measures which would be employed throughout the life of the project. As a consequence, the severity of impacts would be localised and strictly contained during the operation of the mine. Long term impacts would also be reduced by the proposed mitigation measures and the proposed rehabilitation programme.

4.4.5 Issue : Flora Survey Methods

This relates to the concerns regarding the flora survey methodology, the appropriateness of the stratification used, timing of the survey and the possible species occurrence of additional ROTAP species.

Comments on the stratification chosen for the vegetation survey sites do not appear to be warranted and may be attributable to an unfamiliarity with Project Site characteristics. The following information is presented to clarify the issues raised.

The main objectives of the sampling programme were:

- (i) to sample all the vegetation communities occurring within the Project Site to gain adequate data on the species composition and structural characteristics of each community;
- (ii) to survey vegetation in a systematic manner so that information obtained was comparable;
- (iii) to compile a comprehensive species list for the Project Site; and
- (iv) to ensure adequate sampling was undertaken within the proposed areas of disturbance.

Table 4.8 presents the number of plots sampled within each community. The more simple the structure and composition of the community, the fewer plots were sampled.

With regard to aspect and exposure, Table 4.9 indicates that a reasonable mix was obtained, particularly when considered in relation to the proposed disturbance areas.

Sampling time for the field surveys was varied and predominantly covered the late spring, summer, late autumn and winter periods. It is acknowledged that the early spring flowering period was not fully sampled and it is stated in Greenloaning Biostudies (1995) Section 4.1.6 (Page 16), that additional sampling would be expected to record further plant species. The survey method limitations were also discussed in Section 4.1.6 (Page 16).

TABLE 4.8

Plot Sampling Intensity

Community	No. of Plots	Comment
1	15	The majority of these were not sampled in detail owing to uniformity in species composition. Comparatively larger area to be disturbed.
2	8	Comparatively large area to be disturbed.
3	5	Comparatively small area to be disturbed.
4	8	Comparatively large area to be disturbed.
5	10	Complex in structure and composition.
6	3	Structurally simple and small area of proposed disturbance.
7	3	Not proposed to be disturbed.
8	6	Comparatively small area to be disturbed.
9	2	Structurally and floristically simple.
10	2	Structurally and floristically simple.

TABLE 4.9

Plot Aspect and Exposure

	Aspect				Exposure				
	N	S	E	W	Predom. Flat Ridgetop	Exposed	On Steep Slope	Sheltered	Flat Terrain
No. of Plots	22	11	12	8	15	17	20	16	15

ROTAP species not listed in Table 3 of the Greenloaning Biostudies (1995) were assessed as less likely to occur based on various parameters such as recorded habitat and location of records. The NPWS was fully consulted regarding potential rare plant species in the locality and data base records were requested.

Propagation of rare plant species is referred to in Greenloaning Biostudies (1995) Section 4.5.3 (Page 35) and rehabilitation procedures incorporating such species are referred to in Section 4.5.1 (Page 33). In addition to the proposed rehabilitation procedures, the Applicant would also undertake an ongoing programme to monitor the progress of species' regeneration as well as documenting and protecting any other locations of rare plant species identified during the course of ongoing monitoring programmes.

4.4.6 Issue : Pipeline Corridor Flora Impacts

This issue relates to the concerns expressed regarding the impact of clearing on Protected Lands, the potential for a threatened grass species, timing of the survey and need for a more detailed vegetation assessment.

No detailed plant surveys were undertaken along the pipeline corridor route nor considered warranted. However, a preliminary inspection of the pipeline route revealed no obvious signs of rare flora species. No clearing for the pipeline would be necessary as it is proposed to lay the pipeline on the edge or the track for the bulk of the distance. In areas where the pipeline needs to be positioned away from the track, it would be laid in such a manner that would not involve any clearing. Accordingly, the requirements under the Protected Lands regulations are not applicable.

4.4.7 Issue : Rainforest Definition and Other Classifications

The concerns raised relate to vegetation communities 5 and 6 incorrectly described as rainforest.

The definition of rainforest has long been a subject of intense scientific debate. Communities 5 and 6 have therefore been carefully defined within Greenloaning Biostudies (1995) according to their dominant strata and the rainforest component of the lower strata. The definitions applied to the site vegetation were according to Floyd's definitions of various types of rainforest/moist forest, the relevant definitions being provided in Greenloaning Biostudies (1995) Appendix 2. Although some authorities may define this as moist hardwood forest, according to the definitions of Floyd (1990), the rainforest component conforms with the terminology applied. Application of different definitions would be expected to result in different terminology.

The definition of rainforest outside the Project Site has been used in a broader context based on habitat characteristics rather than on components alone. The main basis for this assessment has been aerial photographic interpretation with some confirmation from ground truthing. Environmental characteristics indicative of rainforest habitat include high moisture content of soil and atmosphere, dense canopy cover, dominance of rainforest plant species in understorey strata, sparse ground cover and low lateral visibility. In terms of fauna utilising this habitat, rainforest dependent species would be expected. It is therefore considered valid to refer to these areas as rainforest in general. It is acknowledged, however, there may be a strong eucalypt or hardwood component in the overstorey of the designated rainforest habitats.

4.4.8 Issue : Research Programmes for Endangered Flora

This issue is concerned with the fact that no research programmes are recommended for significant flora of the area.

The Applicant would incorporate appropriate research programmes on endangered flora into its long term monitoring programmes. The Applicant is also in the process of compiling a pictorial file of rare plants recorded on the Project Site so that its personnel can also assist in recording ongoing information on such species.

4.4.9 Issue : Errors in the Flora and Fauna Impact Statement

This issue relates to alleged errors in the Flora and Fauna Impact Statement (Greenloaning Biostudies, 1995) including: the logging of Red Cedar in the area not supported in species list, incorrect naming of a Eucalyptus dalrympleana, Hortons Creek shown as Herding Yard Creek and incorrect/exaggerated overlay of rainforest on Figure 4.

The reference to Red Cedar being logged in the Local Area requires clarification. In this context, the "Local Area" refers to the defined Local Area as shown in Greenloaning Biostudies (1995) Figure 2 which includes the lower altitude vegetation along the Timbarra River and connecting gullies where presumably the Red Cedar would have been most likely to occur. The statement was not intended to imply that Red Cedar occurred naturally on the Timbarra Plateau.

The listing of Eucalyptus dalrympleana within the flora species list was an error and should have read Eucalyptus deanii. Reference to the Appendix 2c within Greenloaning Biostudies (1995) shows that the species is listed as Eucalyptus deanii within Community 2, not E. dalrympleana. According to the National Herbarium Eucalyptus brunnea and Eucalyptus deanii are two separate species.

The methods of mapping the Timbarra Plateau Local Area were inadvertently omitted from the methods section within Greenloaning Biostudies (1995) but have also been clarified in the response to flora issues -- rainforest definitions (Section 4.7 above). Reference to the incorrect labelling of Hortons Creek is accepted to be a valid correction.

4.4.10 Issue : Demon Creek National Park Proposal

This issue relates principally to the proposed Demon National Park on the Demon Fault and Timbarra Plateau area, high conservation values of the area, impact of mining on the proposal and loss to the community.

On 26th February 1995, a policy statement was issued by the Australian Labour Party in New South Wales with respect to the proposed creation of further parks in New South Wales. On 11th May 1995, Ross Mining NL made an announcement to the Australian Stock Exchange that it had sought clarification from the Minister for Mineral Resources of New South Wales in respect of the Timbarra Plateau generally. On 20th June 1995, Ross Mining NL made a further announcement to the Australian Stock Exchange to the effect that the Minister had informed Ross Mining NL that any conservation estate proposal in the region will not constrain exploration and mining generally on the Timbarra Plateau nor constrain the proposed Timbarra Gold Project.

The proposals referred to in the submissions had recently eventuated with the dedication of the Demon Creek Nature Reserve on 22 December 1995. The Demon Creek Nature Reserve is located about 2.5 kilometres west of the mining proposal.

4.5 FAUNA

4.5.1 Issue : Under-Estimation of Fauna Habitat Assessment

The concern raised in this submission is the under-estimation of habitat value of the site and failure to recognise limited regional distribution of some habitat types which support sensitive/endangered fauna.

Greenloaning Biostudies (1995), within Section 5.1.7 (Pages 44 and 45), outlines the Fauna Habitat Assessment methods employed and provides a list of the criteria used in the evaluation, including known or potential occurrence of fauna species of significance. An examination of Table 8 within Section 5.1.7 Greenloaning Biostudies (1995), also indicates that the range in habitat values within the habitat types was variable with three of the seven habitat types recording a higher range value of five. Examination of the assessment rating scale shows that this is equivalent to a high value. Two other habitat types recorded a higher range value of 4.5 (equivalent to moderately high to high). The only higher value than 5 (high) that could be given would be excellent and, as all habitats had suffered some degree of disturbance as well as lacking in some locations many of the criteria listed in Section 5.1.7 (Pages 44 and 45), an overall rating of 6 was not possible using the standardised methods outlined.

However, it is also noted in Section 5.2 (Page 46) that the value of individual locations within the habitats would have specific features of potential significance to individual fauna species. Specific requirements of individual species of significance are discussed in more detail in Sections 5.3.1.4, 5.4 and on Table 17 within Greenloaning Biostudies (1995).

4.5.2 Issue : Impact and Possible Local Extinction of Rare Fauna Species

Concerns outlined include impact on local fauna, particularly endangered species and possible local extinction, impact of cyanide, feral predators, relocation of Hastings River Mouse and the impact of the haul road, particularly on moving fauna.

The significance of fauna species occurring within the Project Site and the general value of the area are identified in Greenloaning Biostudies (1995). However, the extent and significance of impacts within the context of the Timbarra Plateau system also needs to be considered. This was considered in Greenloaning Biostudies (1995), Section 5.5 (Pages 114, 128, Tables 18 and 19).

Greenloaning Biostudies (1995), Section 5.5 (Page 114), discussed the potential impacts on Schedule 12 Fauna and the fauna species likely to be most affected by the proposal. The majority of Schedule 12 fauna recorded within the Project Site would not be expected to be significantly affected in terms of threats to survival of the species or individuals. Only two species, the Rufous Bettong and the Parma Wallaby have been identified as having small areas of habitat removed by the proposal. As neither of these species is restricted to the proposed areas of disturbance within the Project Site or to the Project Site itself, local extinction of these species seems highly unlikely.

The Parma Wallaby, for instance, is likely to occur over much of the Local Area with a number of confirmed records from outside the Project Site and Study Area and four recent records (18th October 1995, Greenloaning Biostudies, pers.obs.) from the northern sector of the Malara Plateau.

Similarly the intensive Hastings River Mouse surveys indicated that critical habitat of the species was most likely to occur outside the proposed disturbance areas. Intensive research programmes identified within Greenloaning Biostudies (1995) are aimed at

identifying such habitat and providing information to enable positive management programmes for the species within the Timbarra Plateau.

4.5.3 Issue : Schedule 12 Species

The submissions express particular concern for Schedule 12 species occurring in the area such as the Hastings River Mouse and Brush-Tailed Rock-Wallaby (listed nationally) and others.

Hastings River Mouse

Intensive field surveys for the Hastings River Mouse conducted in September 1994 did not locate a core population of the species within the area of disturbance. Hence, the conclusions regarding the significance of impact on this species (as stated in Section 5.5.5 (Page 128) Greenloaning Biostudies (1995) remain valid.

The statement regarding the relocation of Hastings River Mouse individuals in Table 4.9 (Page 200) of the EIS should be read in conjunction with Section 5.5.4.2 (Page 122) of Greenloaning Biostudies (1995). Greenloaning Biostudies (1995) clearly states that trapping for subsequent relocation would only target individuals which have come into or are passing through the proposed Poverty Main disturbance area. Release of captured animals would be into the adjoining habitat from which it is considered most likely the individuals originated, i.e. immediately to the north.

The location of the main population of the Hastings River Mouse in this locality is one of the prime objectives of the proposed research programmes for the species identified within the EIS Section 4.5.3.1 (Page 199) and Greenloaning Biostudies (1995) Section 5.5.4.2 (Pages 122, 123).

Brush-tailed Rock-Wallaby

Comments by Greenloaning Biostudies (1995) regarding the use of the Project Site by Brush-tailed Rock-Wallaby were made after intensive field investigations on the Project Site including active searches for roosts and scats. Identification of scats revealed that only small numbers were attributable to the Brush-Tailed Rock-Wallaby, suggesting a relatively low level of use of the Project Site. No shelter sites were recorded in any part of the Project Site.

After the intensive Hastings River Mouse surveys carried out in September 1994, during which specific searches and observation periods were undertaken for the Brush-tailed Rock-Wallaby, it was finally concluded that the Project Site appeared to be primarily used as a movement corridor and that the main populations were considered likely to be located in the more extensive massive rocky outcrops to the south-east and north-east of the Project Site. An examination of a Landsat image of the area indicates that the size of the outcrop at Bold Top Mountain is relatively small, as is also indicated by examination of Figure 4 within Greenloaning Biostudies (1995).

Comments on the likely/potential impacts on the Brush-Tailed Rock-Wallaby, mitigation measures and long term survival prospects of the species as identified within Greenloaning Biostudies (1995) Sections 5.4.1.2 (Pages 72-76), 5.5.4.1 (Pages 121, 125-126), 5.6 (Pages 128-129) and Tables 19 and 20), remain valid.

Further field investigations into the movement patterns of the Brush-Tailed Rock-Wallaby on the Project Site are proposed prior to the final design of the haul road. Additionally, the Applicant is at present investigating the most effective means of identifying prime habitat areas for the Brush-tailed Rock-Wallaby and monitoring the population of the species.

Finally, on the basis of results of investigations undertaken, it is considered that the statement that the project "would most likely result in the elimination of the only

known population on the Timbarra (Malara) Plateau" is emotive and not based on a scientific assessment of the situation.

Tiger Quoll

Greenloaning Biostudies (1995), Sections 5.4.1.2 (Pages 67-79) and 5.5.2.2 (Pages 116-117), describes the national, regional, local and Project Site distribution of the Tiger Quoll and presents a discussion of the overall impacts of the proposal on the species.

It is stated in Greenloaning Biostudies (1995), Section 5.5.2.2 (Page 116), that no individual animals would be expected to be lost. The number of observations of Tiger Quolls over a wider area of the Malara Plateau suggests that the species is relatively common within the Local Area. Details of this are currently being checked but some records are unconfirmed sightings, i.e. not scientifically documented, and are therefore not shown on Figure 8 within Greenloaning Biostudies (1995). Locations of additional sightings of Tiger Quolls from within the Local Area include Darcy's Hill, Tableland Road, Poverty Point Fire Trail (north and south of the intersection with Tableland Road), eastern end of Williams Creek, and Hortons Road (B. Roach, pers.comm).

Parma Wallaby

As the Parma Wallaby typically occurs in moist Eucalypt Forest gullies, it would be expected that its main occurrence within the Local Area would be within this type of habitat associated with the eastern fall of the Divide. As the majority of the moist Eucalypt Forest habitat within the Local Area in particular does not appear to have been surveyed, it is therefore not surprising that there are no additional records to the north of the Project Site on current data base listings. Recent observations however, confirm the occurrence of the Parma Wallaby in the northern sector of the Local Area Section 4.5.2 of this document.

Rufous Bettong

The comments regarding the likely impact on this species, the mitigation measures and long term survival of the population are described both in specific and general terms in Greenloaning Biostudies (1995), Sections 5.5.2.2 (Page 117), 5.5.4.1 (Pages 121-122) and 5.5.4.2 (Pages 122-125, 20), and considered to be valid. Additionally, the general monitoring programmes proposed by the Applicant would incorporate information on this species.

Troughton's Vespadelus

There is no data at present to support the view that this species occurs on the Project Site. To date, this species has not been recorded in the region.

4.5.4 Issue : General Fauna Impacts

This issue addresses concerns expressed regarding general impacts of the development on local diverse and significant fauna.

The comments contained within the submissions are either general or statements of fact with respect to the diversity of fauna species on the Project Site which require no further comment.

However, as with the vegetation communities, all assessments need to be considered within both a local and regional context.

4.5.5 Issue : Research and Monitoring Programmes for Endangered Fauna

This issue relates to the proposed endangered fauna research programmes, especially for the Hastings River Mouse.

The Applicant has committed to undertake research programmes on specified endangered fauna as part of its long term monitoring programmes, and is in the process

of compiling a pictorial file of rare animals recorded on the Site so that all personnel can also assist in recording ongoing information on such species.

4.5.6 Issue : Feral Predator Ingress

The concerns raised include the potential for increased feral predator ingress with increased access, human visitation and habitat alteration (especially ingress of foxes and cats) and impact on sensitive fauna populations and existing fauna diversity of the area.

It is considered that an increase in feral predator populations would not be inevitable as a consequence of the project. Access points to the Project Site would not be increased as a result of the project.

The Applicant has undertaken to ban cats and dogs from the site, and as no personnel would be inhabiting the site, no pets would be expected to be brought in.

The possible occurrence of foxes and other feral animals is discussed in Greenloaning Biostudies (1995), Section 5.5.4.1 (Pages 121 and 122), as is a feral animal monitoring programme to be implemented by the Applicant. Appropriate feral animal management control programmes would be implemented as necessary in consultation and co-ordination with the relevant authorities including the NPWS.

4.5.7 Issue : Main Haul Road and Fauna Impact

The concerns raised relate to the impact of the haul road on the populations and behavioural patterns of sensitive endangered fauna, noise, light, dust and creation of a barrier to species.

Mitigation measures to reduce the impact of the main haul road on fauna are discussed to some extent in the responses to Issues 5.2 and 5.6. Additionally, prior to the final engineering design of the haul road, it is proposed that field identification of the primary pathways of rare species (in particular the Brush-Tailed Rock-Wallaby) are undertaken. Road design would utilise this information to facilitate the maintenance of normal movements of fauna and minimise potential risks to individuals as much as possible.

The potential for impacts on fauna from vehicle traffic both along the access road and haul road would be further mitigated by the imposition of speed limits. Such speed limits would be strictly adhered to by the Applicant and its contractors. Further mitigation measures regarding the haul road (and access roads in general) are discussed in Greenloaning Biostudies (1995), Section 5.5.4 (Pages 122 and 125).

With regard to impacts from dust, studies have generally shown that although dust can have an adverse effect on plants and wildlife, the levels required to cause noticeable physical damage to plants or significant health problems to wildlife are extremely high (Lillie 1970, 1972, Schurmann 1962, in Lillie 1970, Treshow 1970, Manning 1971, Brandt & Rhodes 1972, Auchclair 1977-cited in Croft 1982). In a report published in 1983, the then (SPCC) estimated that deposition rates as high as tens and hundreds of grams per square metre per month would be needed to cause damage to crops, vegetation and livestock (SPCC, 1983).

The report stated that:

“Controlled laboratory and crop field studies indicate that all but very high levels of general particulate matter are relatively unimportant from the standpoint of vegetation damage.

Apart from dusts containing high levels of specific phytotoxic substances, there are three possible mechanisms for atmospheric particulate matter to have an effect on plants. The first is possible stomatal obstruction, the second is the

settling of enough dust on the plant to block access by sunlight, and the third is atmospheric turbidity decreasing the transmission of the portion of the solar spectrum responsible for photosynthesis.

Controlled exposure studies of insoluble dusts indicate that the accumulation of particulate matter on leaf surfaces can result in injury to vegetation when fallout rates are very high (of the order of hundreds of grams per square metre per month).”

Watering of the haul road would be regularly and routinely undertaken to minimise dust generation consistent with the safe operation of mining equipment. The restriction of dust generation to a level consistent with employee safety as required under the Mines Inspection Act, 1901 (as amended) would effectively mitigate against potential adverse effects from dust on wildlife.

4.5.8 Issue : Noise Impact on Fauna

The concerns raised include the impact of continual noise and occasional blasting on behavioural patterns of sensitive fauna species and the lack of background noise data in the EIS.

Given that there are no residents within close proximity to the proposed Timbarra Gold Mine which could be adversely affected by operational noise levels and thereby necessitate a detailed predictive assessment of received noise levels, no background noise survey was considered warranted. However, from experience, the background noise level within remote areas would range between 30 dB(A) and 40 dB(A) during the day and from less than 20 dB(A) to 40 dB(A) during the night depending on climatic conditions and the time of year.

No firm policy or guidelines exist as to the noise levels considered acceptable, or conversely, the level or character of noise that may disturb or otherwise affect the feeding or breeding patterns of native birds or animals. However, research by the NSW

Department of Agriculture and Fisheries on wetland bird species (Poole, 1982) and a study by the Swedish University (Algers et al 1978) on the effect of continuous noise on animals concluded that birds tend to accept and/or adapt to constant steady noise levels, even of a relatively high level in the order of 70 dB(A). Poole (1982) found that continuous exposure to higher noise levels (from 70 dB(A) to 85 dB(A) and above) may cause some degree of behavioural change in birds. Observations of behaviour patterns also indicate tolerance to intermittent level noise events such as road traffic.

Research undertaken in the US on the effect of noise on farm-raised mink, animals which are characteristically sensitive to stress, reportedly showed no harmful effects from simulated or actual sonic booms and that the booms were of little consequence to ongoing behaviour. Additionally, decreased overt response to each successive boom suggested that female mink quickly adapted to the recurring booms when not accompanied by other sensory cues to danger.

It is also noteworthy that Kinnear has routinely observed Rock-Wallabies amongst the mine workings at large open cut mines in WA (L.Lim).

On the basis of standard attenuation rates, it would be expected that the noise from operating mining equipment would be at a level of approximately 70 dB(A) at a distance of approximately 100 m from the mining activity. Consequently, overall impacts from noise would be expected to be highly localised.

The effects of lights on individual species are also difficult to assess. However, lights have been observed to have a positive effect on feeding resources for bats, with numerous insects being attracted to the lights. Recent surveys by the Natural Resources Audit Council (NRAC) suggest a positive correlation between bat capture success and the presence of lighting.

4.5.9 Issue : Indirect Impacts on Fauna

The principal concerns raised relate to indirect impacts on fauna, considered to be inadequately addressed in the EIS, through the siting of the leach pad adjacent to sensitive wetlands and habitat of the Eastern Chestnut Mouse, the haul road, Big Hill Open Cut and waste rock emplacement, and feral predators.

The proposed mitigation procedures including access control, dust control, feral animal monitoring and control programmes as necessary, total restrictions on domestic pets, erosion control and pollution control have been designed to mitigate substantial potential direct and indirect impacts on fauna.

The Applicant is to investigate the potential for minor modification of the location of the heap leach pad, process ponds and crushing facility area in an attempt to minimise the extent of impact on the wetland zone. The Applicant is to develop a predator control programme in conjunction with consultants and the National Parks and Wildlife Service.

4.5.10 Issue : Cyanide Contamination of Wildlife

The principal concerns relate to potential cyanide contamination of wildlife through ingestion potential, cyanide in the food chain; drinking or swimming in process water ponds, contaminated waterways and wetland areas, and cyanide drift from the heaps.

The potential for wildlife ingesting cyanide contaminated solution from the process water ponds would be minimised by the following measures identified within the EIS:

- installation of man-proof fencing (wildlife barriers) around the perimeter of heap leach pad, process water ponds and crushing areas thereby preventing access to all except smallest forms of ground fauna (Ref. EIS Section 2.8 (Page 61)); and

- substantial netting over the ILS, PLS and BLS ponds to prevent use by bird and bat species; (Rf EIS Section 2.6.5 (Page 50)).

Additionally, the Applicant would install:

- a sheet metal barrier around perimeter of treatment area to approximately 1 m to prevent access by small ground fauna; and
- place a removable netting cover over the ILS and PLS drains to prevent fauna (primarily birds) drinking the cyanide solution, particularly during drought conditions.

The likelihood of wildlife poisoning from access to the leach heap is considered to be very low for the following reasons:

- the material comprising the heap would be very coarse. The irrigated cyanide solution would quickly percolate through the system leaving little opportunity for any ponding to occur on the surface of the heap;
- the spray system for the heap leach pad is designed to dispense only large droplets of cyanide solution, thus minimising the potential for spray drift onto surrounding areas retaining access to fauna. The only real potential for any fauna species to ingest cyanide solution from the spray system would seem to be to stand under the spray and catch the drops of solution as they fell. As the spray is also applied under pressure, the potential for such an occurrence would seem to be low. Personal observations by other heap leach pad operators indicate that fauna are not likely to ingest cyanide by this means.

A spillage of cyanide outside the protected access area would be considered most unlikely and would not have a significant adverse effect on wildlife for the following reasons:

- detailed and specific cyanide handling procedures would be closely followed at all times;
- any leakage would be slow moving and identified and contained during the course of the proposed monitoring programme, prior to any significant spread of cyanide into the adjacent systems;
- cyanide is not stable and, on exposure to air and sunlight, breaks down rapidly into inert materials. Any cyanide solution present at the ground surface would therefore be expected to remain for only a short time; and
- when ingested, cyanide breaks down rapidly within the body. Concentrations of cyanide up the food chain would therefore not occur.

Appendix 3 prepared by Mr John McGlynn, the Department of Mineral Resources, Senior Environmental Chemist provides further information on the effects of cyanide on wildlife.

4.5.11 Issue : Duncans Creek

The principal concerns include the impact on riparian and aquatic habitats (particularly Stuttering Frog habitat) and downstream aquatic life resulting from the diversion of Duncans Creek and altered flow regime. Protection of water quality and normal flow regime is also raised.

Duncans Creek and the associated moist habitats upstream from the proposed Big Hill Open Cut should not be significantly affected by the proposal. Given that the nature of these habitats appears to be in direct response to the natural runoff and sheltered characteristics of Duncans Creek gully, and that these factors would not alter upstream from the open cut, the habitats present would be expected to remain.

The habitats downstream from the proposed open cut appear to be substantially drier than the upstream habitats. Aerial photographs (1:10 000 colour 1993) clearly indicate

that the Wet Sclerophyll Forest/Rainforest understorey communities are not present to any significant extent downstream of the proposed Big Hill Open Cut. A single narrow band of rainforest elements continue for approximately 100 m beyond the current area of disturbance. However, the Applicant now proposes to reduce the area of the waste rock emplacement associated with the Big Hill Open Cut which would result in the removal of the emplacement from the areas within Duncans Creek and the avoidance of any potential habitat fragmentation.

Given the Applicant also proposes to divert approximately 80 per cent of flows within Duncans Creek away from the Big Hill Open Cut to provide an environmental baseline flow for downstream reaches of the creek, the moisture levels downstream would retain the natural variability currently experienced.

Continuation of an environmental flow, together with the control of sedimentation through measures identified in the EIS and to be detailed in the Water Management, Erosion and Sediment Control Plans would effectively protect the riparian corridor with the exception of that length directly impacted by the Big Hill Open Cut and associated waste rock emplacement.

Since suitable habitat for the Stuttering Frog (*Mixophyes balbus*), does not appear to occur downstream from the proposed Big Hill Open Cut, there does not appear to be any potential for impact on this species associated with the activities in the vicinity of Duncans Creek.

4.6 SOILS AND SOIL MANAGEMENT

4.6.1 Issue : Erosion Potential

This issue relates to the assessment of the potential erodibility of the site and the waste rock emplacements, apparent under-estimation of soil erosion potential in EIS and need for erosion hazard assessment prior to commencement of project activities.

Section 3 of Veness and Associates Pty Limited (1994) discusses the implications for erosion, i.e. the erosion potential, of the study area's soils based on the referenced interpretation of standard laboratory analyses. Section 3.3 of that report recognises the generality of the term "erosion potential". Consequently, because "... the simplest way to objectively determine the erosion potential of the study area's soils is to determine their erosion hazard", the report adopted the concept of erosion hazard and its interpretation as described by Houghten and Charman, (1986) (Glossary of Terms used in Soil Conservation -- Soil Conservation Service of NSW) to draw a conclusion in respect of the study area's soils.

4.6.2 Issue : Topsoil/Subsoil Stripping

This issue principally relates to soil management involving amount of topsoil/subsoil, suitability, method and location of stockpiling, erosion control of stockpiles, minimal stripping and handling and soil replacement.

In developing its soil management proposals for the Timbarra Gold Project, the Applicant fully recognised that soil management is one of the most important aspects of any rehabilitation programme. Accordingly, the Applicant sought the input from a range of specialists including Veness and Associates Pty Limited, Anne Clements and Associates Pty Limited and Greenloaning Biostudies, all of whom have extensive experience in mine development and rehabilitation activities, to ensure that the soil management and rehabilitation proposals as identified within the EIS were practical,

economical and, based on their experience, will produce an erosion-free landform with native vegetation communities which emulate communities now present on the site.

The criticism of the proposal to strip only 10 cm of topsoil from the Stage 1 area of the leach pads when 30 cm is shown on the stripping map does not fully recognise the nature of the soil material occurring on the site, the Company's rehabilitation proposals for the decommissioned heaps, nor the nature of the heaped materials once reworked into the nominated final landform.

The selection of a nominal 10 cm stripping depth within the heap leach pad area reflects:

- the variability in the thickness of the "A" horizon identified in Veness and Associates Pty Limited (1994) and the presence of rock outcrop in Soil Mapping Unit "A"; and
- the recommendation of Anne Clements and Associates Pty Ltd that stripping of topsoil be limited to the upper seed-containing section of the profile. Inherent to this advice was the realisation that the heathland vegetation community currently present in much of the area of the proposed heap leach pad could not be established on the elevated landform of the spent ore heaps and that the soil material to be preferentially used for the rehabilitation of the heaps should be sourced in more elevated areas of the Project Site, i.e. from areas developed within Soil Mapping Unit "A", where the vegetation community more closely resembled that proposed for the heaps.

In other words, it was considered realistic to only recover the quantity of topsoil considered necessary to establish a final vegetative cover over the re-contoured spent ore.

The submission has also failed to recognise that the agglomerates within the ore heap on the leach pad are extremely weak and are susceptible to crumbling with only minor mechanical disturbance: the agglomerates readily disintegrate to the component particles if pressed between fingers and will also break down through the impact of large rain drops. The Applicant's proposal to undertake large scale reshaping and drainage works during the rehabilitation of the heaps using earthmoving equipment will therefore destroy the agglomerates within and below the worked material and provide a "subsoil" layer which comprises a range of particle sizes with a water holding capacity far greater than that of the agglomerated ore.

Although the Applicant and its consultants experienced in rehabilitation of mine sites consider that the distribution of a topsoil layer over the reworked agglomerates will enable the rapid establishment of a stable vegetative cover, given the concerns expressed, the Applicant will initially strip both subsoil and the 10 cm of topsoil from the Stage 1 Heap Leach Pad area. Depending on the results of the rehabilitation trials which will include an assessment of the need for subsoil distribution, the Applicant will either extend the stripping of both topsoil and subsoil to the remaining heap leach pad area or cease the practice and use the previously stockpiled subsoil materials for general Project Site rehabilitation.

4.6.3 Issue : Soil Loss Figures not Appropriate

The issue relates to the soil loss figures in the EIS, which have been considered as "not appropriate" for short duration mining and roading operations.

Section 3.3 of Veness and Associates Pty Limited (1994) clearly details how the soil loss values were derived. The Department of Land and Water Conservation (DLWC) (formerly the Department of Conservation and Land Management's (CaLM)) own SOILOSS programme was used to generate the data which was then interpreted using CaLM definitions. Consequently, the procedures followed and the modelling used were those which were routinely used by, and recommended by CaLM at that time.

If the interpretation has been definitionally altered by DLWC subsequent to the report being written, it will be a simple matter to redefine the expected soil loss. However, it will appear that, despite any apparent redefinition, the anticipated soil loss is still “an acceptable soil loss”.

It is accepted by most soil scientists that the SOILOSS computer programme and similar programmes have their limitations and that their use or accuracy are heavily dependent on the input of a range of factors which collectively may cause erroneous assessments of soil loss.

4.6.4 Issue : Erosion Hazard too Low

The issue raised and challenged in this submission is the erosion hazard rating as low for the proposed mining operations and road network.

The derivation of erosion hazard in Veness and Associates Pty Limited (1994) is clearly shown in Section 3.3 and used the CaLM SOILOSS programme which, in part, relies on the results of laboratory analyses. As no data is offered by CaLM in their submission to validate the statement that “initial investigations indicate that the erosion hazard for the proposed mining and roading operation are higher than that indicated by Veness and Associates”, little comment can be made at this stage. Regardless of this point, the Department of Land and Water Conservation accepts that a relevant erosion and hazard assessment can be undertaken and appropriate erosion and sediment controls can be installed.

4.6.5 Issue : Limited Soil Survey Data of Heap Leach Pad Area

This issue relates to the density of soil sampling in the area of the heap leach pad which may not be representative of all soils present under the heap leach pad.

The statement that “the soil survey undertaken by Veness and Associates Pty Limited (1994) provides one full profile description for Soil Mapping Unit “B” on which the Heap Leach Pad is located” is assessed to be inappropriate. The frequency of soil descriptions and sampling are consistent with the Soil Conservation Service (DLWC) specification for soil surveys on mine sites. Section 1.3 of Veness and Associates Pty Limited (1994) states:

“Mapping techniques and soil properties examined are consistent with the specifications determined by the Department of Conservation and Land Management (CaLM) regarding the undertaking of soil surveys on proposed open-cut coal mine sites. In the absence of any other specifications, these were adopted for the Timbarra study area. These specifications require a soil profile description to be undertaken for each 25 hectares of study area or new mapping unit (whichever is greater), and observation holes to be dug at a minimum of one every 6.5 hectares at a frequency to establish consistency within, and boundaries between, soil mapping units. The frequency of soil pits and observation holes undertaken in the study area was compatible with these specifications.”

Furthermore, it should be noted that all of the soils data generated within each Soil Mapping Unit was used to formulate a description for that unit. Table 1 within Veness and Associates Pty Limited (1994) clearly shows that nine soil sites were examined to assess the area covered by Soil Mapping Unit “B” of which three were located within the area to be utilised for the heap leach pad area. It is also noted that Veness &

Associates Pty Limited had been supplied with data collected in that area by Coffey Partners International Pty Ltd.

4.6.6 Issue : Erodibility of the Site in General

This issue addresses the erodibility of the site in general.

Section 3 of Veness and Associates Pty Limited (1994) clearly identifies that there is some potential for erosion and sediment movement to occur on site. However, the report concludes that "providing sensible measures are undertaken to protect the soil resource, there should be little detrimental effects suffered by the soils within the study area as a result of the proposed mining". Details of these measures will be provided in the various Water Management, Erosion and Sediment Control Plans to be prepared prior to the commencement of particular activities.

4.6.7 Issue : Available Soil Storage

This issue addresses the perceived insufficient area on abandoned access tracks for soil and vegetation/debris storage and maintenance of soil viability, requirement for more detail on location and impact of the stockpiles and duration of stockpiling.

Section 2.4.4 of the EIS identified a range of locations suitable for the storage of soil materials which cannot be emplaced directly onto completed surfaces as part of the rehabilitation process, and in Table 2.5, the projected volume of topsoil that will be expected from the development of each area on the Project Site.

- The possible storage locations were selected in order to maximise the use of:
- areas already disturbed on the Project Site, e.g. abandoned exploration and logging tracks and drill pads;

- areas to be disturbed as part of project development, e.g. future leach pad development; or
- completed surfaces, e.g. upper surfaces of waste rock emplacements; and
- to minimise the disturbance of additional areas to provide soil storage capacity.

The actual storage requirement within each of the above areas and the amount of soil which could be directly emplaced on completed surfaces will be a function of the volume of the soil retrieved and detailed operational scheduling which is beyond the scope of the EIS. This additional detail, together with the erosion and sediment control measures to be applied for each of the designated stockpile areas will, however, be presented in the MREMP and/or Water Management, Erosion and Sediment Control Plans to be submitted prior to any on-site development.

However, it is noteworthy that even in the absence of any direct emplacement of topsoil or the use of the former tracks or drilling pads or other areas for stockpiling purposes, the Stage 2 leach pad area alone, i.e. approximately 9 ha, will have sufficient capacity for more than the 110 000 m³ of soil identified within EIS Table 2.5. At a maximum storage height of 1.5 m as recommended by Veness and Associates Pty Limited (1994), 110 000 m³ will require a stockpile area of less than 8 ha.

Contrary to concerns identified, it is not the Applicant's intention to stockpile up to 9 000 m³ on adjacent landholders' property. Rather, Section 2.4.4 of the EIS identifies that this volume will, subject to the agreement of State Forests of NSW and/or the adjacent landowners, be preferentially used to rehabilitate various disturbed areas in close proximity to the Project Site, thereby maximising the benefits available from this resource. In the event that areas on these lands are not available or permission cannot be obtained, these materials will be treated in the same manner as all other topsoil material salvaged from the heap leach pad area.

Soil stockpiling methods (e.g. heights of stockpiles, duration of stockpiling) to be employed on-site are as recommended by Veness & Associates Pty Limited (1994).

4.6.8 Issue : Exploration Activities and Soil Erosion Problems

This issue relates to the apparent admissions of soil erosion problems caused by exploration in the EIS.

At no time does the EIS admit or infer that erosion is a problem. In fact the soil erosion at Timbarra is minimal and every effort has been made to help rehabilitation of disturbance after drilling has ceased.

Comments by the then Soil Conservation Service during a visit by Mr Patric Millar of the Glen Innes office on November 1993 indicated the Applicant's exploration team did a very good road rehabilitation job. All exploration staff involved with road making and rehabilitation have had on site training by Mr Bob Curtis of CaLM, the Regional Field Service Manager, concentrating on drainage during road construction and rehabilitation.

Numerous site inspections were also carried out by officers of State Forests to obtain guidance for track construction methods and drill pad siting. Site visits by State Forests began in 1988 by Mr Michael Combe, the then District Forester, and Mr Ray Butler, Forest Foreman. Succeeding Forestry officers have been continually updated on activities and their guidance sought regarding roading and rehabilitation.

From other Departments, contact has been made for guidance regarding the soil erosion control measures most appropriate and the District Inspector of Mines, Mr Mark Stephens, has made regular visits to site during exploration and development programmes and his directions followed as a matter of course.

It is worth noting that the EIS states in Section 2.12.7 (Page 87):

“The Applicant will progressively rehabilitate disturbed areas once they are no longer in use. This practice which has been already undertaken on numerous exploration tracks on the Project Site...”

4.7 PROJECT DESIGN AND OPERATIONS

4.7.1 Issue : Extent of Application

This issue discusses comments relating to the lack of discussion in the EIS regarding other identified gold deposits on the Project Site, Miserable Swamp and Lushes Hill which could significantly change the scale, intensity and impact of the operation and the possible requirement for a further EIS.

The EIS Section 2.3 (Page 20) and Figure 2.2 presented the Applicant's terminology/approach to each of the areas of mineralisation within the Project Site. Distinction was made between:

- Economic Mineralisation (Big Hill and Poverty Combined);
- Potential Mine Areas (Big Hill South, CP-1, Poverty North, and Poverty Combined Extended); and
- Gold Prospects (Miserable Swamp and Lushes Hill).

The environmental assessment presented in the EIS covered the areas of economic mineralisation and Potential Mine Areas and together form the areas for which approval is being sought to mine. Sufficient information was incorporated in the EIS to enable the environmental assessment of the proposed area of disturbance, waste rock management, and access to each of the Potential Mine Areas. However, it was recognised that additional information on mine planning (together with the necessary erosion and sediment controls) will need to be compiled (and submitted for Government review) before mining will proceed in those areas.

The Applicant accepts and recognises that because insufficient information is available on the Gold Prospects, that should areas be considered as areas of economic

mineralisation in the future, that they will be the subject of further environmental assessment and approvals.

4.7.2 Issue : Geological Significance/Comparison with Drake Mines

This issue relates to the "unique" geological occurrence of the Timbarra gold deposits and the legacy of the Mount Carrington Mine near Drake.

Gold deposits in granite environments themselves are not considered to have geological significance. Rather, it is uncommon for such deposits to only contain gold (and minor silver) with virtually no other metallic minerals present. From a metallurgical point of view, the ore is benign and not capable of yielding any leachates. Development of this deposit therefore represents an opportunity to undertake mining and ore processing and to leave the site in a form which will ensure that a legacy similar to that which occurred at the Drake mines i.e. presence of residual cyanide, acidic water and heavy metals, is not repeated.

Throughout the assessment process, the discussions between the Applicant and members of the Drake and Tabulam communities were dominated by concerns arising from problems experienced at the Drake mines. It is important and invariably overlooked by opponents to the Timbarra Gold Project that there are substantial differences between what has happened at Drake and what is proposed at Timbarra.

The principal differences are:

- (i) The geological setting of the Drake mines is entirely different to that at Timbarra. The Drake mines are located within the andesitic Drake Volcanics which contain two types of mineralisation (Houston, 1993):
 - gold, zinc (sulphides) and silver present in veins; and
 - copper/iron sulphides present in flow-banded intrusives.

Conversely, the Timbarra mineralisation is essentially free gold present in coarse-grained granite without any elevated concentrations of other metals.

- (ii) The abundance of metals within the ore and waste rock at Drake is significantly different to those at Drake. Table 4.10 lists the abundance of the various metals at both Timbarra and Drake, together with the known abundance of such metals in non-mineralized granite. Higher concentrations of copper (49 300 mg/kg) and zinc² (10 000 mg/kg) are recorded at other mines in the Drake area (Thompson, 1973).

TABLE 4.10
Comparative Metal Concentrations in Ore and Waste Rock
at Timbarra and Drake

Metal	Timbarra*		Drake**	Typical Concentration in Granite***
	Mean (mg/kg)	Range (mg/kg)	Range (mg/kg)	
Cu	19.4	BLD-61	10- 500	7-110
Pb	34.7	BLD-124	5-1 000	5-516
Zn	26.6	11-118	40-5 000	100-132
As	38.7	7-135	200-500	5-11
Bi	12.2	1-40	N.A.	0.2-7
Mn	168	22-422	N.A.	49-975
Fe	1.33	1.0-1.7	N.A.	4.9-10.2

Source *** Roster (1972)
 ** Bottomer (1986)
 * Environmental Impact Statement
 N.A. Not Available

- (iii) The recovery of gold that occurred in 1988 and 1989 at Drake was undertaken using a carbon-in-pulp plant that produced a residual slurry which was stored in dams.

The recovery of gold at Timbarra would be undertaken using heap leach technology whereby no tailings are produced and at the completion of the project, no unacceptable levels of cyanide would remain.

- (iv) The Applicant for the Timbarra Gold Project is part of the Ross Mining NL group, a profitable experienced mining company, that is compared to the company that most recently operated the mine at Drake and became bankrupt.

4.7.3 Issue : Big Hill Waste Rock Emplacement Stability

This issue incorporates the potential erodibility and long term stability of the Big Hill waste rock emplacement, steepness of slopes in the area, and perceived lack of geotechnical investigations and mitigation measures.

The Big Hill external waste rock emplacement was designed by Dames and Moore Pty Ltd, specialist Mining, Geotechnical and Environmental Engineering consultants. Their principal objectives were to design an emplacement to contain approximately 3 million tonnes that provided a low maintenance, geotechnically stable landform commensurate with an ultimate nature conservation land use.

It is now the intention of the Applicant, based on their mining/heap leach experience, to slightly decrease the quantity of waste rock to be placed in this emplacement. This will be achieved by marginally reducing the ore cut-off grade. Such a reduction in total volume, will enable the toe of the waste rock emplacement to be relocated on the northern side of Duncans Creek and thereby avoid the need to place any waste rock within Duncans Creek.

It is noted that the waste rock material within the Big Hill waste rock emplacement will comprise fresh, blasted granite with a fragmentation top size of approximately 700 mm and a natural angle of repose of approximately 37° to the horizontal. Such

materials could be placed on the existing slopes without causing any instability within the emplacement.

Given that blasting is an expensive activity, it will also be in the Applicant's financial interest to reduce the power factor, i.e. the amount of explosive required per tonne of waste rock produced in order, to maximise the production of larger waste rock fragments and minimise the production of fines : production of excess fine waste rock particles is the result of cost-inefficient blast design.

4.7.4 Issue : Alternative Locations for the Waste Rock Emplacements

This issue addresses the question of alternative locations for the waste rock emplacements and the provision of additional detail, especially for alternatives that minimise impact on Duncans Creek.

Section 2.13.8 within the EIS briefly discusses the consideration of alternative waste rock emplacements and the reason for the preferred options. It is reiterated that in the case of both the Poverty Combined and Big Hill Open Cut Mines, the design of the project and mine sequencing has attempted to maximise the extent of waste rock backfilling within each open cut. This is also applicable for both CP-1 and Poverty North Open Cuts which will result in all waste rock being placed in the Poverty Combined Open Cut.

As stated in Response 4.7.3, it is now the intention of the Applicant, based on their mining/heap leach experience to slightly decrease the quantity of waste rock to be placed in this emplacement. This will be achieved by marginally reducing the ore cut-off grade. Such a reduction in total volume, will enable the toe of the waste rock emplacement to be relocated on the northern side of Duncans Creek and thereby avoid the need to place any waste rock within Duncans Creek.

Two alternative locations for the Big Hill external waste emplacement were examined by the Applicant's mining consultant, Dames and Moore Pty Ltd. The first location was to the south of the current waste emplacement site. The emplacement site was subsequently moved to the north of this location because the initial site investigated did not have sufficient volume to handle all of the Big Hill Open Cut Stage 1 waste rock, it required haultruck operations on excessive grades and it impacted upon recognised Rufous Bettong habitat.

Only one site for the Poverty Combined waste rock emplacement was considered, it being the closest practical area for truck dumping upon exit from the Poverty Main Open Cut. The site was, however, positioned to avoid the more important vegetation communities.

4.7.5 Issue : Timbarra River Pipeline -- Licencing Erosion and Sediment Control

This issue relates to the impact (especially from clearing) on Protected Lands and Crown Lands, and the requirement for an Occupation Permit for the part of pipeline transversing State Forests, a licence for the pump site on Timbarra River, design and maintenance of pipeline corridor and a water management, erosion and sediment control plan.

The requirements for a Water Licence Application under Section 10 of the NSW Water Act, 1912 and the preparation of a Water Management, Erosion and Sediment Control Plan were both identified within the EIS.

A Water Licence Application under Section 10 of the NSW Water Act 1912 has been lodged with the NSW Department of Land and Water Conservation (Water Resources) seeking to construct and use the water pumping works and associated water pipeline and to take, use and dispose of water. The Department of Land and Water

Conservation (Water Resources) has indicated that it will determine the conditions which will attach to any licence issued following the determination of the Mining Lease Applications.

With respect to the question of erosion control measures along the water pipeline route, the Soil Conservation Service of the Department of Land and Water Conservation has identified that an effective Water Management, Erosion and Sediment Control Plan (WMESCP) should be implemented prior to the commencement of operations, and that the requirement for such a plan should be a condition of development consent and/or should be included as a condition of the Mining Leases. The Applicant concurs with this approach.

4.7.6 Issue : Main Haul Road Detail

This issue relates to the lack of design details and erosion controls in the EIS for the main haul road and the involvement of the Department of Land and Water Conservation (DLAWC) in design and maintenance of the haul road.

As stated in response 4.3.5, an EIS is not intended to be a detailed design document nor should it be required to provide the level of detail sought. However, it is acknowledged that such a level of detail including cross sections and a long section will be required prior to construction to enable a proper assessment of the adequacy of the design and the Applicant's proposal for batter rehabilitation, erosion and sediment control. These design details will be submitted to the relevant Government Authorities, including the Department of Land and Water Conservation, prior to construction, as outlined in the Submission. The question of batter rehabilitation, erosion and sediment control for the haul road will be addressed in the WMESCP.

4.7.7 Issue : Project Access Road

This issue relates to the considered lack of design details of the access road, sediment and erosion control plan and flora assessment; who will be responsible for construction and maintenance and Tenterfield Council's recommendations, impact on Crown Land and vegetation, safety, and the maintenance of public access to Timbarra River via the Poverty Point Fire Trail.

Since the outset of project planning, the Applicant has acknowledged that the existing alignment and formation of Timbarra Road, and more particularly, the Poverty Point Fire Trail to the Project Site will be inadequate for its requirements and will require upgrading to enable the safe passage of project-related and private vehicles. In addition to road upgrading, Section 4.7.1 of the EIS identifies a range of safeguards including speed restrictions, sign-posting, etc. to be employed which will ensure that the impact of project-related vehicles remains within reasonable community expectations and does not impact on other road users.

Under the terms of an Agreement between the Applicant and Tenterfield Shire Council forwarded to the Department of Mineral Resources on the 15th August 1995, the Applicant undertook to reconstruct the access road to the mine site from the Bruxner Highway to Council's standards for Local Roads (generally AUSTRROADS). In addition, the Applicant's road design consultants are to liaise with Council and provide detailed road designs for approval. Council will co-ordinate the Part 5 assessment (under the Environmental Planning and Assessment Act, 1979) of the road upgrading.

On finalisation of design details to Council's requirements, the Applicant will submit a Water Management, Erosion and Sediment Control Plan (WMESCP) for the access road upgrade to the Department of Land and Water Conservation. The Applicant also acknowledges that the consent of the Department of Land and Water Conservation will be required for new sections of road and closing road sections no longer required, and that the concurrence of the State Lands Services and State Forests of NSW will be required in respect to the clearing or lopping of trees on Crown Land.

Prior to the construction of the access road, a flora survey will be conducted along sectors requiring disturbance to the vegetation. Such a survey will include investigations for ROTAP species.

Maintenance of Timbarra Road and Poverty Point Fire Trail will be undertaken by the Applicant on an as needs basis throughout the life of the project. Subsequent road maintenance will be the responsibility of the appropriate Government Authorities. The road will be left in a satisfactory condition at the completion of mining and gold recovery activities on the Project Site.

4.7.8 Issue : Traffic Levels

The issue addresses comments that traffic levels were inadequately described in the EIS, identifies to which roads traffic movements apply, and comments on the under-estimation of traffic increases.

Section 2.11.1 of the EIS clearly states that the access to the Project Site will be from the Bruxner Highway and along the upgraded Timbarra Road and Poverty Point Fire Trail. All transport movements to and from the Project Site as identified in Table 2.19 refer to that route. The Applicant no longer plans to use Nutshell Road (from the Bruxner Highway) to gain access to the Project Site.

Additionally, irregular maintenance vehicle movements will be undertaken along the Poverty Point Fire Trail between the Project Site and the Timbarra River pumping station and of fuel trucks along Long Gully Road from the Bruxner Highway.

The estimates of traffic level increases on the Poverty Point Fire Trail to the north of the Project Site and Timbarra Road were based on:

- an assumed AADT of 40 movements on Timbarra Road, a figure determined on basis of the Applicant's own observations; and
- detailed project information on employee numbers and reagent and supply deliveries.

It was also noted that during periods of timber harvesting, these levels will be likely to increase.

Independent of whether the assumed AADT and the likely percentage increases on these roads are accurate, the conclusions within Section 4.7.2 of the EIS remain valid i.e. the absolute number of vehicle movements will be well within the design limit of the upgraded road network.

4.7.9 Issue : Backfilling the Big Hill Open Cut and Emplacement Capacities

This issue relates to the rehabilitation alternatives for Big Hill Open Cut including backfilling with waste rock and reinstating Duncans Creek and comparisons of potential impacts on flora and fauna.

It has previously been described in Response 4.7.3 that the Applicant proposes a minor change to the Big Hill Waste Rock Emplacement in that the toe of the emplacement will be removed from Duncans Creek.

Notwithstanding this change, backfilling of the proposed Big Hill Open Cut beyond the extent identified within the EIS (i.e. Stage 2 waste rock emplaced within the Stage 1 area):

- could not be undertaken without adversely affecting the overall economic viability of the proposal; and
- will still necessitate the creation of the Big Hill waste rock emplacement and hence necessitate the clearing of the bulk of the area identified (excluding Duncans Creek).

Contrary to comments received, the Big Hill waste rock emplacement has sufficient storage capacity only for approximately 3 Mt, that is, the volume of waste rock to be produced from the Stage 1 development.

The EIS Section 2.7.4.2 notes the area and storage capacity nominated for the Poverty Combined waste rock emplacement is sufficient for the storage of the 0.32 Mt waste rock to be produced from the Stage 1 mine and 0.23 Mt waste rock to be produced from the Stage 2 open cut, but that subject to operational constraints in the field and the degree of in-pit waste emplacement that may be undertaken (if any) the area and/or height of the emplacement may be reduced. Given that the potential for in-pit emplacement will not be ascertained until the mine is in operation, it was considered appropriate that the assessment of impact be undertaken on the basis of the worst case scenario. It should also be noted from EIS Figure 2.9 that the construction method to be employed on the emplacement involves progressive clearing on an as-needs basis rather than total disturbance from the outset. Consequently, a reduction in the extent of clearing, if required could be readily implemented.

4.7.10 Issue : Arsenic from Waste Rock

This issue relates to the disposal of contaminated waste rock, cyanide pollution and risk of arsenic production.

The concentration of metals in the Timbarra ore and waste rock will not impose any risk to the environment. The levels identified within Table 2.11 of the EIS are typical

of the area, including local stream sediments. The waste rock will not contain any process chemicals.

4.7.11 Issue : Dust and Noise from Blasting and Crushing Operations

This issue relates to noise and dust generation from explosives and crushing operations.

Sections 4.1 and 4.4.4.5 of the EIS detail a range of industry accepted controls which will be employed on the Project Site to ensure dust levels from mining, processing and blasting will remain at acceptable levels. The impact of dust from mining and processing is discussed in Section 4.1.5 and the impacts of blasting and mine operations on the acoustic climate are presented in Sections 4.4.7 and 4.4.4 respectively.

Through the application of appropriate controls in blast design as identified in EIS Sections 2.4.7 and 4.4.5.2, the dust can be reduced to very small amounts. For a well-controlled blast, i.e. a blast which maximises fragmentation, the resulting dust usually remains in suspension in the atmosphere at a given location for only a short period. Blast generated dust is also highly transient and, based on experience at other mines and quarries, is usually insignificant compared with dust created by vehicle and equipment and processing activities.

4.7.12 Issue : Project Site Fencing

This issue relates to comments on security fencing around the Project Site.

The Applicant does not consider that fencing of areas other than those identified on Figure 2.2 of the EIS (i.e. those areas containing cyanide solutions) is warranted. Exclusion of vehicles from the active mining areas will be achieved by permanent closure of all existing tracks which will otherwise enable access to project activities.

Further details on proposed safety/security management are provided in the EIS Section 2.8.

4.7.13 Issue : Process Water Detoxification/Neutralisation

This issue relates to the fate and quality of water left on site in the ponds at the close of the project.

The detoxification/neutralisation methods to be applied to all water remaining in the process water ponds on completion of processing and heap flushing activities will be determined on the basis of detailed analyses of the water chemistry and will be subject to the prior approval of the Department of Mineral Resources, Environment Protection Authority and Department of Land and Water Conservation. Discharge of this water to the adjacent wetland system will only be undertaken once these Departments were satisfied that any discharges will comply with the relevant discharge criteria at the time.

4.7.14 Issue : Cyanide Use and Neutralisation

This issue relates to comments on the perceived lack of detail given in the EIS on the cyanide neutralisation process, long term cyanide levels and break-down products.

In the EIS document, Appendix 4, an Information Brochure entitled "Cyanide in the Gold Mining Industry" was included to give readers a summary of most aspects of cyanide use in the gold mining industry. Appendix 3. presents a paper prepared by Mr John McGlynn, the Department of Mineral Resources' Senior Environmental Chemist, which address matters relating to neutralisation of cyanide.

The gold mining industry has seen a century of experience in the use of cyanide compounds for the recovery of precious metals such as gold and silver. It continues to be used as there are no equivalent or more efficient agents or methods available to replace it. The Australian gold mining industry uses in excess of 100 000 tonnes of

sodium cyanide per year. The annual consumption of sodium cyanide for the Timbarra Project will be approximately 700 tonnes.

The cyanide in the solution applied to the leach heaps is very dilute, having a free cyanide concentration of only approximately 170 parts per million or 0.017 per cent by weight. Most of the cyanide is consumed in the gold dissolution and subsequent gold recovery process. In addition, some cyanide is broken down in the heaps by sub-aerial oxidation to carbon dioxide and nitrogen compounds (ammonia and, ultimately, nitrogen dioxide), and by further oxidation processes, (both chemical and biological). Because of this depletion of cyanide in the heap leach cycle, it is necessary to continually add small amounts of make-up cyanide to the leach solution to maintain tenor and leach kinetics.

Another process which causes rapid decomposition of cyanide into oxides of carbon and nitrogen is photo-chemical dissociation caused by ultra-violet (UV) light. This mechanism will play a particularly important role in the dissipation of residual cyanide levels on completion of operations. If required, more rapid neutralisation of cyanide can be undertaken by processes such as alkaline chlorination, oxidation with hydrogen peroxide or oxidation with SO_2 air.

An important consideration in the use of cyanide as a process reagent is the prevention of the formation of hydrogen cyanide gas in the system. In practice, this is accomplished by the addition of lime as a pH buffer so that dissociation of the cyanide under acidic conditions cannot occur.

Cyanide dust and hydrogen cyanide gas levels are monitored on a regular basis in operations and such monitoring is subjected to regular inspections by relevant Authorities. All mixing of cyanide solutions will take place within enclosed fully banded areas with automatic sump pumps to control any spillages which may occur.

As cyanide is a very expensive chemical, costing nearly \$2 000 per tonne, and as the process liquors contain not only cyanide but the precious metals on which the project depends for its profitability, it is not in the interest of the Applicant to have losses of the cyanide solution.

4.7.15 Issue : Solution Drift

This issue addresses cyanide drift from sprinklers on the heap leach pad, implication of drift and prevention.

The use of the cellular leaching method limits the area under active leaching to a maximum of approximately 16 per cent of the total leach pad area. In this way, most drift from the active cells will be likely to affect adjacent cells no longer under active leach but still connected to the solution flow drainage system.

The sprinkler system will consist of wobblers (No. 12 and No. 10) spaced on a 10 x 10 metre pattern along the distribution lines within a cell. Wobblers were selected given the larger drop size which in turn significantly minimises wind drift.

Each wobbler will distribute solution in an area which will overlap the flow from adjacent sprinklers. A solution application rate of up to 6 litres per square metre per hour will be provided. Individual pressure regulators are available for the wobblers to ensure that each wobbler delivers an even amount of solution.

Given the sprinkler layout and low application rates as outlined above, it is not expected that any significant drift of dilute cyanide solution will occur beyond the active cells under leach, let alone beyond the entire heap leach pad area. However, should extreme wind velocities occur which prevent the even distribution of leach

solution over active cells, the system will be temporarily shut down until favourable conditions returned.

Technical papers that refer to concentrations arising from solution drift are included in Appendix . 3 - paper by Mr J McGlynn.

4.7.16 Issue : Detailed Hazard Analyses and Spill Response

This issue relates to the transport, storage, use and disposal of hazardous chemicals, emergency issues, the requirement for a spill response plan and impacts of an accident, leak and/or spill.

- Prior to the commencement of project operations, the Applicant will submit a Final Hazard Analysis to the Department of Urban Affairs and Planning which identifies:
- all hazards associated with the operation;
- an analyses of the hazards on and off-site in terms of their consequences to people, property and the biophysical environment, and their likelihood of occurrence;
- a quantification of risks; and
- a spill response plan developed in consultation with Tenterfield Shire Local Emergency Management Committee.

The Final Hazard Analysis will be prepared in accordance with the Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis.

Potential impacts of any contamination event will depend on the location and nature of the event. The safeguards proposed in the EIS (Sections 2 and 4), together with those identified in this response document (e.g. increasing the storm storage capacity) have been designed to minimise the potential for such events.

4.7.17 Issue : Fine Sediment Clogging Heap Drainage

This issue considers the potential for fine sediment to clog the heap leach pad drainage system.

The agglomeration process prior to the stockpiling of the ore is undertaken to maximise the infiltration of the cyanide solution through the heap and to bind the fine particles to the coarser particles. Fine particle movement through the heap and the possibility of the drainage system blocking is therefore insignificant.

4.7.18 Issue : Fire Risk of Stockpiled Biomass

This issue addresses the ignition of stockpiled vegetation debris and potential for wildfires.

The Fire Protection and Management Plan to be developed in consultation with both the Shire's Bush Fire Controller and NSW Forests will address all fire-related issues associated with the project, including the need for specific measures to be undertaken to minimise the fire risk in stockpiled biomass.

4.7.19 Issue : Solar Power

This issue relates to the use of solar power as an alternative power source for the project.

The average annual power consumption estimate for the Timbarra Project will be 7.3 million kWh and peak demand when all major crushing and processing facilities are operating, will approach 2MW. This power requirement is well beyond the capacity of solar cell technology and current solar - powered turbine technology by two orders of magnitude. It is also noteworthy that the recent trials of solar powered turbines

employing state of the art tracking solar dishes to produce AC mains power at Tennant Creek, could provide only a small percentage of the project's power requirement.

4.7.20 Issue : Environmental Officer

This submission addresses the need for a qualified environmental officer to be appointed on-site.

The Applicant will appoint a staff member on site who will have the responsibility for day-to-day environmental management. This employee will be assisted by specialist consultants on an as-needs basis.

4.8 SOCIAL AND ECONOMIC ASPECTS

4.8.1 Issue : Impact on Existing and Proposed Activities on "Poverty's End" and Increase Accessibility

This issue incorporates concerns expressed regarding the impact on existing and future activities on "Poverty's End" (located 1 km to the west and south-west of proposed development on MLA 4), and increased numbers of people to the area and associated theft and trespassing.

The impact of the proposed Timbarra Gold Project on the "Poverty's End" property will not be detrimental to nor inconsistent with either the existing or proposed future developments and activities outlined in these submissions.

Existing Developments

The Hut on Portion 39, located approximately 3.5 km from the Project Site, will have the access enhanced by the road development to site, allowing a safe all-weather access. Property security will also be enhanced as the access to this property will be able to be monitored by mine staff and other project-related personnel using the road. This will similarly apply to other properties within the area.

Other activities on the property such as stock grazing within fenced areas and plantings of *Eucalyptus olida* spp are located at significant distances from the Project Site.

Existing activities outlined in the submissions as being associated with the existing developments at "Poverty's End" such as forestry, including the harvesting of sawlogs, round and split posts and firewood, and *Eucalyptus olida* harvesting will not be adversely affected. Rather, these activities will be enhanced by the provision of an upgraded access.

Recreational pursuits will likewise be enhanced although specific mining and related activities may, on occasions, be audible. It is noteworthy, however, that during the exploration phase of the project when up to five drill rigs and a bulldozer were operating at any one time, activities were only audible during very still, cold evenings (B. Roach).

Future Developments

Although the development of the project will result in an increased level of activity in the area throughout its operational life, it will not adversely impact upon the future developments identified for the property.

Rather, the provision of an upgraded access which will remain beyond the life of the project will enhance the future development opportunities for the property and others in the area.

4.8.2 Issue : Loss of Access to Portion 57

This issue relates to the loss of access to the Portion 57 grazing licence.

The Applicant will provide access to Portion 57 through its Mining Lease as and when required by the grazing licensee.

4.8.3 Issue : Residence Proximity and Noise

The issue relates to comments on the failure of the EIS to recognise permanent residences located within 5 km of the Project Site.

On the basis of the submissions received, the Applicant accepts that there are currently more residents in the general area of the Project Site than identified within the EIS. However, as none of the residences are located closer to the Project Site than those

used for noise assessment purposes, the comments within the EIS with respect to potential impacts from noise, blasting, visibility, land-use etc. remain valid.

4.8.4 Issue : Economic Costs

This issue incorporates concerns as to the economic costs of the project (such as negative impacts on other industries, e.g. forestry, farming, etc.), greenhouse emissions, infrastructure costs and other environmental community costs.

The socio-economic impacts of the Timbarra Project are addressed in Section 4.9 of the EIS. Included in the project's cost structure are cost estimates for the access roadworks and rehabilitation costs. The question of compensation to State Forests for any damage, loss of future productive capacity or costs of supervision under the Mining Leases will be the subject of a compensation agreement. Other costs associated with compliance inspections are covered by the payments of mining royalties to the State Government and by the application of the "user pays" principal in specific areas.

The question of the social costs of the project by way of "Greenhouse emissions" is a macro-economic, socio-political issue dealt with on a National level by way of policy.

4.8.5 Issue : Future Mining Developments

This issue relates to questions raised on the possibility of future mining projects and magnified environmental impacts.

The likelihood of future mining developments within the area of MLA 4, in close proximity to the Project Site or elsewhere on the Timbarra Plateau will depend on future exploration activity.

As with the possible future development of the Prospects identified within the EIS, any such proposals will be subject to separate environmental assessment procedures.

4.8.6 Issue : Community Benefits

This issue relates to comments on benefits of the project to the community.

The EIS envisages that approximately 75 full-time persons will be directly employed at Timbarra during the operational life of the project. Although professional staff will be relocated from other Company operations, it is anticipated that a significant number of employees will be drawn from the surrounding district. All employees and most contractors not already living in the district could be expected to relocate with their families to the Tenterfield area and participate in the local community. The Applicant recognises it has a responsibility to be a good corporate citizen and ensure a positive contribution to the region is made during the life of the project.

4.8.7 Issue : Economic Viability

This issue relates to the long term economic viability of the project given the volatility of the international gold markets and low grade ore.

The economic viability of the project has been clearly established by the Company through a detailed feasibility study (not a public document). Finance of approximately \$20 million will be required to develop the project which will be provided by the Applicant's bankers after due diligence is completed. A bank guarantee is provided to the Department of Mineral Resources prior to commencement of construction that provides sufficient funds to ensure that any environmental/rehabilitation issue can be fully addressed in the event the Company becomes insolvent and cannot meet its commitments. The parent public Company, Ross Mining NL, is financially strong, making net profits of approximately \$10 million for the last two years, pays dividends to its shareholders, currently employs approximately 130 persons, and anticipates further growth.

4.9 REHABILITATION

4.9.1 Issue : Performance Bond and Monitoring

This issue relates to the adequacy of a bond and conditions to meet rehabilitation costs if required, method of bond determination and adequacy of a community involvement in monitoring.

The Department of Mineral Resources will, as a condition of the Mining Leases, require the Applicant to provide security for the purpose of ensuring the fulfilment of the lease conditions, including the successful rehabilitation of the site to a standard accepted by the Department of Mineral Resources, Department of Land and Water Conservation and other relevant Authorities. In the event of a failure by the Applicant to comply with the lease conditions, the security may be used towards the costs of complying with the requirements.

The MREMP process, including the provision of annual reports, is a mechanism which enables the regular review of the Applicant's ongoing performance. Such a programme requires the documentation of progress and success in rehabilitation, the necessity and nature of ameliorative measures and the presentation of all monitoring results, outlining programmes for the ensuing 12 month period.

The Applicant will maintain an open-door policy and establish a formal complaints protocol for the expeditious investigation into, and reporting on, any complaints received. Details of the complaints protocol will be placed within the local newspaper, provided to all relevant Government Authorities and mailed to representatives of local community groups. Additionally, copies of the Annual Report and the MREMP will be placed within the Tenterfield Shire Council Library following review and acceptance by the Department of Mineral Resources.

The security to be called for by the Department of Mineral Resources prior to mining commencing will be an amount of \$3,100,000.

4.9.2 Issue: Spent Ore Heap Rehabilitation

This issue relates to comments on the success of flushing of the heaps; long term potential for cyanide leachate, inadequate assurance of successful rehabilitation of the heaps and lack of reference to examples of heaps operated and rehabilitated in similar environments.

Prior to rehabilitation activities commencing on the spent ore heaps, the heaps will be flushed to remove the remaining cyanide. This will be undertaken for whatever period is required to achieve a cyanide level of less than 0.05mg/L to 0.01mg/L. Based on metallurgical testing undertaken, achievement of this level will be predicted to occur within approximately in 30 days of commencement of the flushing process.

The technique identified in the EIS Section 2.12.5 for the rehabilitation of the spent ore heaps has been recommended by Anne Clements and Associates Pty Ltd, a consultant with extensive experience in the area of mine rehabilitation, following a review of all relevant operational, biological and edaphic information pertaining to the Project.

The agglomerates within the heap are extremely weak and are susceptible to crumbling with only minor mechanical working. The extensive reshaping of the spent ore using earthmoving equipment will destroy the agglomerates within and below the worked material and provide a layer below the emplaced topsoil which comprises a range of particle sizes with a water holding capacity far greater than the agglomerated ore. The distribution of the organic rich material stockpiled during heap leach preparation, topsoil from soil mapping unit "A" and biomass will further enhance the moisture holding capacity.

It should also be noted that, with the exception of the pH within the heap which will be elevated for some time due to the small amount of cement used in the agglomeration process, the spent ore heap and the waste rock emplacements are similar : both comprise landforms elevated above the surrounding land and will incorporate a mixture of coarse and fine rock particles which will be more permeable than the surrounding country. Although the pH of the spent ore will be elevated relative to the natural soils of the area, the pH will still be within the range identified by Veness and Associates Pty Limited (1994) as acceptable for agronomic purposes. Furthermore, the pH gradually reduce through the flushing effects of percolating rainfall and the organic acids from the breakdown of emplaced biomass.

Although rehabilitation of waste rock emplacements, using the methods identified within the EIS, are widely accepted by both industry and Government Authorities as appropriate, there are no examples of decommissioned spent ore heaps in Australia where there has been a concerted effort in the establishment of native vegetation as is proposed in this project. Furthermore, the limited number of decommissioned heaps are generally located in arid zones and have been irrigated with highly saline groundwater and/or contained sulphide-bearing ore. There are no decommissioned heaps within climatic zones similar to that at Timbarra.

In the EIS, the Applicant identified an intention to establish a trial to determine the necessity for subsoil replacement prior to the development of Stage 2 of the heap leach pad area. Given the concerns expressed by the Department of Land and Water Conservation, the trial will be commenced within 6 months of the commencement of operations using agglomerated waste rock and topsoil and subsoil removed from the initial development of the Stage 1 heap leach pad area. The results of this trial will then determine the necessity for subsequent subsoil stripping over the remainder of the Stage 1 and Stage 2 heap leach pad areas.

Pot trials will also be undertaken to determine the pH sensitivity of the commonly occurring species to be used in the rehabilitation programme. Notwithstanding the occurrence of *Eucalyptus olida* in elevated areas on the Project Site and advice from Mr R. Dyason, these pot trials will also assess the suitability of the spent ore as a growth medium for *E. olida*. Details of the trial will be supplied to the Department of Land and Water Conservation prior to implementation, and the results of the trial presented in the MREMP Annual Reports.

4.9.3 Issue : Rehabilitation of Process Water Ponds

This issue relates to comments on the appropriateness of rehabilitation methods proposed for the process water ponds.

The rehabilitation proposals for the ILS, PLS and BLS ponds as identified in the EIS Section 2.12.6, following cyanide neutralisation, include ripping the pond liner and filling to 1 m of the surface with spent ore, and replacement of approximately 1 m of stockpiled peaty materials and a veneer of seed-bearing branches. Given:

- (i) the similarity between the profile within the former ponds to that prior to development i.e. peaty material and colluvium over sandy residual soils and hard clayey residual soils over weathered rock;
- (ii) the removal of the barrier between the former pond and the natural groundwater table; and
- (iii) that the rehabilitated solution ponds will not be substantially elevated above the pre-existing ground level,

the final landform will therefore be expected to be appropriate for rehabilitation to a community similar to the surrounding vegetation system.

The final rehabilitation proposals for the ponds will, however, be discussed with the Department of Land and Water Conservation prior to decommissioning of the site.

4.9.4 Issue : Post-Mining Storm Pond Storage Dam and Sediment Dam Management

This issue relates to comments on the perceived failure of the EIS to deal with the management and fate of water storage structures left on site at the close of the project, and water quality.

The ultimate management procedures to be applied to each of the above water storages will be detailed in a Decommissioning Plan to be submitted with the last MREMP Annual Report prior to the cessation of activities on the site. For the Storage Dam and Sediment Dam, the plan adopted will be determined in part on the observed behaviour of these structures during the life of the mine and their ability to retain water without additional treatments. It is notable that the Storage Pond was deliberately located within a known kaolinite deposit.

4.9.5 Issue: Seed Collection and Plant Propagation

This issue relates to comments on the collection of seed from local vegetation, storage of topsoil rich in seed and the propagation of plants for rehabilitation.

It is acknowledged that the timing of seed harvesting, and therefore the availability of seed, will not necessarily correspond with the scheduled clearing time for various component areas of the Project Site.

Seed collection programmes in addition to those identified in the EIS Section 2.4.3 will be undertaken on the recommendation of the Applicant's flora/rehabilitation consultant, with the necessity for further broadbased or species-specific programmes

determined following the initial seed collection programme and as part of ongoing monitoring procedures. In line with current industry practice, however, the Applicant will preferentially employ the direct transferral of cleared debris to available surfaces and the collection and spreading of seed bearing biomass as a means of minimizing seed collection programmes. A seed/biomass collection calendar will be developed by the Applicant's flora/rehabilitation consultant. The effectiveness of the seed collection and revegetation programmes will be reported on annually in the MREMP Annual Reports.

Propagation of plant species in addition to those nominated within Greenloaning Biostudies (1995) Section 4.5 (pages 33 and 35) will also be undertaken on the basis of rehabilitation monitoring recommendations.

4.10 CONSULTATION

4.10.1 Issue : Inadequacy of Consultation

This issue relates to comments regarding a lack of adequate community consultation, especially consultation with downstream river users such as the Aboriginal community, and inadequacies of the public meeting.

The community consultation process undertaken during the exploration phase and subsequently, the planning and EIS preparation phases of any proposal are designed to:

- ensure that landholders directly affected by exploration and/or the potential development are aware of the proposal; and
- ascertain if there are any specific issues or areas of concern to the local community over and above those identified in the Government consultation process.

In the case of the Timbarra Gold Project, consultation took a number of forms as foreshadowed within the EIS and significant meetings as documented in Appendix 1:

- informal liaison with local landowners;
- formal discussions and presentations to local landowners;
- meetings with the Government Departments that had responded to the EIS,
- discussions with community groups or their representatives e.g. Aboriginal Land Councils based at Tabulam and Tenterfield, Tenterfield Rural Landcare Committee, Big Scrub Environment Centre, Drake/Rocky River residents; and
- follow-up meetings in November/December 1995 with various community groups to discuss the responses prepared in reply to the submissions lodged commenting on the EIS.

Notwithstanding the above consultation that was undertaken, the Applicant, through Ross Mining NL is aware of the concerns raised in relation to consultation. As a result of this awareness, Ross Mining NL proposes to undertake a programme of community consultation throughout the development and operational stages of the project to ensure that issues of both interest and concern are fully addressed.

4.10.2 Issue: Other Matters

Matters relating to the approach to advertising and accessibility of the EIS are matters that are not the responsibility of the Applicant.

The advertising and the display of the EIS were organised by the Department of Mineral Resources.

The advertising of the lodgement and display of the EIS appeared in the "Land" and "Tenterfield Star" on 29 June and 6 July 1995 and in the "Sydney Morning Herald" on 14 and 21 July 1995. Additional notices appeared in the "Land" and "Tenterfield Star" on 3 and 4 August 1995, respectively, advising of the extension of the display and submission period up to and including 14 August 1995.

The EIS and supporting documents were placed on public display at the Department of Mineral Resources St Leonards (Sydney) and Armidale Offices. The documents were also placed on public display at; the Government Information Centre (Sydney), Environment Centre (NSW) Pty Ltd (Sydney), the Department of Urban Affairs and Planning (Sydney), NSW Government Offices (Inverell), and the Tenterfield Shire Council.

During the second week of August, acting on requests from residents of Drake, the Department of Mineral Resources arranged for copies of the EIS to be placed on

display at the Drake General Store and the Drake Hotel. Additional copies of the EIS were also organised to be made available for local purchase at Drake.

The Department of Mineral Resources exercised its discretion in accepting submissions received after 14 August 1995, providing the residents of Drake and Tabulam additional time to lodge submissions. Submissions were received and accepted by the Department up to and including 31 August 1995.

5. ASSESSMENT OF ENVIRONMENTAL IMPACT

5.1 Introduction

The Timbarra Gold Project has been designed by the Applicant in consultation with a range of specialist consultants in the technical and environmental fields in order to ensure that the proposal is not only technically and economically feasible but also incorporates safeguards and procedures to ensure that the area within and surrounding the Project Site is not adversely affected and that the level of impact meets specified criteria or reasonable community expectations.

The following sub-sections briefly address the predicted impacts on the existing relevant components of the environment once the various safeguards and procedures are adopted. The impacts of refinements to the Project introduced since the submission of the EIS, are also addressed.

5.2 Topography

The proposal will result in a significant and unavoidable modification of a landform which has already been modified by past mining activities.

The Big Hill Open Cut will remain as a water holding void with a water surface of approximately 6 ha.

The Poverty Combined and Big Hill Waste Rock Emplacements will form elevated plateaux and slopes which, with final landscaping and revegetation, will blend in as far as possible with the natural landform on the Project Site. Depending on the degree of in-pit waste rock emplacement achievable, the former Poverty Combined Open Cut will ultimately be either a shallow (2 m deep) water holding depression or a free draining landform similar to that prior to mining.

The re-shaped spent leach heap will remain an obvious feature of the modified landscape.

The summit of Bold Top Mountain will be unaffected by the Project.

5.3 Air Quality

With the exception of dust generation along Timbarra Road in the proximity of the limited residences, the Project will have negligible impact on local air quality. Specific controls such as road sealing adjacent to the two residences fronting onto Timbarra Road and the restrictions of project-related vehicle speeds on Timbarra Road will maintain dust levels at these residences at acceptable levels. Dust levels away from the sealed sections of Timbarra Road will be similar to those generated on other unsealed roads throughout Tenterfield Shire.

The installation of a perimeter bund around the top of the active leach heap and sprinkler shut-off during periods of abnormally high winds will maintain leach solution drift at acceptable levels. Any drift occurring will not have any significant impact on either the flora or fauna due to the unstable nature of the cyanide solution and its rapid breakdown into inert materials within the natural environment.

Fines from blasting or earthmoving equipment and gases and odours arising from the use of equipment and chemicals on the Project will rapidly disperse into the atmosphere.

The Applicant will monitor deposited dust at the "Timbarra" homestead. No other monitoring of air quality is considered necessary given the substantial distance from dust sources to surrounding residences and experience at other mines where comparable safeguards are operated.

5.4 Surface and Groundwater Issues

The Applicant has recognised six principal potential sources of water pollution associated with the Project.

- (i) Surface runoff containing an elevated suspended solids load.
- (ii) Surface water contaminated with process chemicals.
- (iii) Spillages of reagents from the adsorption/desorption plant area.
- (iv) Leakages of process liquors from the leach pad.
- (v) Leakages or overtopping of the process water ponds.
- (vi) Spillages of fuels/oils from the Contractor's area, workshop or during refuelling activities in the open cuts.

Safeguards and management procedures which address each of the above potential sources have been incorporated into the design of the Project.

The proposed water supply system for the Project (i.e. the combination of Timbarra River water extraction, surface and groundwater inflows to the open cuts and collection of water from the leach pad area) will result in a marginal reduction in surface runoff from the site.

Development of the Poverty Combined Open Cut and Waste Rock Emplacement will result in the temporary loss of 7 ha or 1 per cent of the catchment of the Williams and McLeans Creeks for the life of the Project while construction of the Big Hill Open Cut will result in a reduction in the area of the Duncans Creek catchment by 2 per cent for between 16 and 20 years.

In the EIS it was proposed to collect all flows from the Duncans Creek catchment upstream of the Big Hill Open Cut and use the water in the site process system. However, as a result of concerns expressed in the submissions, the Applicant will direct approximately 80 per cent of upstream runoff around the open cut. Though extending the period to fill the Big Hill Open Cut void by 6 to 8 years, this modified approach will ensure the maintenance of environmental flows in downstream reaches.

For the duration of Project Life, rainfall on the heap leach pad area will be collected and diverted to the process water cycle. In the EIS, it was proposed to divert runoff from the upper surface of the rehabilitated leach pad area to the McLeans Creek catchment. However, given the concerns expressed in submissions on the EIS regarding the long term exclusion of these flows from the adjacent wetland area, redirection of these flows to the wetland within the Nelsons Creek Catchment will be undertaken.

The extraction of 235 ML water from the Timbarra River during Year 1 (at a maximum pumping rate of 2.5 ML/day) and the restriction to be imposed within the Water Licence to be issued by the Department of Land and Water Conservation which will limit extraction to days when flows exceed 60 ML, will result in an imperceptible reduction in flows or water levels within the Timbarra River, and have no impact on downstream water users or aquatic biology.

In the EIS, the "closed" contaminated water management system was designed with a storage capacity of 115 ML over and above nominal process water storage volumes within the Process Water Ponds and the Storm Pond. Although this volume was equivalent to that generated from a 1 in 100 year 72 hour rainfall event, daily simulation of storage behaviour over a 100 year period of historical rainfall data showed that on two occasions, prolonged wet periods will have generated a volume in excess of the 115 ML storage capacity. A contingency plan involving the pumping of excess water to the Big Hill Open Cut was developed which could be implemented if required.

In view of the considerable community concern expressed in submissions on the EIS, the Applicant is to increase the storm storage capacity within the Process Water and Storm Pond to 140 ML, thereby catering for a 1 in 400 year 72 hour event and providing a volume more than adequate to contain the runoff from all extended wet periods which have occurred in the 100 year period of historical rainfall. The contingency plan will still remain.

The proposed range of water quality management measures together with the Applicant's implementation of progressive clearing and rehabilitation will minimise any impact of the proposed mining operations on surface water quality and ensure that the water quality criteria identified by the Environment Protection Authority (EPA) are achieved at all times. Detailed designs for each of the water quality measures are to be provided in the various WMESCPs to be produced by the Applicant prior to individual activities being undertaken.

The installation of the Timbarra River pumping station will have a negligible impact on water quality within the river. There will be no significant increase in turbidity levels resulting from the installation of the pipeline and no increase in salinity as a result of its operation.

Hydraulic testing has indicated that the permeability of soils and the bulk rockmass is low and that fracture systems (zones) are poorly interconnected.

Subject to the proper design, construction, monitoring and maintenance of the containment systems for the heap leach pad and process water ponds and given the low permeability of materials (soils and rocks) at the site, the potential for cyanide pollution of groundwater will be minimal. In the unlikely event of Contingency Plan implementation, the low permeability of the basement rock will preclude any significant groundwater contamination prior to the return of the water to the adsorption plant as process make-up water.

With the exception of diesel fuel for equipment operation, substances capable of contaminating the groundwater will not be used within the open cuts. Any fuel spillage that occurs within the open cut will be quickly cleaned up and any contaminated material removed.

Numerical modelling of the groundwater system around the proposed Big Hill and Poverty Combined Open Cuts indicates that, as a consequence of the low permeability of the fracture aquifer system, the decline in the piezometric surface both during and after mining will be very localised.

Although a drawdown in the piezometric surface of in excess of 10 m will occur in close proximity to the open cuts once the open cut faces are developed, the effect will be relatively short-lived. In the area surrounding the Poverty Combined Open Cut, achievement of a post-mining piezometric surface similar to that prior to mining will be expected within one to two years from the completion of backfilling operations. The achievement of the post mining piezometric levels around the Big Hill Open Cut will be more gradual and depend on the period and rate to achieve the final water level within the open cut. Once filled with water, the predicted drawdown around the Big Hill Open Cut will be less than 1 m at a distance of 100 m to the north-west and 2 m or less 100 m to the south and west of the open cut. Elsewhere, no perceptible change from the pre-mining situation was predicted.

Mining at the Poverty Combined Open Cut will have no impact on the shallow water table in the swamp immediately north and west of the heap leach pad either prior to, during, or on completion of mining.

5.5 Soil Management

The Applicant's proposal to undertake progressive removal of the vegetative cover and soil, the preferential direct transfer of topsoil to areas awaiting rehabilitation, the

use of a range of erosion controls and the implementation of progressive rehabilitation will minimise the impact on soil resources on or in the vicinity of the Project.

The positioning of the Timbarra Pipeline on the natural surface within the area of existing disturbance associated with the Poverty Point Fire Trail and the minimal earthworks required for pipeline or pumping station installation will ensure no short or long term impacts from these activities.

5.6 Noise Issues

Activities on the Project Site and/or at the Timbarra River pumping station may occasionally be audible at the nearest residences to the Project but will readily satisfy EPA criteria. The noise associated with traffic movements along Timbarra Road will also satisfy the EPA criteria at the two residences fronting onto Timbarra Road.

5.7 Blasting

The impacts of blasting at all surrounding residences will comply with the statutory limits even under the most adverse meteorological conditions.

5.8 Ecology

5.8.1 Flora

The development of the Timbarra Gold Project will necessitate clearing of up to 80 ha of native vegetation over the life of the Project. Of the ten vegetation communities identified on the Project Site, all but the Blue Mountains Ash Woodland Community will be affected to varying degrees.

All vegetation types incorporating the communities that will be disturbed for the Project are represented elsewhere on the Timbarra Plateau. Based on the degree of this

representation, the significance of clearing the various vegetation communities was assessed by the Applicant's consultants as ranging from nil to moderately high within the Project Site and from nil to moderate on a Local (Timbarra Plateau) basis. On both a Regional or State-wide basis, the impact on all but the Eucalyptus olida/New England Blackbutt Open-forest community was assessed as negligible. The impact on this community was assessed as moderate.

Four plant species of significance occur within the area to be cleared with a further species of significance occurring as a stand within 50 m of the possible limit of the potential Poverty North Open Cut.

In addition to the above direct impacts, a number of potential indirect impacts on vegetation communities and plant species have been identified including edge effects, potential groundwater drawdown effects and impacts from erosion and from the introduction of weeds or plant disease. The safeguards to be employed will restrict these impacts to a minimum.

Vegetation along the proposed pipeline corridor will not be adversely affected. Along the Timbarra Road/Poverty Point Fire Trail, a detailed flora survey is to be undertaken in areas to be cleared, once the road alignment and design is finalised.

It has been concluded by the Applicant's consultants, the National Parks and Wildlife Service (NPWS) and other Authorities that, subject to the implementation of the identified safeguards, management and rehabilitation procedures, the Timbarra Gold Project could proceed without threatening the survival of any vegetation community or species within the Timbarra Plateau or Tenterfield region.

5.8.2 Fauna

Fauna species utilising the habitats within the Project Site will be directly affected by the proposed development as a result of the clearing operations, and some individual animals utilising the disturbed areas may be expected to be lost or displaced over the life of the Project.

All habitats occurring within the Project Site are well represented within the Timbarra Plateau and the area of each habitat affected will be comparatively small compared to the overall habitat availability. The Project will not affect the diversity or species richness of the fauna inhabiting the Project Site.

The proposed activities could result in the loss or displacement or changes in the behaviour of some individual Schedule 12 fauna species but will not be expected to threaten the survival of any population of Schedule 12 species or alter the overall dynamics of fauna population within the Project Site or local area. The safeguards proposed will minimise any adverse impacts.

Installation of the Timbarra Pipeline will have no substantial impacts on fauna habitats. Pumping activities at the Timbarra River will not affect aquatic habitats.

A large proportion of the impacts upon the fauna inhabiting or frequenting the Project Site will be short term. Due to likely changes to the topography and introduction of the lake within the Big Hill Open Cut, habitats additional to those currently present on the Project Site, will be created in the area.

The potential for indirect effects on native fauna by increased predation resulting from the introduction of exotic fauna; habitat degradation through use of the area and increased accessibility; changed fire incidence, and degradation of water quality will be negligible.

5.9 Visibility

Due to the isolation of the site, the visual impacts of the Project will be limited. The site is well screened from the limited residences within the area by forest vegetation and topography.

5.10 Transport Issues

Timbarra Road and the Poverty Point Fire Trail to the Project Site will be upgraded at the Applicant's expense and result in improved safety of the road system for the local residents and road users.

The upgraded Timbarra Road will carry up to 30 project-related vehicles daily, an increase of up to 150 per cent over current levels. Increased traffic levels on the Bruxner Highway and New England Highway will be imperceptible.

5.11 Land Use

The Project will result in the permanent loss of up to 16 ha of State Forest while the opportunity to harvest produce from up to 64 ha of forest will be foregone for periods of between 10 years to in excess of 50 years.

Existing land uses undertaken around the site will be unaffected by the Project.

Alternative access routes will be provided to the public and/or land users within the area of operations.

5.12 Safety

Project activities, if undertaken in accordance with the requirements of the Mines Inspection Act, 1901, and the WorkCover Authority, and as described within the EIS will ensure the safety of all employees, local residents and land users and visitors to the Project.

Improvements to the Timbarra Road/Poverty Point Fire Trail and the intersection with the Bruxner Highway will have a positive impact on public safety.

The provision of a water storage within the Big Hill Open Cut void will be beneficial to future fire suppression activities in the area.

5.13 Archaeology and Aboriginal Issues

The Applicant engaged the services of archaeological consultants Mr J. Appleton and Ms H. Burke to undertake a study of both the pre-European and post-European archaeology of the proposed development.

The pre-European archaeological survey identified no material evidence of Aboriginal sites or relics. However, the summit of Bold Top Mountain, approximately 300 m west of the Big Hill Open cut was identified by an Elder of the Jubullum Community as a potential "Aboriginal Place". A buffer zone of 200 m radius to be retained around the summit of Bold Top Mountain will guarantee the continued physical integrity of the "place".

Numerous historic features were identified on the Project Site but all were assessed as being of low historical, scientific/archaeological and public significance.

5.14 Bushfires

The Applicant is to develop and implement a comprehensive Fire Protection and Management Plan in consultation with the local Bush Fire Controller and State Forests of NSW and appoint a person who will be responsible for fire protection and management on the Project.

6. CONCLUSIONS

In considering the proposed activity by Capricornia Prospecting Pty Ltd (to be now managed by Ross Mining NL) the Department of Mineral Resources has examined and taken into account to the fullest extent possible all matters likely to affect the environment and in doing so has considered all representations received in relation to the Environmental Impact Statement.

The National Parks and Wildlife Service has fully considered the Fauna Impact Statement and all recommended conditions of consent suggested by the Service have been incorporated as lease conditions for the project. Conditions were originally prepared for the former Section 120 licence system, but this has now been replaced by the requirement of the Threatened Species Conservation Act 1995. Essentially the same conditions with some minor additions have now been put forwarded by the Director-General National Parks and Wildlife Service. These conditions have all been incorporated in the mining lease conditions.

Copies of all submissions have been referred to the Department of Urban Affairs and Planning pursuant to Section 113(3) of the Environmental Planning and Assessment Act 1979.

The Department of Mineral Resources, based on the foregoing environmental assessment, is satisfied that the open cut mining and processing of the gold reserves at Timbarra can be undertaken in an environmentally acceptable manner subject to the provisions of adequate environmental safeguards as discussed in this report and the incorporation of appropriate conditions in the proposed mining lease (including special conditions).

The requirement by the Department of Mineral Resources for a Plan of Management to be approved prior to the commencement of mining, is an important tool in ensuring the mine is operated to a high standard of environmental control and has minimal environmental impact beyond the actual mining area. (This plan of Management is

generally known as the Mine Rehabilitation and Environmental Management Plan - MREMP).

The major issues of concern have been the subject of extensive consultation between Ross Mining and relevant Government agencies, facilitated by the Department of Mineral Resources. The issues have all been satisfactorily resolved with in some cases modification made to the original plans in order to achieve improved outcomes.

Ross Mining has also undertaken public meetings and community liaison at Tenterfield, Drake and Tabulam.

While the topography at the mine site will have significant landform modification there is no likelihood of water pollution during or following mining, due to the proposed water management and rehabilitation plans combined with the relatively benign nature of the host rock and waste material. Air quality and noise issues will result in minimal impact, well within EPA guidelines. Subject to the identified safeguards, and management and rehabilitation procedures the project will proceed without creating any long term adverse flora or fauna impacts.

Timbarra Road and Poverty Point fire trail will be upgraded at the applicant's expense and result in improved safety of the road system for local residents and road users. A buffer zone of 200m radius will be retained around the summit of Bold Top Mountain to guarantee continued physical integrity of this area of considerable Aboriginal significance. The water supply at Tabulam will not be threatened by any pollution whatsoever, nor by any lack of water because pumping from the river for the mine cannot proceed when flow is below a relatively high minimum level.

The grant of a mining lease(s) in satisfaction of Mining Lease Application Nos 4 and 5 Inverell does not absolve Capricornia Prospecting Pty Ltd of its responsibilities of obtaining all the necessary approvals, permits and licences required for this proposal. Subject to the grant of a mining lease(s), the Company will be required to obtain all the necessary licences, permits and approvals from Government Departments, Local

Government and Public Authorities that have statutory responsibilities in respect of the development and continued operation of the mining project.

The types of approvals required would also include:

1. all statutory approvals required under the Pollution Control Act, 1970, the Clean Air Act, 1961, Clean Waters Act, 1970 and Noise Control Act, 1975, from the Environment Protection Authority,
2. Section 27 approval, under the Forestry Act 1916, from the State Forest of NSW or the Department of Land and Water Conservation, for any clearing required within Portion 37 in the Parish of Maclean,
3. approvals from the Department of Land and Water Conservation for;
 - a) a pumping licence,
 - b) a licence to divert Duncans Creek,
 - c) licencing of any bores,
 - d) licencing of rock emplacement near Duncans Creek,
 - e) licencing of rock emplacements/leach pad near other creeks,
 - f) permits for creek crossings for any haul roads or tracks proposed,
 - g) Protected Land Approvals, and
4. the necessary approvals required from Tenterfield Shire Council.

7. RECOMMENDATION TO THE MINISTER FOR MINERAL RESOURCES

The Department of Mineral Resources recommends that the Minister for Mineral Resources approve:

- (a) The development of the Timbarra gold mine subject to the conditions of the proposed mining lease, (including special conditions) documented within this report.
- (b) Subject to a separate submission indicating compliance with all legislative requirements, the grant of a mining lease(s) in satisfaction of MLAs 4 and 5 Inverell.

Subject to the grant of a mining lease(s), Capricornia Prospecting Pty Ltd will be reminded of its obligations to obtain all the necessary licences, permits and approvals from Government Departments, Local Government and Public Authorities that have statutory responsibilities in respect of the development and continued operation of the mining project.

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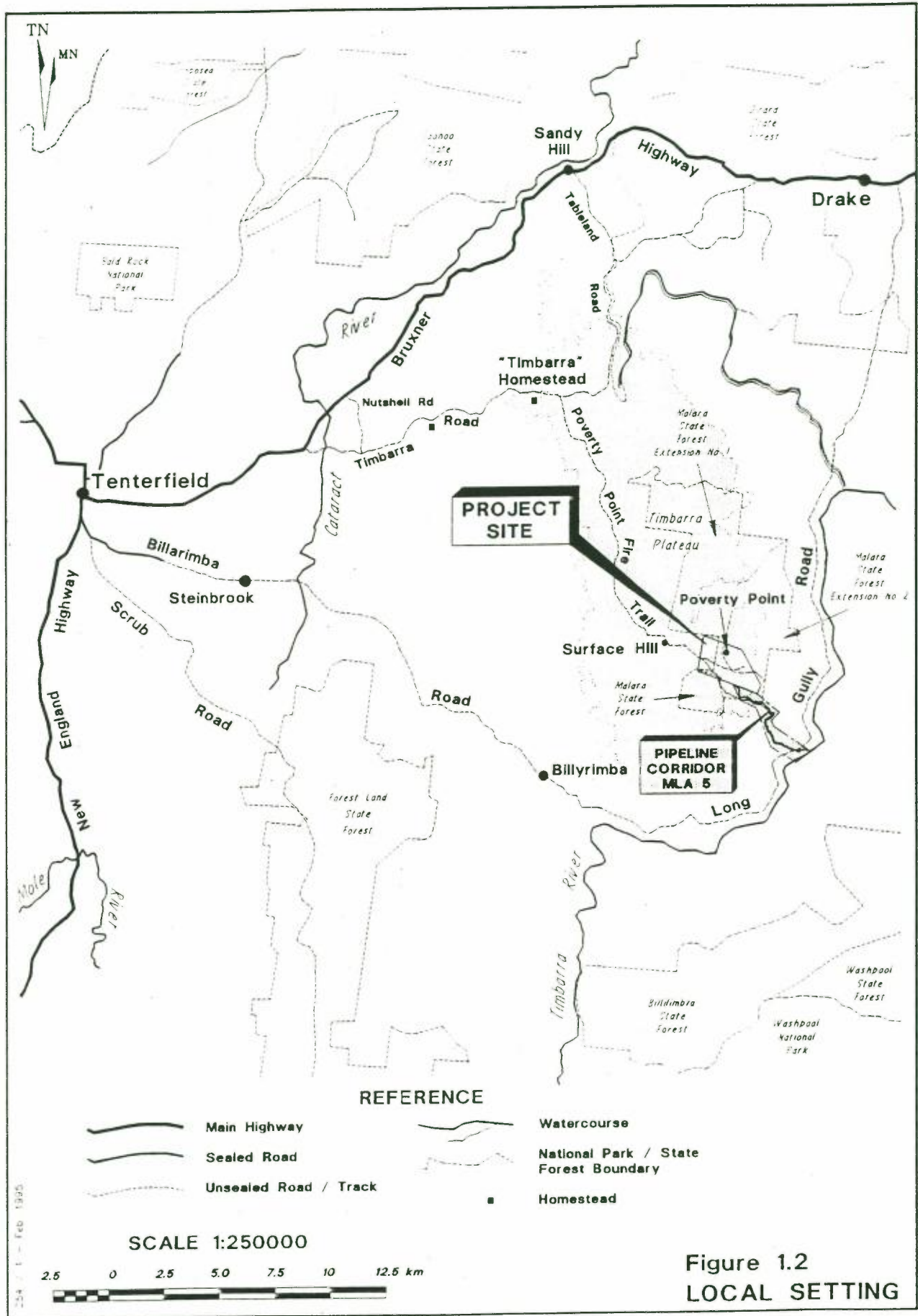
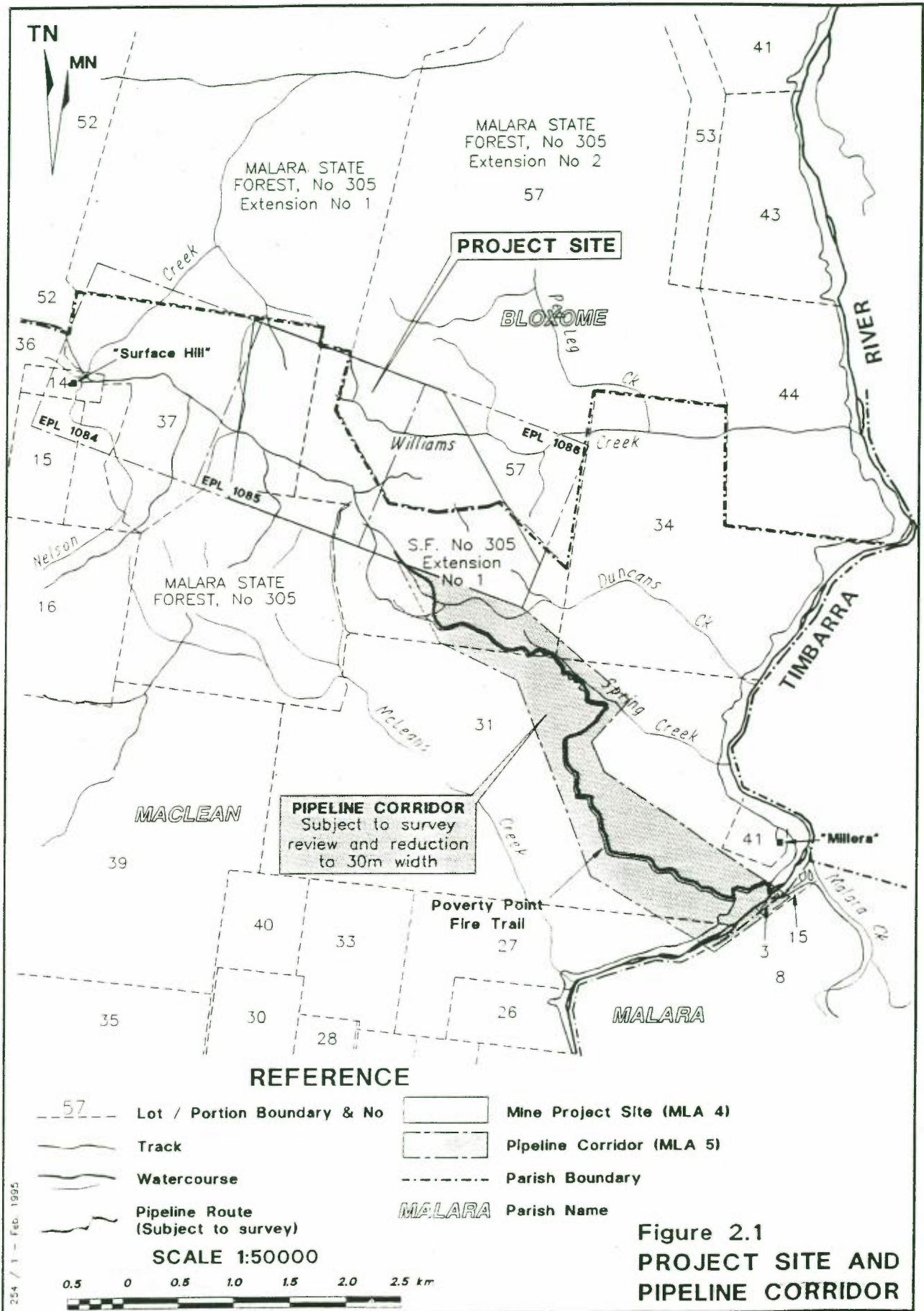


Figure 1.2
 LOCAL SETTING





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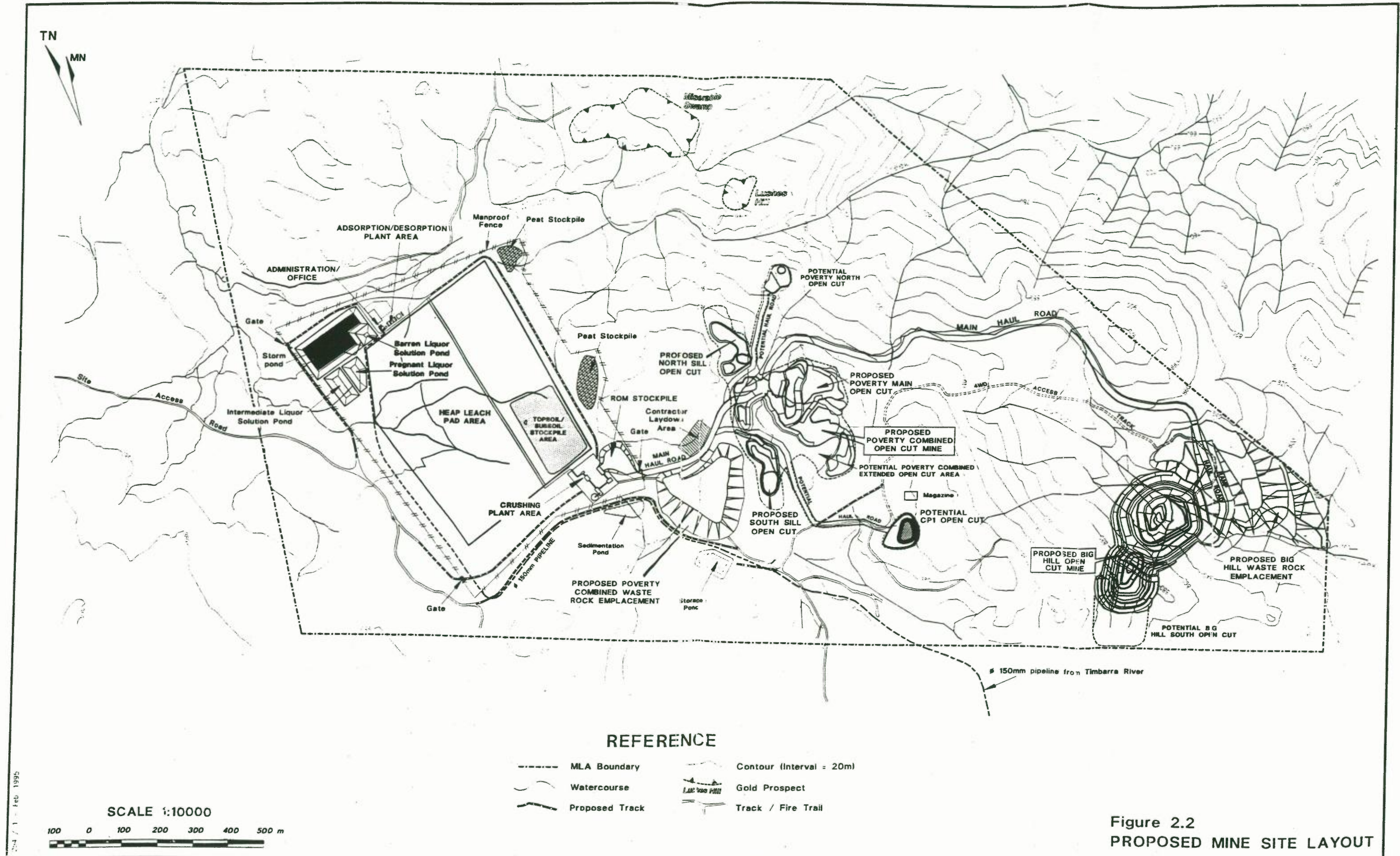
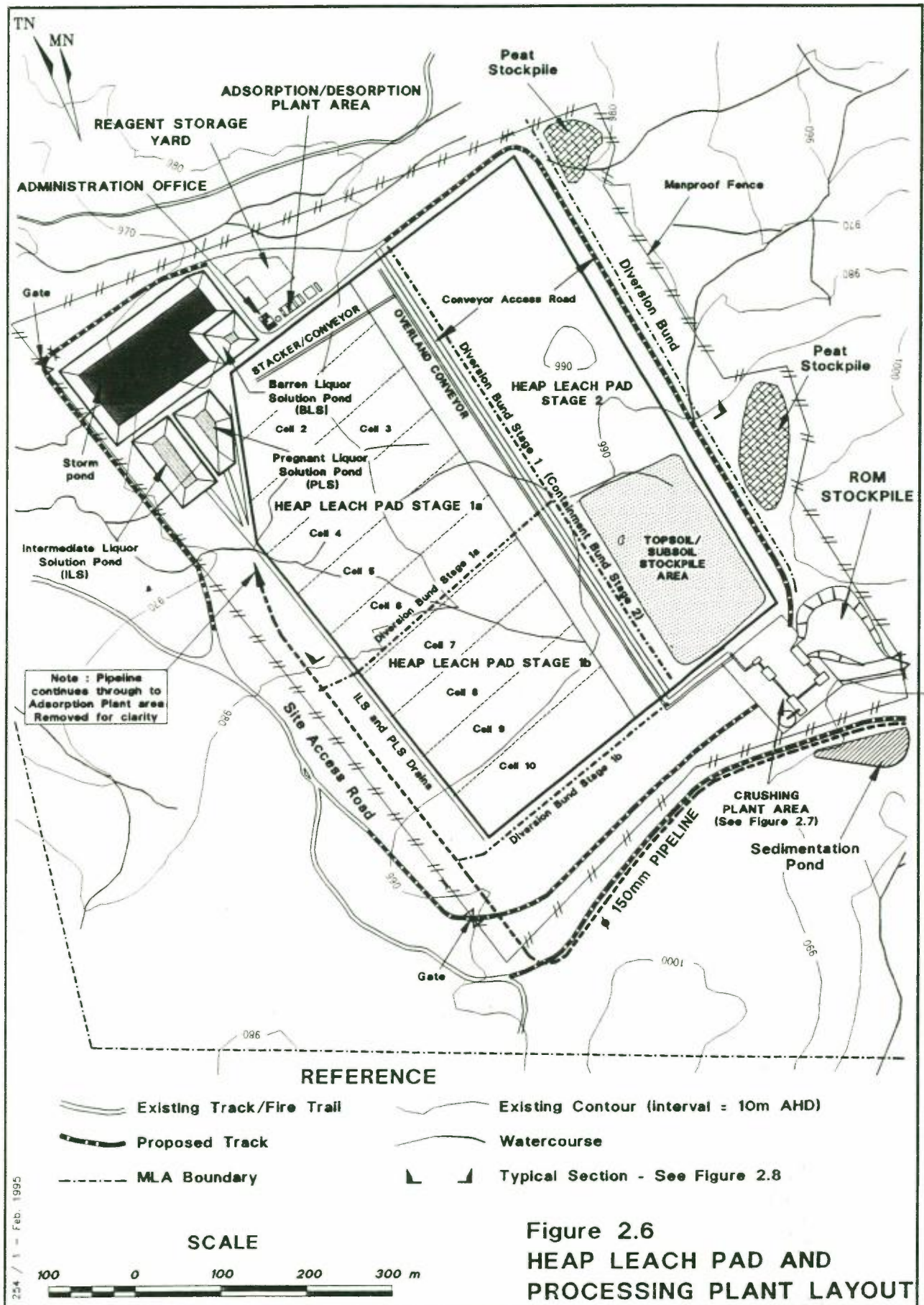
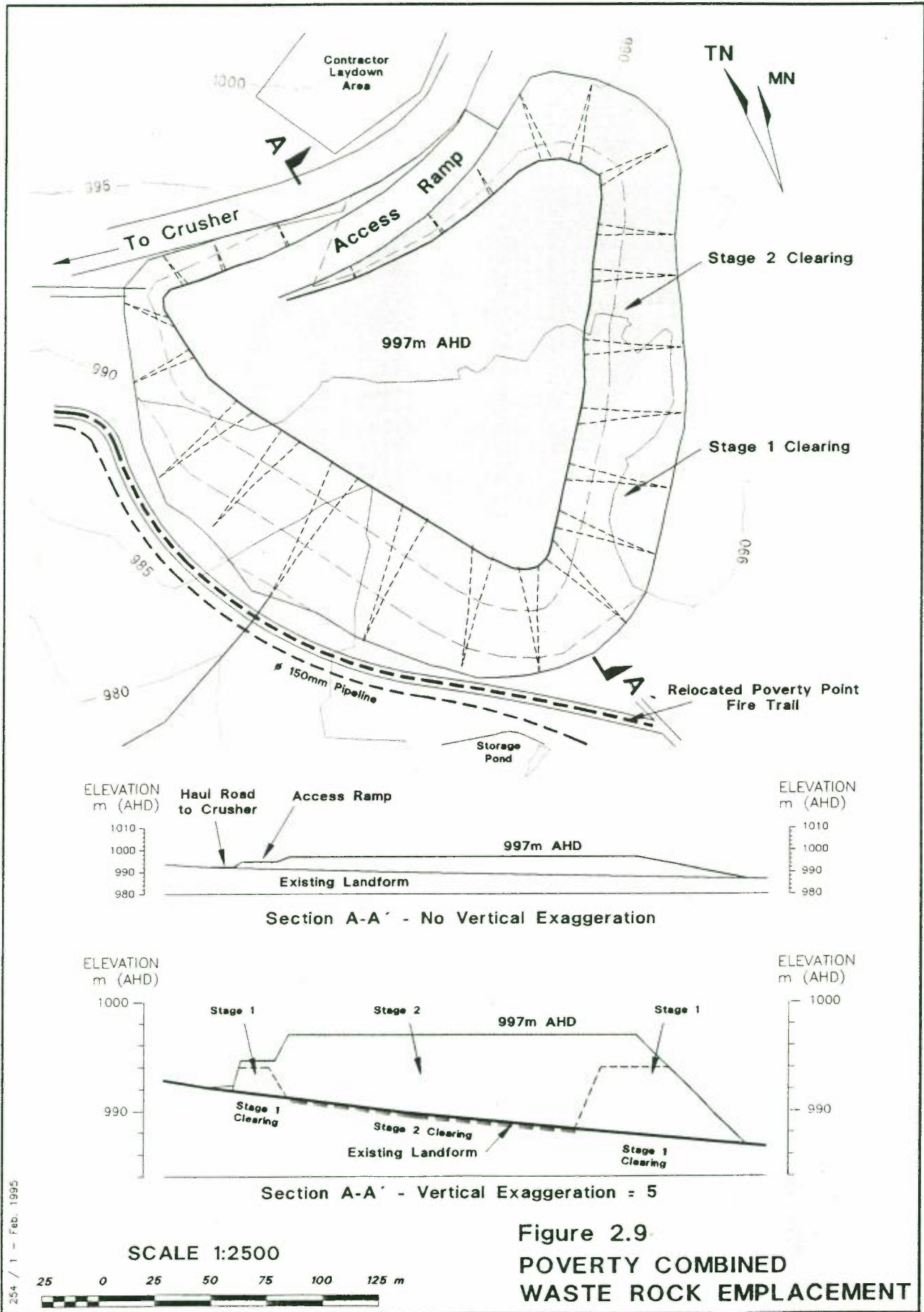
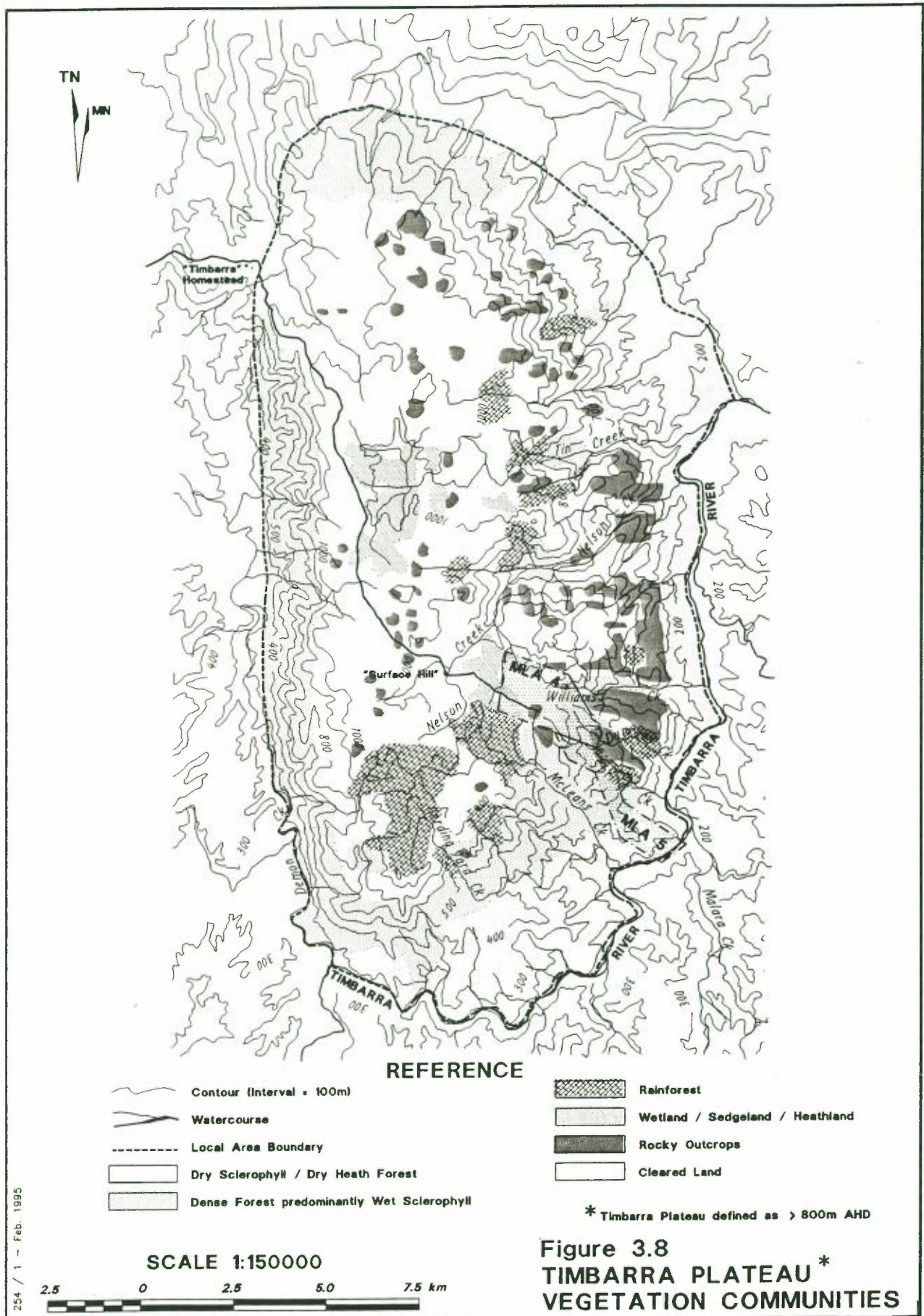


Figure 2.2
 PROPOSED MINE SITE LAYOUT









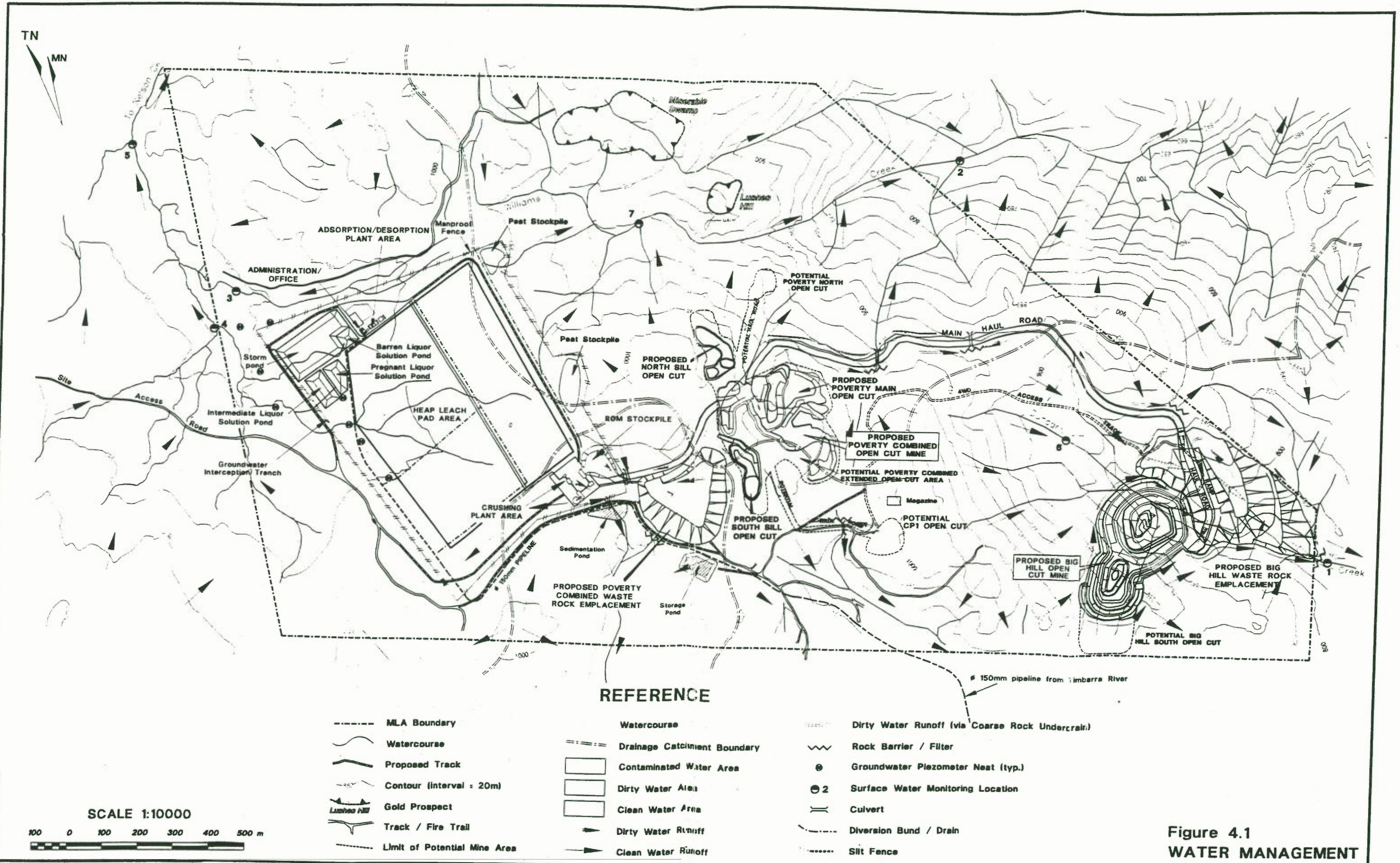


Figure 4.1
 WATER MANAGEMENT

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Part V Chronological process for MLAs 4 and 5 Inverell

- 12/11/93 *Dept of Planning letter of 02/11/93/ advising that Part V of the Environmental Planning and Assessment Act 1979 applies and the Minister for Mineral Resources has been identified as a determining authority.*
- 03/02/95 **Planning Focus Meeting (held on site) attended by**
 Tenterfield Shire,
 Department of Urban Affairs and Planning,
 Department of Land & Water Conservation:
 Water Resources
 Soil Conservation Services
 Crown Land Services
 NSW State Forest
 National Parks and Wildlife Services
 Environment Protection Authority
 Department of Mineral Resources
 Capricornia Prospecting Pty Ltd
 R W Corkery and Co Pty Ltd (Consultants)
 Greenloaning Biostudies
- 10/02/95 *Letter from Department of Planning confirming Part V and the need for discussions with other determining authorities for concurrence for the nomination of a nominated determining authority. Possibility that SEPP 34 may apply.*
- 17/02/95 **Lodgement of Mining Lease Applications 4 and 5 Inverell**
- 18/04/95 **EIS (40 copies) lodged with the Department of Mineral Resources.**
- 24/05/95 *Letter from Minister for Mineral Resources to the Minister for Urban Affairs and Planning requesting affirmative action to be taken to specifically nominate the Minister for Mineral Resources as the nominated determining authority for this proposal.*
- 20/06/95 **Copies of EIS accompanied by invitation to attend Project Meeting (and references) forwarded to:**
 Department of Land and Water Conservation-
 Soil conservation Service - Glen Innes (also Tamworth)
 Water Resources - Grafton
 Crown Lands Services - Armidale
 NSW State Forests - Glen Innes
 Department of Urban Affairs and Planning - Grafton (4 Copies to Sydney)
 Tenterfield Shire (2 copies forwarded)

NSW Fisheries - Grafton
National Parks and Wildlife Service - Coffs Harbour
Environment Protection Authority - Armidale

- 26/06/95 **Minister for Mineral Resources determination that an EIS and FIS are required**
- 26/06/95 *Telephone advice from the Department of Urban Affairs and Planning that agreement is required from the other determining authorities to nominate the Minister for Mineral Resources as the "nominated determining authority". This to be confirmed by letter from Minister for Urban Affairs and Planning.*
- 29/06/95 **Advertisement of Assessment of Environmental Impact Statement.**
Notices appeared in the Land and the Tenterfield Star advising submission period until 2 August 1995.
- 29/06/95 **EIS Placed on display at approved locations which include;**
Department of Mineral Resources - Sydney
Department of Mineral Resources - Armidale
Department of Urban Affairs and Planning - Sydney
Tenterfield Shire Council
Government Information Service of NSW - Sydney
Environment Centre (NSW) Pty Ltd - the Rocks, Sydney
NSW Government Offices - Inverell
- 06/07/95 **Second EIS notices advertised in the Land and the Tenterfield Star advising 2 August date.**
- 07/07/95 *Telephone advice from Department of Urban Affairs and Planning that the advertising appearing in the Tenterfield Star complies however the Land is not classified as a State Paper under the Planning legislation. This may be rectified by advertising in a State Paper. Additional notices also to be placed in the local paper to advise of change of closing date, now 14 August 1995*
- 13/07/95 **Project Meeting held at Glen Innes. Meeting attended by;**
Department of Land and Water Conservation-
Soil conservation Service - Glen Innes (also Tamworth)
NSW State Forests - Glen Innes
Department of Urban Affairs and Planning - Grafton (4 Copies to Sydney)
Tenterfield Shire (2 copies forwarded)
National Parks and Wildlife Service - Coffs Harbour
Environment Protection Authority - Armidale
Department of Mineral Resources

Capricornia Prospecting
R W Corkery and Co Pty Ltd
Ross Mining NL

- 14/07/95 **Advertising of EIS in Sydney Morning Herald advising of proposal and 14 August date**
- 18/08/95 **Advices forwarded to EIS display centres on the extension to 14 August 1995**
- 19/07/95 **Confirmation forwarded to referenced government agencies re closing date of EIS now 14 August 1995**
- 20/07/95 *Letter from Minister for Urban Affairs and Planning advising that the Dept of Planning has been requested to take appropriate action re nominated determining authority.*
- 21/07/95 **Second advertisement in Sydney Morning Herald**
- 27/07/95 **Meeting with Tenterfield Shire/Company and Dept Mineral Resources; (Road issue)**
- 28/07/95 *Letters to Department of Land and Water Conservation (Soil Con, Water Resources) EPA, and National Parks and Wildlife Service seeking agreement to the nomination of the Minister for Mineral Resources as the nominated determining authority.*
- 01/08/95 **“Water Resources” agrees to nomination of Minister for Mineral Resources**
- 03/08/95 **Notice in the Land advising extension of display and EIS periods**
- 04/08/95 **Notice in the Tenterfield Star advising extension of display and EIS periods**
- 14/08/95 **Approval by Director-General to accept late submission up to and including 25 August 1995**
- 14/08/95 **EPA agrees to nomination of Minister for Mineral Resources**
- 15/08/95 **National Parks and Wildlife Service agrees to nomination**
- 31/08/95 **Submissions accepted up to and including this date**

- 01/09/95 All copies of submissions forwarded to Company and its environmental consultant, R W Corkery and Co P/L
- 07/09/95 Meeting re Assessment of submissions received and approach to environmental assessment. Meeting held at St Leonards attended by Capricornia, Ross Mining, R W Corkery and Co, Department Mineral resources, Media Force. Approach agreed to:
 Consultants to assess submissions and objections
 Assessment to be forwarded to Department for review and evaluation
 Department and Company to meet and discuss assessments
 Consultations with individual government agencies that had responded to the EIS (joint approach by Department and Co)
 Obtain feed back from government agencies to response prepared
 Co to advise the community of responses prepared
 Department of Urban Affairs and Planning to be notified of proposed action
 Department of Mineral Resources to acknowledge receipt of submissions
 Determination process
- 27/09/95 Copies of all submissions received forwarded to Department of Urban Affairs and Planning
 Department advised of process to be adopted.
- 09/10/95 Acknowledgments forwarded to all who had responded to EIS
- 09/10/95 Advice received of Ross Mining Merger with Auralia
- 18/10/95 Copies of all submissions received forwarded to EPA (as requested)
- 20/10/95 Meeting to review responses prepared.
 Meeting with Ross Mining and Dept of Mineral Resources
- 27/10/95 Draft responses forwarded to Department of Land and Water Conservation (Soil Con, Water Resources, Crown Land Services), EPA, Forestry and NPWS addressing specific issues addressed by the agency.
- 06/11/95 Meeting with "CaLM" (Armidale)
- 06/11/95 Meeting with Forestry (Glen Innes)
- 07/11/95 Meeting with "Water Resources" (Grafton)
- 08/11/95 Meeting with EPA and NPWS (Coffs Harbour)

The above meeting were held to discuss the responses prepared for submissions received on the EIS

- 07/11/95 Agreement from "CaLM" to the nomination of the Minister for Mineral Resources subject to retaining concurrence role for Por 37.
- 01/12/95 Draft responses to submissions received on EIS forwarded to Dept of Urban Affairs and Planning along with copies of agreement from the other determining authorities to the nomination of the Minister for Mineral Resources as the nominated determining authority. Department of Urban Affairs and Planning requested to take action to gazette nomination.
- 4-7/12/95 Community meetings held at Tenterfield, Drake and Tabulam to discuss the company's responses to submissions lodged commenting on the EIS.
- 8/12/95 Meeting at Department of Aboriginal Affairs -the host department- with representatives from the former Department of Water Resources, Department of Mineral Resources, Ross Mining NL and representatives of the Jabullum Local Aboriginal Land Council from Tabulam. Meeting to discuss issues concerning water quality and supply, native title and associated issues.
- 2/2/96 The Minister for Urban Affairs and Planning nominates the Minister for Mineral Resources as the nominated determining authority for the Timbarra proposal. The nomination was published in the Government Gazette on 2 February 1996 and to be published in the Sydney Morning Herald and Tenterfield Star.
- 6/2/96 Meeting at Tenterfield Council Chambers chaired by the Department of Urban Affairs and Planning. The meeting attended by EPA, NPWS, Department of Land and Water Conservation, Department of Mineral Resources and Tenterfield Shire Council. The meeting was held so as to;
- * provide clarification of the Part V assessment process
 - * provide update on current status of the proposal
 - * provide advice on the progress of the draft Tenterfield Local Environmental Plan
 - * Discuss implication and requirements of the Threatened Species Conservation Act 1995 concerning the savings provisions and the need for consultation
 - * outstanding issues for resolution
 - * agreed approach for finalising assessment and enabling determination.

14/3/96

**In accordance with the provisions of Section 112B of the EP&A Act,
the Minister for Mineral Resources consulted with the Minister for
the Environment.**

TENTERFIELD SHIRE COUNCILTIMBARRA GOLD MINE PROJECTAGREEMENT ON USE OF TIMBARRA ROAD AND ASSOCIATED MATTERS

Agreement shall be for five (5) years or the life of the mine, whichever is sooner or for the duration of the resources referred to in the EIS which don't require a further D.A. at this stage, at which time the Company will be required to enter into a new agreement with Council if mining operations are continuing.

COMPANY'S UNDERTAKINGSROAD RECONSTRUCTION

1. The road is to be reconstructed to generally an 8m gravel formation from the Bruxner Highway to the mine site (approximately 30km) to Council's standards for Local Roads (generally AUSTRADS).
2. The Company's road designers are to liaise with Council and to upgrade where feasible the road to a higher standard than the planned 60 kph design. In some instances a lower standard may be acceptable.
3. Road drainage structures, including the existing timber bridge over the Cataract River are to be upgraded to Council's satisfaction.
4. In consultation with the R.T.A., a type 'A' intersection is to be provided at the junction with the Bruxner Highway with 2 metre wide sealed shoulders (both sides of the Bruxner Highway) for the acceleration/deceleration length for 100km/hr traffic. Sealing for as a minimum 50m along Timbarra Road from the Bruxner Highway is required.
5. The intersection of Timbarra Road and Nutshell Road to be constructed similarly to the junction with the Bruxner Highway with widening of Timbarra Road similar to condition 4 above.
6. The company to consult with Council and R.T.A. concerning Nutshell Road and its junction with the Bruxner Highway. It is envisaged that similar requirements to Timbarra Road and its junction with the Highway may be required unless an undertaking from the Company is given to have all transport to and from the mine via Timbarra Road only.
7. Bitumen sealing on Timbarra Road as indicated in the E.I.S. is to be undertaken to Council's satisfaction.
8. Initially, a 75 mm compacted gravel road base is to be constructed on the road and an additional 100 mm compacted gravel road base is to be added to the road within six months of the first gold pour (i.e. total gravel pavement thickness of minimum 175mm compacted).
9. Company to upgrade and/or widen drainage structures including causeways and replace or extend pipes with precast concrete headwalls at appropriate locations.

ROAD MAINTENANCE

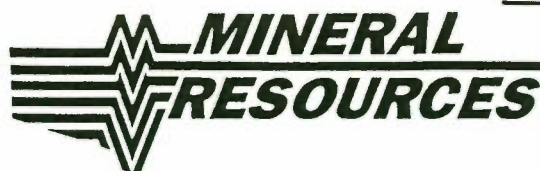
1. That the company agree to provide Council with a suitable form of Bond to the value of \$50,000 to be expended at Council's discretion should the company default on any of the conditions layed down by Council with respect to the maintenance and restoration of the access roads to be utilised by the Company.
2. The Cataract River bridge on Timbarra Road to be upgraded and maintained by the company for the life of the mine and that the company is to have the bridge inspected by a structural engineer prior to work commencing.
3. Timbarra Road from the Bruxner Highway to the Mine site is to be maintained by the Company for the life of the mine including all drainage structures and road-side furniture.
4. That the Company agree to undertake appropriate dust suppression measures by the use of watercarts or other approved techniques if and when required by Council.
5. That the Company at the completion of the agreement undertake to leave the access roads in a safe and good trafficable condition.

OTHER

1. Prior to the commencement of mining operations the Company is to liaise with the Tenterfield Shire Local Emergency Management Committee to discuss emergency issues which may affect the mine and transportation of goods to and from the mine.
2. The Company to liaise with Council's Fire Control Officer in the drawing up of the Bushfire Management Plan for the site.

COUNCIL'S UNDERTAKINGS

1. Council to be responsible for the supply and erection of all signage following design being undertaken by the company.
2. Council to facilitate gravel, water and burn off locations and to provide the company with a preliminary plan of suitable areas prior to the commencement of roadworks.
3. Council to undertake any road resumptions within the first 13 kilometres of Timbarra Road reconstruction if required.
4. Council to undertake the maintenance of the sealed sections of road at cost price to the Company.
5. All maintenance undertaken by Council to be at cost price to the Company.



NSW DEPARTMENT OF MINERAL RESOURCES
 Cnr Joseph Street & Weeroona Road
 (P.O. Box 76), Lidcombe, NSW 2141, Australia
 Phone (02) 646 1644 · Fax (02) 646 3224

CYANIDE HAZARDS AND TIMBARRA HEAP LEACH PROPOSAL

These notes have been prepared to provide a background against which to evaluate potential hazards related to the possible escape of cyanide from the proposed Timbarra heap leach operation.

TOXICITY OF CYANIDE

Animals

Smith and Mudder (1991) report that cyanide prevents animal tissue from using oxygen to support aerobic life processes. The pharmacological pathway involves complexation of iron in the cytochrome oxidase system resulting in depression of the central nervous system.

Cyanide is not accumulated in the body and is readily metabolised. Cyanide is broken down in the body to thiocyanate and excreted in urine. There is no evidence that chronic exposure to cyanide results in teratogenic, mutagenic or carcinogenic effects. Recovery from non-fatal poisoning is usually complete and with no lasting effects.

Ingested Cyanide: Published data by Smith & Mudder (1991), Heming & Thurston (1984), and Reed (1984) report that the mean lethal dosage by ingestion for humans is of the range 1 to 3 milligrams per kilogram of body weight with death occurring within one hour. Long term ingestion of 10 milligrams or less per day (for a person of average weight) is considered to be non toxic. Sax (1979) has published toxicity data for other mammals that suggest toxicity to other animals is similar to that of humans.

For comparison purposes it is perhaps relevant to note that Australian Groundwater Consultants (1988) reports coffee as containing up to 6 mg/L cyanide.

Breathed Cyanide: Sax (1979) reports toxicity data for inhaled gaseous hydrocyanic acid (hydrogen cyanide) as:

- Lowest human fatality recorded: 110 mL/M³ for 1 hour
180 mL/M³ for 10 minutes
- Level at which 50% of rats die: 544 mL/M³ for 5 minutes

Occupational Health and Safety standards require the maximum average level in a workplace to be less than 10 mL/M³. Dizziness and other symptoms may occur at 40 mL/M³. By way of comparison, it is worthy to note that Australian Groundwater

Consultants (1988) also report that cigarette smoke has been recorded as containing up to 1600 mL/M³ of cyanide.

Aquatic Animals

Toxicity of cyanide to fish is usually quoted in terms of its concentration in water. Toxicity to fish varies with fish type and water chemistry but is generally of the order of 0.05 mg/L. (Doudoroff 1976, Reed 1984) That is a level about a thousand fold less than the cyanide level likely to be in Timbarra heap leach water circuit.

It is the potential toxicity of cyanide to fish which determines the customarily accepted criteria of 0.05 mg/L limit of cyanide in water.

Vegetation

Cyanide has been used in the past as a fertiliser and source of nitrogen for the nutrition of plants (Smith & Mudder 1992). There is no available literature which suggests that cyanide is toxic to plants.

CHEMISTRY OF CYANIDE

Natural Degradation

Cyanide is readily oxidised into ammonia and carbon dioxide either from solution or from its gaseous form. It can react with sulphur compounds in soils or other materials to form thiocyanate. Under some conditions it is oxidised to cyanates. It also forms strong complexes with metals such as iron. All these products are reported as benign or very much less toxic than cyanide itself (Sax 1979, Smith & Mudder 1984). Cyanide can be volatilised from solution into the atmosphere as hydrogen cyanide (also known as hydrocyanic acid).

Chemical Degradation

The oxidation of cyanide can also be accomplished by the addition of chemicals. There are a number of propriety treatments (Degussa's peroxide process and Inco's SO₂/Air process) that have been used in the mining industry to rapidly remove cyanide that might cause contamination problems.

HEAP ATMOSPHERIC CYANIDE AND AEROSOL WIND DRIFT

Feigley et al (1984) have undertaken a study where cyanide intake of a range of rodents (voles, chipmunks and other North American species) was monitored adjacent to a cyanide heap leach operation in South Dakota. Both free ranging and caged animals were used in the study. Points emerging from their study were:

- Atmospheric cyanide was measured at an average of 3.8 mL/M³ 2 to 3 metres from the leach pad dropping to less than 0.5 mL/M³ at 20 to 30 metres.

- No behaviour, breeding, demographic or survival impacts on animals were detected. However, caged animals held 3 metres from the leach pad showed signs of cyanide degradation products in urine
- Toxicity literature indicated that rodents would have to be exposed to cyanide levels in excess of 80 mL/M³ in order to be affected.

Conclusions can be drawn concerning the likely impact of the Timbarra Heap Leach Operation on native animals living around or visiting the area surrounding the leach pad.:

- Measurable atmospheric cyanide is likely to be present close to the pad.
- Occupational health and safety requirements to which the company will be held are that average cyanide levels must be below 10 mL/M³
- Heap leach operations throughout the world can and do meet this requirement. Timbarra is not expected to be an exception.
- Occupational health and safety requirements for humans are adequate to protect animals living in the vicinity of the heap leach.
- Precautions to prevent drift of cyanide spray in high winds are as important to meet OH&S requirements as they are to protect wildlife.

THREATS TO BIRD LIFE

Since recent incidents elsewhere in NSW there has been a review of procedures to protect bird life. Revised procedures will most certainly apply to Timbarra.

Overseas research reported and discussed in "Proceedings of Nevada/Wildlife/Mining Workshop" 1990 suggests that standing water containing less than 50 mg/L cyanide is unlikely to result in bird kills. Preliminary evidence suggests that this level may be applicable to Australian birds. The American experience is that where there is no practical alternative to having open water that may contain cyanide above 50 mg/L, covering of exposed water is the only effective way of ensuring birds are not killed.

HEAP LEACH LEAK/SPILL

There are many reactions through which soil can degrade cyanide: carbonaceous material enhances the oxidation of cyanide; cyanide can be attenuated by adsorption by clays, hydrous oxides and other soil constituents. Soil degradation pathways are extensively covered in Smith and Mudder 1991, and Chatwin 1989. While no specific research has been done at Timbarra, the typically acidic soils and subsoils reported to be present can be expected to promptly attenuate any minor spills or leakages. The likely effects of a minor spill of process water at a typical level of cyanide (20-50 mg/l) onto ground outside the containment area at Timbarra are:

- A minor spill or leakage absorbed into the ground will not have a significant (local or more distant) impact on soil or vegetation.
- Animals drinking directly from pools arising from a spill before its cyanide has had time to degrade or soak into the ground may suffer. A 5 kg animal would have to drink at least 200 ml of such water in a short time to suffer harm, A human would have to drink about 2 litres.

- Drinking of water with degraded or diluted cyanide of say 5 mg/L is unlikely to have a significant effect.
- At the concentrations likely to be spilt (20 to 50 mg/L) it would not be possible for an animal to eat sufficient spill-wet vegetation to cause a problem.

Should the spill reach the nearby wetland

- An undiluted and non-degraded spill or leakage would devastate aquatic animals that contacted it, and
- A hundred-fold dilution or degradation of cyanide levels from a spill of 50 mg/L to an effective level of 0.05 mg/L may still have a deleterious effect on aquatic animals.

There are multiple features proposed at Timbarra that protect the wetland from cyanide ingress:

- Lining the pad and water containments with high density polyethylene. The liner proposed is thicker than is customarily used. A high level of engineering design of the soil/clay base and placement/sealing of the liner can ensure integrity of the liner.
- Compacted soil/clay base below the liner which is itself to all intents and purposes impervious and which also has a capacity to absorb and degrade cyanide,
- A drainage system above the liner which prevents the build of a hydraulic head and,
- An interception trench downslope of the containment area which will:
 - intercept any and all leakage/seepage from the pad area,
 - locate and allow isolation/repair of the section of pad from which a leak has occurred
 - enable any leakage/seepage to be returned to the containment area.

By itself each measure gives a high level of security. It would take a failure of all three protection measures before cyanide could escape from the containment area to the nearby wetland or the Nelsons Creek catchment.

The measures necessary to give a high level of protection to the wetland adjacent to the operation also serve to protect the downstream portion of Nelsons creek. Any escape of contaminated water from the mine site to the downstream portion of Nelsons creek would be diluted by flows from other parts of the catchment. The further dilution of Nelsons Creek by the Timbarra River (by between 10 and 100 fold) gives a further level of protection to the Timbarra River against cyanide pollution.

WATER ESCAPE IN AN EXTREME RAIN EVENT

It is proposed that cyanide holding ponds at Timbarra be designed to cope with a 1 in 400 72 hour rainfall event. Ponds proposed are excavations and not subject to risk of failure of dam walls. The Company's hydrological consultants estimate that should overtopping occur in an extreme event, the maximum concentration of cyanide in water that would

escape the contained area is 5 mg/L. Bearing in mind runoff from other parts of the Nelsons Creek catchment, the concentration of cyanide in the water of Nelsons Creek where it joins the Timbarra River would be less than 0.05 mg/L and more likely even less because of the ready degradation of cyanide. The Timbarra River would further dilute any cyanide present by at least a further order of magnitude.

CONCLUSION

Subject to construction and operational strategies as proposed in the EIS, supporting expert reports and subsequent negotiations the use of cyanide at the proposed Timbarra Mine does not put the environment or downstream water users at significant risk.

It would however be prudent for the relevant authorities to impose licence and lease conditions to ensure the proponents adopt high standards of controls.

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Sax, N. I., "Dangerous Properties of Industrial Materials", Van Nostrand Reinhold Company 1979

Smith, A. & Mudder, T., "The Chemistry and Treatment of Cyanide Wastes", Mining Journal Books Ltd, London 1991

Reed 1984 "Cyanide Compounds in Plants and Their Effects on Animals" Conference on Cyanide and the Environment; Tucson Arizona December ; 1984: 47-50.



John McGlynn

5/1/96



NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

PROPOSED POVERTY POINT/TIMBARRA
GOLD MINING PROJECT

DIRECTOR-GENERAL'S
RECOMMENDATIONS REPORT

March 1996

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1.0 INTRODUCTION

On 10 May 1995, the Director-General of National Parks and Wildlife received an application from Capricornia Prospecting Pty Ltd for a licence to "take or kill" endangered fauna consequent to the proposed Poverty Point/ Timbarra gold project.

Section 120 of the *National Parks and Wildlife Act 1974* (NPW Act) provided for the licensing of activities that are likely to "take or kill" endangered fauna. Section 92B(2)(a) of the NPW Act required that an application for such a licence must be accompanied by a Fauna Impact Statement (FIS) prepared in accordance with Section 92D of the NPW Act. Greenloaning Biostudies prepared the FIS dated April 1995 on behalf of Capricornia Prospecting Pty Ltd.

The *Threatened Species Conservation Act 1995* (TSC) amended the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the NPW Act. As a consequence of those amendments the Minister for Mineral Resources, as a determining authority for this project, is required to consult with the Minister for the Environment before issuing consent (section 112B (1) EP&A Act). The Minister for the Environment is required to provide the Minister for Mineral Resources with any recommendations made by the Director-General of the National Parks and Wildlife Service (section 112B (2) EP&A Act). Matters listed in section 112E(a to g) of the EP&A Act must be considered by the Director-General of National Parks and Wildlife Service in making recommendations to the Minister for the Environment.

Under the transitional provisions of the TSC Act and the *Threatened Species Conservation (Savings and Transitional) Regulation 1996* the Fauna Impact Statement prepared for the project is considered to be a Species Impact Statement.

This report outlines the considerations involved in the Director-General's recommendations to the Minister for the Environment regarding the Minister for Mineral Resources' decision to grant a mining lease for the proposed Poverty Point/ Timbarra gold project. This report does not represent a concurrence report for the issuing of the relevant approvals sought by the applicant from the Environment Protection Authority or the Department of Land and Water Conservation.

DEFINITIONS

The following terms are used frequently throughout the report and are defined as:

Threatened Species	means those species listed on Schedules 1 or 2 of the <i>Threatened Species Conservation Act, 1996</i> .
NPWS	means the NSW National Parks and Wildlife Service.
Manager, Northern Zone	means the Manager of the Northern Zone of the NSW National Parks and Wildlife Service.
region	means Timbarra Plateau as defined in Figure 3.8 of the EIS.
project site	means the area covered by Mining Lease Areas no. 4 and 5 Inverell, on figure 2.1 of the EIS
study area	An area approximately 5 kilometres by 4 kilometres surrounding the Project Site.

2.0 SUMMARY OF PROPOSAL

This section of the report presents a summary of the proposal for which consultation with the Minister for the Environment is sought. It briefly examines the environment of the proposed Poverty Point/Timbarra gold project area.

2.1 THE PROPOSAL AREA AND ITS ENVIRONMENT

The project site covers Mining Lease Areas 4 & 5 Inverell (MLA) which are approximately 3.5 km² (400 hectares) in size. It is located approximately 30 kilometres east of Tenterfield and 24 kilometres south of Drake on the eastern edge of the Great Dividing Range. The project site incorporates tablelands, the eastern fall of the Divide, and in the far east, alluvial lowland associated with the Clarence River. This eastern section is part of the Clarence Valley Basin.

The project site comprises both moderately undulating to flat plateau country and steep slopes and gorges. The FIS identified ten naturally occurring vegetation communities within the project site:

- New England Blackbutt Open Forest/ Woodland (Dry Sclerophyll Forest);
- *Eucalyptus olida*/ New England Blackbutt Open Forest/ Woodland (Dry Heath Forest);
- New England Blackbutt/ Red Bloodwood Open Forest/ Woodland (Dry [grassy] Sclerophyll Forest);
- New England Blackbutt/ Tallowwood Open/ Closed Forest (Wet Sclerophyll Forest);
- Tallowwood/ Blue Gum/ Brush Box Open Forest Overstorey - Coachwood/ Corkwood Warm Temperate Rainforest Understorey;
- Blue Mountain Ash Woodland;
- New England Blackbutt/ Diehard Stringybark/ Red Bloodwood Woodland/ Low Woodland;
- *Leptospermum gregarium* Closed Heath/ Sedgeland (Wet Heath/Sedgeland); and
- *Xyris operculata*/ *Lepidosperma laterale* Closed Sedgeland.

The New England Blackbutt Open Forest/ Woodland (Dry Sclerophyll Forest) community is the most widespread community on the project site, occurring on the undulating country and dry ridges. The New England Blackbutt/ Tallowwood Open/ Closed Forest (Wet Sclerophyll Forest) community is also relatively widespread, being associated with the steeper slopes and sheltered gullies. Small patches of rainforest occur in the vicinity of Duncan's Creek, Williams Gully and Billys Gully.

The FIS indicates that the project site has been subject to past disturbance. Gold mining occurred from the 1850s until the early 1900s, with human occupation occurring over a similar period. Logging and grazing activities have also occurred. Part of the project site includes mature hollow bearing trees in forest and woodlands.

The proposed activity will be within the boundaries of MLA No. 4 (Inverell), the pipeline corridor will be contained in MLA No. 5 (Inverell).

Sixteen threatened species on Schedules 1 and 2 of the TSC Act were recorded on the project site and a further 3 in the study area. A further 22 threatened species are considered likely to occur in the study area.

2.2 THE PROPOSED ACTIVITY

The proposal is to undertake open cut mining in two areas referred to as Poverty Combined and Big Hill to extract up to 7.6 Mt of gold-bearing ore, over a project life of approximately five years.

The proposed open cut mining uses conventional drill and blast techniques. Water would be obtained from on-site harvesting of rainwater and pumping from the Timbarra River.

The FIS provides that the main components of the proposal as shown in Figure 1 of the FIS include:

- two open cuts;
- two waste rock emplacements;
- a single leach heap;
- an absorption/ desorption plant area with associated process water ponds;
- a haul road between the crushing plant at the leach heap and the Poverty Combined and Big Hill open cuts; and
- an existing access road to Tenterfield and the Timbarra River.

The above activities have been described in detail in the Environmental Impact Statement (EIS) for the proposed activity.

Access to the project site would be from the Bruxner Highway via an upgraded Timbarra Road and Poverty Point Fire Trail.

The FIS provides that the gold recovery process requires the construction of a heap leach pad covering approximately 36 hectares in the western sector of the project site. A weak cyanide solution is percolated through the heap of agglomerated ore to obtain a gold bearing solution from which the gold is subsequently extracted.

A maximum of 80 hectares of vegetation would be removed by the project. A rehabilitation program has been proposed, with the aim of regenerating approximately 85% of the area to be disturbed to vegetation communities and habitats occurring in the pre-mining environment. Approximately 12 hectares of vegetation will be permanently removed and replaced by water bodies.

3.0 THE DIRECTOR-GENERAL'S RECOMMENDATIONS

This section of the report details the Director-General's recommendations to the Minister for the Environment with respect to the Minister of Mineral Resources' granting of a mining lease for the project.

The Director-General of National Parks and Wildlife Service recommends that the Minister for the Environment agrees to the Minister for Mineral Resources granting the mining leases for the project, subject to the conditions outlined below.

In assessing Capricornia Exploration Pty. Ltd.'s application for a section 120 Licence to "take or kill" endangered fauna the National Parks and Wildlife Service negotiated a number of draft Licence conditions with the company. The company had informally agreed to these conditions. National Parks and Wildlife Service provided these draft conditions to the Department of Mineral Resources on 10 January 1996. The Department of Mineral Resources have incorporated these conditions into the proposed mining lease. In addition to these conditions the Director-General recommends that the Minister for the Environment requests Department of Mineral Resources make it a condition of the Mining Lease that the company implement any additional mitigation or amelioration measures provided for in either the Fauna Impact Statement or the Environmental Impact Statement.

The NPWS recommends that any rehabilitation plans, including plans for the propagation of rare flora, be provided to Manager Northern Zone NPWS for comment.

The NPWS recommends that the management plan for threatened species, as provided for in the proposed mining lease conditions should include management of the flora listed on the Rare or Threatened Plant (ROTAP) database that are not listed on Schedule 1 or 2 of the TSC Act. These species include: *Eucalyptus scias*, *Eucalyptus olida* ssp. *apoda*, *Pultenaea pycnocephala* and *Acacia floydii*.

The NPWS recommends that the proponent should be required to provide the Manager NPWS Northern Zone with copies of any reports of flora or fauna survey carried out on the project site or local area. The proponent should be required to notify the Manager NPWS, Northern Zone of any sightings of additional species listed on either schedules 1 or 2 of the TSC Act.

The NPWS proposes an alternative condition 98 regarding dispute resolution:

"98. In the event that the lease holder and the Manager, National Parks and Wildlife Service, Northern Zone cannot agree on the survey methodologies, results or ameliorative measures required in Conditions 96 and 97, the matter shall be referred to the Director-General (Mineral Resources) for mediation between the parties. If mediation fails to resolve disagreement between the two parties the matter shall be referred by either party to arbitration by a person nominated by the Director of the Australian Museum."

The NPWS believes that any resolution of dispute over survey methods, the interpretation of survey results or ameliorative measures should be arbitrated by some one with extensive experience in this field. NPWS believes that the Director of the Australian Museum is a sufficiently independent authority in this field to nominate an appropriately qualified person.

The Director-General of National Parks and Wildlife recommends that the Minister for the Environment request that the following revised conditions be included in the Mining Lease conditions.

Revised Conditions

Conditions similar to those outlined below were provided to the Department of Mineral Resources by the National Parks and Wildlife Service and have been incorporated into the proposed mining lease conditions.

1. Ameliorative Measures

The proponent should implement the following ameliorative measures:

1.1 Surveys of threatened species

Prior to the commencement of any clearing activities:

- 1.1.1 Surveys on the Timbarra Plateau should be undertaken according to the methods approved in Condition 1.1.2 to ascertain the regional status of the following species:
Hastings River Mouse *Pseudomys oralis*
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*
Stuttering Frog *Mixophyes balbus*
Brush-tailed Rock Wallaby *Petrogale penicillata*
- 1.1.2 The Manager NPWS, Northern Zone should be consulted regarding appropriate survey methods.
- 1.1.3 A written report should be provided detailing the results of the surveys and whether populations of the species listed in Condition 1.1.1 occur or are likely to occur in the region, also a description and assessment of potential threats to those populations. The report should include any further recommendations for amelioration of the impact of the proposed activities as a result of the surveys.
- 1.1.4 If viable populations of the species listed in Condition 1.1.1 cannot be found on the Timbarra Plateau, other than on the project site, site ameliorative measures should be provided.
- 1.1.5 The NPWS Manager, Northern Zone should be consulted before clearing activities occur in relation to threatened species habitat, for the species listed in Condition 1.1.1.

1.2 Eastern Bristlebird

- 1.2.1 Prior to the commencement of any clearing activities, a survey for Eastern Bristlebirds should be undertaken in potentially suitable habitat to ascertain the presence of the Eastern Bristlebird on and around the project site. The NPWS Manager, Northern Zone should be consulted regarding appropriate survey methods. Results should be provided in writing to the NPWS Manager, Northern Zone.
- 1.2.2 If the Eastern Bristlebird is recorded, ameliorative measures should be provided and implemented to ensure the continued existence of the species. Such measures should be approved by the NPWS Manager, Northern Zone.
- 1.2.3 The NPWS Manager, Northern Zone should be consulted before clearing activities occur in relation to the Eastern Bristlebird habitat.

1.3 Square-tailed Kite

An inspection for Square-tailed Kite nests should be undertaken in all suitable habitat where clearing activities are proposed prior to any clearing activities taking place. The surveys should be conducted between August and October, the most likely breeding season. If an active nest of a Square-tailed Kite is recorded, any clearing activities should not occur within a 200 metre radius of the nest until breeding has been completed. If the nest tree itself is proposed to be cleared, consultations with the NPWS Manager, Northern Zone should then occur to determine further management actions.

1.4 Threatened Bats - Yellow-bellied Sheath-tail Bat, Beccari's Mastiff Bat, Eastern Little Mastiff Bat, Golden-tipped Bat, Greater Broad-nosed Bat, Great Pipistrelle, Large Pied Bat, Hoary Bat, Little Bent-wing Bat, Common Bent-wing Bat, Large-footed Mouse-eared Bat, Greater Long-eared Bat, Greater Broad-nosed Bat.

Prior to the commencement of any clearing activities:

- 1.4.1 Surveys for threatened bat species to locate roost and nest sites in areas where clearing activities are proposed should be undertaken. The NPWS Manager, Northern Zone should be consulted regarding appropriate survey methods.
- 1.4.2 Results should be provided in writing to NPWS Manager, Northern Zone.
- 1.4.3 If roost or nest sites of threatened bat species are recorded, ameliorative measures should be provided to NPWS Manager Northern Zone for approval and implemented.
- 1.4.4 The NPWS Manager, Northern Zone should be consulted before any clearing activities occur in relation to roost and nest sites.

1.5 Koala

A search for Koalas and for evidence of Koalas (scratch marks on trees, scats) should be undertaken immediately prior to any clearing activities. If a Koala or evidence of a Koala is

recorded a survey should be undertaken within a 200 metre radius of the sighting to locate (further) individuals. Any Koalas located should be captured by experienced fauna carers and released in suitable habitat in the locality. Clearing activities should not occur within a 200 metre radius of the record until all Koalas have been relocated away from the area to be cleared or until such time as the animal(s) have moved away from the area to be cleared.

1.6 Masked Owl/Sooty Owl/Powerful Owl

Prior to any clearing activities, all old growth/ hollow bearing trees should be inspected to ascertain if they are being used as roost or nest trees. If Masked Owl/Sooty Owl/Powerful Owl roost or nest trees are detected, then clearing activities should not occur within a 200 metre radius of a nest tree and a 100 metre radius of a roost tree before consulting the NPWS Manager, Northern Zone.

1.7 Predator Control Program

Prior to any clearing activities, a Predator Control Program to control foxes and cats on and around the project site should be prepared and implemented. The Predator Control Program should be carried out over the life of the project and should aim to mitigate likely impacts from Foxes, Dogs and Cats on local populations of threatened species; including the Hastings River Mouse and the Brush-tailed Rock Wallaby.

1.10 Threatened Species Management Plan

A Threatened Species Management Plan should be prepared for Mining Lease Area No. 4 (Inverell) and Mining Lease Area No. 5 (Inverell) which are depicted in Figure 2.1 of the EIS. The Threatened Species Management Plan should detail management actions proposed to ensure the protection and enhancement of Threatened Species habitat.

2. Monitoring

An annual monitoring report on the implementation of the ameliorative measures detailed in Condition 1 and the vegetation rehabilitation program should be provided to NPWS Manager, Northern Zone.



ROBYN KRUK
DIRECTOR-GENERAL
NATIONAL PARKS AND WILDLIFE

4.0 CONSIDERATION OF SECTION 112E MATTERS

Section 112E of the Environmental Planning and Assessment Act (EP&A) 1979 details several matters that must be taken into consideration when the Minister for the Environment is providing advice to another Minister who is a determining authority. This section of the report considers matters in Section 112E of the EP&A Act.

4.1 CONSIDERATION OF ANY SPECIES IMPACT STATEMENT PREPARED IN RELATION TO THE ACTIVITY

This section considers any Species Impact Statement prepared in relation to the activity.

Under Section 112E(a) of the EP&A Act the Minister for the Environment must take into consideration any Species Impact Statement prepared in relation to the activity. This section deals with the Species Impact Statement.

Under the savings and transitional provisions of the TSC Act and the *Threatened Species Conservation (Savings and Transitional) Regulation 1996* the Fauna Impact Statement (FIS) prepared for this project is considered to be a Species Impact Statement. As the FIS was prepared under the provisions of the *Endangered Fauna (Interim Protection) Act 1991* discussion of the FIS relates to the requirements of this legislation as well as the TSC Act.

This section gives consideration to the FIS: **Capricornia Prospecting Pty. Ltd. (1995) Flora and Fauna Impact Statement Timbarra Gold Project via Tenterfield**. Prepared by Alison Martin, Greenloaning Biostudies for R.W. Corkery & Co. Pty Ltd.

In considering the FIS the Director-General National Parks and Wildlife Service recognises that no endangered populations, endangered ecological communities or threatening processes

have been listed under the TSC Act, that no recovery plans or threat abatement plans have been prepared under the TSC Act and no critical habitat has been declared under the TSC Act.

REQUIREMENTS OF SECTION 92D(1) OF THE NPW ACT

The substantive matters under 92D(1) of the NPW Act are repeated below in bold lettering, followed by a statement of the FIS's treatment of that matter.

Section 92D(1) (a) and (b) require that the FIS be in writing and be signed by the person who prepared it. The FIS is in writing, and has been signed by the author, A S Martin, B. Sc..

Section 92D(1)(c)(i) requires a full description of the fauna to be affected by the actions and the habitat used by the fauna.

The FIS provides a descriptive profile of the 18 species of fauna listed on Schedules 1 and 2 of the TSC Act recorded within the project site or study area and likely to be affected by the proposed activities. The profiles contain information on the distribution, habitat, feeding, breeding, sensitivity to disturbance, and conservation status of the following species:

Endangered

Hastings River Mouse *Pseudomys oralis*

Vulnerable

Stuttering Frog *Mixophyes balbus*
Rose-crowned Fruit-Dove *Ptilinopus regina*
Glossy Black Cockatoo *Calyptorhynchus lathami*
Powerful Owl *Ninox strenua*
Masked Owl *Tyto novaehollandiae*
Sooty Owl *Tyto tenebricosa*
Tiger Quoll *Dasyurus maculatus*
Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris*
Parma Wallaby *Macropus parma*
Brush-tailed Rock Wallaby *Petrogale penicillata*
Eastern Little Mastiff Bat *Mormopterus norfolkensis*
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*
Rufous Bettong *Aepyprymnus rufescens*
Great Pipistrelle *Falsistrellus tasmaniensis*
Golden-tipped Bat *Kerivoula papuensis*
Common Bent-wing Bat *Miniopterus schreibersii*
Greater Broad-nosed Bat *Scoteanax rueppellii*

Profiles are also provided for Schedule 1 and 2 species of fauna not recorded in the project site or study area but known to occur in the region. These comprise:

Endangered

Black-striped Wallaby *Macropus dorsalis*

Vulnerable

Brush-tailed Phascogale *Phascogale tapoatafa*
Red-legged Pademelon *Thylogale stigmatica*
Beccari's Mastiff Bat *Mormopterus beccarii*
Yellow-bellied Glider *Petaurus australis*
Squirrel Glider *Petaurus norfolcensis*
Koala *Phascolarctos cinereus*
Troughton's Vespardelus *Vespardelus troughtoni*
Little Bent-wing Bat *Miniopterus australis*
Large-footed Mouse-eared Bat *Myotis adversus*

NPWS considers that the following fauna species for which profiles have not been documented are likely to be affected by the proposed activity and full descriptions of these should also have been included:

Endangered

Bush Thick-knee *Burhinus magnirostris*
Regent Honeyeater *Xanthomyza phrygia*

Vulnerable

Peppered Frog *Litoria piperata*
New England Tree Frog *Litoria subglandulosa*
Yellow-bellied Mountain Frog *Philoria kundagungan*
Square-tailed Kite *Lophoictinia isura*
Turquoise Parrot *Neophema pulchella*
Eastern Bristlebird *Dasyornis brachypterus*
Painted Honeyeater *Grantiella picta*
Long-nosed Potoroo *Potorous tridactylus*
Large Pied Bat *Chalinolobus dwyeri*
Hoary Bat *Chalinolobus nigrogriseus*

The main habitat types on the project site, their characteristics and notes on their distribution within the project site are provided in Table 7 of the FIS.

Section 92D(1)(c)(ii) requires an assessment of the regional and state wide distribution of the species and the habitat to be affected by the actions and any environmental pressures on them.

The FIS provides that the boundary between two major biogeographical regions, the Macpherson Province and the Hawkesbury Province, occurs within the general vicinity of the site. The corresponding north coast and northern tablelands botanical divisions have been located five kilometres to the east of the project site.

The regional and state wide distributions of the habitats present in the Project site have not been addressed in the FIS.

Descriptions of the regional distributions of threatened species known or likely to occur in the Project site are provided in species profiles and illustrated on a map in the FIS showing

known records in the Tenterfield 1 : 100 000 topographical map sheet area. No detailed assessments of the regional distributions are provided in the FIS. Distributions of the species within NSW are briefly discussed in the species profiles.

In considering the total number of species recorded for the project site with respect to the total number of species recorded in the Tenterfield Forestry Management Area (70% of species recorded in the Management Area are recorded on the project site), and taking into account the relatively small size of the project site (400 hectares), the FIS rates the species richness within the project site as comparatively high at a regional level.

Section 92D(1)(c)(iii) requires a description of the actions and how they will modify the environment and affect the essential behavioural patterns of the fauna in the short and long term where long term encompasses the time required to regenerate essential habitat components.

The FIS provides that the proposed activity will involve mining by an open-cut method using conventional drill and blast techniques. Ore and waste rock from the open cuts would be loaded into off-road rear haul trucks with a hydraulic excavator. Ore would be delivered to the runoff mine stockpile adjacent to the crushing plant whilst the waste rock would either be placed in two contoured waste rock emplacements in close proximity to the open cuts or used as backfill within the open cuts.

Gold would be extracted from the mined ore using the heap leach method, which involves crushing the ore to make the gold more accessible, then mixing with cement to bind together the very fine particles generated during crushing and handling. The agglomerated ore would be irrigated with a weak cyanide solution which percolates through the heap, dissolving the gold as it moves downward. The gold-bearing solution would be collected at the base of the heap.

Gold would be recovered by placing the solution through tanks or columns of carbon. The gold would leave the solution to adhere to the carbon. The gold would then be removed from the carbon and after further processing would be poured into moulds to form gold bars.

The main components of the project include:

- two open cuts;
- two waste rock emplacements;
- a single leach heap;
- an absorption/ desorption plant area with associated process water ponds;
- a haul road between the crushing plant at the leach heap and the Poverty Combined and Big Hill open cuts; and
- an existing access road to the Tenterfield and Timbarra River.

Direct impacts will include clearing of foraging and shelter habitat and direct loss of individuals. Other potential impacts on endangered fauna are listed in the FIS as:

- increased level of predation through introduction or encouragement of the introduction of exotic fauna species, in particular predators such as the Fox and the Feral Cat;

- increased or altered incidence of fire leading to modification of fauna habitats;
- general degradation of fauna habitats through use of the area and increased accessibility;
- degradation of habitat through stress on vegetation related to such factors as edge effects adjacent to mining operations; and
- degradation of water quality through sediment laden run-off and associated habitat degradation.

Impacts of the proposed activity on each of the fauna species recorded within the site have been discussed under section 5.5.2.2 of the FIS.

Section 92D(1)(c)(iv) requires details of the measures to be taken to ameliorate the impacts.

The FIS provides that rehabilitation procedures will be undertaken progressively to provide a low maintenance site in the long term.

The FIS proposes a range of general safeguards and management procedures to maintain the faunal species diversity on the project site. These include:

- Direct disturbance to natural bushland areas would be restricted to those areas defined as proposed development areas. Any potentially sensitive habitat would be marked and fenced to ensure protection.
- The removal of any old growth trees would be avoided except where it is essential for the proposed operations. Where it is essential; as is the case for a small section of the Big Hill open cut, trees would be checked for signs of use as habitat trees.
- Progressive rehabilitation to limit the time any areas are left in a disturbed state. Rehabilitation should proceed from the onset of the mining operation with closure and revegetation of unwanted tracks with topsoil from the current operation. The rehabilitation of the Main Poverty Pit area could, for example, at least be partially completed in the first year of mining. Unnecessary disturbance of fauna habitat should be further avoided by storing most of the overburden on already disturbed areas like exploration tracks as well as refilling worked areas of the mine pits.
- Rehabilitation would be directed to reinstate previous landforms, main vegetation types and vegetation community structures to conform with existing habitat characteristics that favour threatened fauna species.
- It is recommended that a feral animal monitoring program be implemented and any incidence of feral animal sightings during the operation are reported. If feral predators are found to be increasing, then an appropriate control program would be implemented.
- Prior to any clearing operations the proposed clearance area would be traversed on foot to ensure that no mobile ground fauna such as the Rufous Bettong or Parma Wallaby were present.

- Vehicle speed along access roads and the haul road within the project site would be restricted to minimise the potential for road kill hazard for fauna. The CALM's guidelines for protected lands to ameliorate the impact on threatened forest fauna should be used wherever possible.
- The monitoring of the impact of the proposed activity on potentially sensitive threatened species on the project site should be continued. Losses of any individuals of such species should be reported as soon as possible to NPWS and any adverse impact minimised to the extent practicable. An annual review of the operational procedures of the mine should be incorporated into the management program to explore further ways to minimise, if possible, any adverse impact on sensitive threatened fauna.

Specific ameliorative measures are proposed for Schedule 1 and 2 species occurring within the project site. These are summarised in Table 20 of the FIS, and include pre-clearing surveys, trapping and relocation, inspection of old growth trees and buffers around nest sites, protection of creek and gully habitat.

Pre-clearing inspections of hollow trees are proposed for threatened fauna in the project site. The FIS does not specify how this will be conducted for threatened bats, and does not address ameliorative actions for threatened bats that are located in trees that will be cleared.

Section 92D(1)(c)(v) requires details of the qualifications and experience in biological science and fauna management of the person preparing the statement and of any other person who has conducted research or investigations relied upon.

The Curriculum Vitae of Alison Martin, who undertook the flora and fauna survey of an area of the proposed gold mining operation, is included in the FIS. Ms Martin was assisted by Jason Anderson (Anderson Environmental Consultancy), and specialist surveys were provided by Sally Townley (Southern Cross University), Terry Tweedie (State Forests), and Dr. Darren Quin (University of New England). Peer reviews of flora, fauna and Hastings River Mouse components were undertaken by Dr Anne Clements (Anne Clements and Associates Pty Ltd), Dr Leong Lim (Countrywide Ecological Services) and Sally Townley respectively. Curriculum Vitae of these assistants and specialists have not been provided.

THE DIRECTOR-GENERAL'S REQUIREMENTS

The Director-General's Requirements for the proposed mining project were issued by NPWS to RW Corkery & Co Pty Ltd Geological and Environmental Consultants on 3 October 1993. NPWS is satisfied that the FIS has substantially complied with the Director-General's requirements.

In addition to the requirement of Section 92D(1)(c)(i) the Director-General required:

A fauna survey is required to be conducted in the area proposed for mining operations and surrounding areas likely to contribute to fauna habitat (study area). Sampling

methodology should specifically target endangered species known or likely to occur in the study area. Previous fauna studies may be incorporated as part of this work.

Fauna sampling was undertaken to target avifauna, mammals, amphibians and reptiles. The methodologies employed included standard methods used to target endangered species known or likely to occur in the study area. The methodologies are outlined below.

A full description of the methodology used in the fauna survey (eg. dates of survey, weather conditions, number of traps, configuration of traps etc.). Identification of reptiles, frogs and bats should be confirmed by a recognised authority (eg. Australian Museum) for species of taxonomic uncertainty.

The FIS provides that field studies for fauna in the study area commenced in mid November 1993 and extended until January 1995. The FIS provides that the following methodologies were applied for the respective fauna groups:

Avifauna

- General observations.
- Bird counts.
- Owl call playback.
- Pigeon call playback.
- Call identification.
- Spotlighting.

Mammals (excluding bats)

- Small mammal trapping - Small Elliott traps.
- Cage traps.
- Hair tubes.
- Scat collection.
- Other presence indicators.
- Spotlighting.

Bats

- Harp traps.
- Mistnetting.
- Ultrasonic call detection (tapes sent to Glen Hoye, FBN Bat Surveys, for analysis).

Amphibians

- Call recognition.
- Taping of frog calls (tapes analysed by Glen Ingram, Queensland Museum).
- General observations and records of any species identified.
- Listening to taped calls of Schedule 12 species known to occur in the area, and listening in the field for similar calls.

- Searching for animals at sites where calls were heard and collection of live individuals for identification.

Reptiles

- Opportunistic observations.
- Systematic reptile searches.
- Indirectly through specimens being captured in traps.
- Information from local residents/ site workers.

In addition to the requirement of Section 92D(1)(c)(ii) the Director-General required:

A description of the local distribution and abundance of endangered fauna known or likely to occur in the study area, and any environmental pressures on them and their habitat.

Eighteen TSC Act Schedule 1 and 2 fauna species were recorded in the study area, of which 15 were recorded in the project site. The local distribution and abundance of these species and other species likely to occur on the site, and the environmental pressures on the species, are described in Section 5.4.1 of the FIS. Figure 6 of the FIS shows the distribution of Schedule 1 and 2 fauna recorded within the project site.

The FIS provides that a number of impacts associated with past uses on the study area remain evident. These include:

- previous gold mining;
- settlement of the area from the 1850s to the 1940s;
- logging since the 1830s, the major product being hardwood sawlogs;
- grazing for approximately the past 50 years; and
- altered fire regimes.

A description of the habitats and potential habitats of endangered fauna in the study area, describing habitat distribution within the study area and local distribution of these habitats. Habitat critical to essential behavioural patterns of the endangered species should be identified.

Eight major fauna habitats were identified as occurring on the project site:

- Dry Sclerophyll Forest/ Woodland;
- Dry Heath Forest;
- Wet Sclerophyll Forest;
- Rainforest;
- Massive Granite Outcrops;
- Moderate Granite Outcrops;
- Wetland; and
- Grassland/ Sedgeland/ Heathland.

The rainforest habitat was assessed by the FIS as being the highest value habitat, exhibiting structural diversity, maturity of tree growth, presence of potential ground shelter sites, and a moderate to high number of tree hollows, as well as being known habitat for a number of Schedule 12 species. The FIS provides that a substandard expanse of rainforest occurs in the nearby Malara State Forest, and a larger tract of similar rainforest occurs outside the project site immediately to the west, predominantly on freehold and some grazing leasehold property.

According to the FIS, wetland systems are restricted in extent in the Timbarra Plateau, covering approximately 650 hectares. A wetland system occurs in the western sector of the project site and forms a significant feature of the area.

Dry Sclerophyll and Dry Heathland forests are the most common vegetation types in the Malara/ Timbarra Plateau and local area.

The FIS provides that the majority of the local area supports comparatively natural bushland, with a large proportion of this within the Malara and Girard State Forests.

A description of the habitat types and their distribution in the project site is provided in Table 7 of the FIS. Habitat critical to the essential behavioural patterns of each of the species is addressed under Section 5.4.1 of the FIS.

Table 8 of the FIS provides a summary of Fauna Habitat Value Assessment. However, this habitat assessment may be of little use in assessing the conservation significance of particular habitats. Some habitats which may have low Average Habitat Value provide important habitats for particular threatened species and as such have high conservation significance. For example, Granite outcrops has moderate to moderate high Average Habitat Value but constitute core habitat for the Brush-tailed Rock Wallaby.

An assessment of dispersal or movement areas or routes of endangered fauna species known or likely to occur in the study area and any existing future barriers to interbreeding opportunities between populations of endangered fauna within the local area.

The local area, comprising the Timbarra (Malara) Plateau, is isolated from other forested systems to the east and south by the Timbarra River and to the west by the Timbarra Creek gorge system.

The FIS provides that movement of fauna within and through the Project site would be disrupted over the life of the project (estimated to be five years) in the vicinity of proposed disturbance areas. Mitigation measures should ensure that the effects on the majority of Schedule 1 and 2 species are minor. Small ground fauna species would be likely to be most affected.

In addition to the requirement of Section 92D(1)(c)(iii) the Director-General required:

A description of the location, nature and extent of habitat degradation which may result from the proposed mining activity and the likely effect on endangered fauna known or likely to occur in the study area.

The FIS provides that a maximum of 80 hectares of fauna habitat would be cleared for the proposed activity.

Table 19 of the FIS summarises the potential impacts of the proposed habitat clearing on individuals and populations of Schedule 1 and 2 fauna species recorded within the project site. A description of the location, nature, and extent of habitat degradation and the likely effect on threatened fauna, is provided in Section 5.5.2 of the FIS for each of the species recorded within the project site.

The FIS provides that for bats, individuals roosting in the disturbance areas "may be affected to a minor extent" by clearing operations and removal of habitat. This is an underestimate of the potential impacts on threatened bats. Individuals could be injured, killed or exposed to excessive risk by predation or by disturbance/ destruction of roost sites, particularly tree removal, during clearing and earth works on the site. The FIS considers that the direct impacts of the mining operations on bats would be restricted to foraging habitat of a small number of individuals of some species. Most threatened bat species known or likely to occur on the project site roost in tree hollows, and measures to identify threatened species in pre-operational inspections of mature trees are unlikely to detect the presence of bats.

The effect of noise and dust pollution is not addressed in the FIS and may be significant for bats. Maternity colonies are known to be sensitive to disturbance. Torpid individuals are at risk of starvation resulting from energy loss from arousal during winter or periods of adverse weather when energy expenditure cannot be replaced due to scarce food sources.

A central assumption in the evaluation of potential impacts is that suitable habitat is extensively distributed throughout the Timbarra Plateau, and by implication that threatened species present on the site are also widely distributed. This assumption is not supported with references or data.

The FIS does not clearly address possible indirect effects of the proposal on threatened fauna and habitat. In particular, possible water pollution, alteration of water tables due to earthworks, dust effects on vegetation, and noise/ vibration effects on nearby animal populations.

In addition to the requirement of Section 92D(1)(c)(iv) the Director-General required:

Any habitat restoration proposed for the study area, including the expected time taken to restore habitat, any proposals or opportunities to improve habitat and the likely impact on fauna, particularly during the time the habitat is being restored.

The FIS provides that as a general mitigation measure, progressive rehabilitation will occur from the onset of the mining operation through closure and revegetation of unwanted tracks, utilising topsoil from the current operation. Rehabilitation would be directed towards

reinstating previous landforms and major vegetation types and vegetation community structures to conform with existing habitat characteristics favouring threatened fauna species.

Any proposed on-going monitoring of the effectiveness of those ameliorative measures.

The FIS proposes monitoring the impact of the proposed activity on potentially sensitive threatened species on the project site. The FIS suggests that an annual review of the operational procedures of the mine should be incorporated into the management program to explore further ways to minimise, if possible, any adverse impacts on threatened fauna. The FIS does not provide how the impact or effectiveness of ameliorative measures will be measured.

Reference should be made to any ameliorative proposals and proposed habitat retention areas that would reduce the extent of any habitat degradation.

Ameliorative proposals to reduce the extent of habitat degradation on the project site include:

- Direct disturbance to natural bushland areas would be restricted to those areas defined as proposed development areas. Any potentially sensitive habitat would be marked and fenced to ensure protection.
- The removal of any old growth trees would be avoided, except where essential for the development of the proposed operations. Where essential, as is the case for a small section of the Big Hill Open Cut, trees would be checked for signs of use as habitat trees.
- Progressive rehabilitation to limit the time any areas are left in a disturbed state. Rehabilitation should proceed from the onset of the mining operation, involving closure and revegetation of unwanted tracks utilising top soil from the current operation. Unnecessary disturbance of fauna habitat should be further avoided by storing most of the overburden on already disturbed areas such as exploration tracks as well as filling worked areas of the mine pits.
- Rehabilitation would be directed towards reinstating previous landforms, major vegetation types and vegetation community structures to conform with existing habitat characteristics favouring threatened fauna species.
- A feral animal monitoring program would be implemented. If the occurrence of feral predators or species such as feral goats was found to be increasing, then an appropriate control program would be implemented.
- Prior to any clearing operations the proposed disturbance area would be traversed on foot to ensure that no mobile ground fauna such as the Rufous Bettong or Parma Wallaby were present.
- Vehicle speed along access roads and the haul road, within the project site would be restricted to minimise the potential threat to fauna. Further traffic calming ameliorative

measures may be warranted for some of the threatened fauna if indicated by the monitoring program.

- The monitoring of the impact of the proposed activity on threatened species on the project site should be continued.

In addition to the requirement of Section 92D(1)(c)(v) the Director-General required:

All information cited, from which statements or conclusions are made, must be provided or fully referenced.

Most of the information cited in the FIS is fully referenced. Barker *et al.* 1994 (cited on page 122 of the FIS) is not referenced.

ASSESSMENT OF FLORA

The FIS provides a description of vegetation communities and rare flora on the project site. The flora survey involved mapping vegetation communities from 1994 1:10,000 colour aerial photographs and associated ground surveys conducted between November 1993 and January 1995. Plot based sampling of flora was undertaken.

Ten vegetation communities were identified on the project site:

1. New England Blackbutt Open Forest/ Woodland (Dry Sclerophyll Forest);
2. *Eucalyptus olida*/ New England Blackbutt Open Forest/ Woodland (Dry Heath Forest);
3. New England Blackbutt/ Red Bloodwood Open Forest/ Woodland (Dry [grassy] Sclerophyll Forest);
4. New England Blackbutt/ Tallowwood Open/ Closed Forest (Wet Sclerophyll Forest);
5. Blue Gum/ Tallowwood/ Brush Box Open Forest Overstorey - Subtropical Rainforest Understorey;
6. Tallowwood/New England Blackbutt/Coachwood Open Forest overstorey-Warm Temperate Closed Forest understorey
7. Blue Mountain Ash Woodland;
8. New England Blackbutt/ Diehard Stringybark/ Red Bloodwood Woodland/ Low Woodland;
9. *Leptospermum gregarium* Closed Heath/ Sedgeland (Wet Heath/Sedgeland); and
10. *Xyris operculata*/ *Lepidosperma laterale* Closed Sedgeland.

Four vegetation communities were assessed as having moderately high conservation rating:

- community 2: *Eucalyptus olida*/ New England Blackbutt Open Forest/ Woodland (Dry Heath Forest);
- community 7: Blue Mountain Ash Woodland;
- community 9: *Leptospermum gregarium* Closed Heath/ Sedgeland (Wet Heath/Sedgeland); and
- community 10: *Xyris operculata*/ *Lepidosperma laterale* Closed Sedgeland.

Four species of plants listed on the Rare or Threatened Australian Plant (ROTAP) database were recorded on the project site: *Eucalyptus olida*, *Eucalyptus scias* ssp. *apoda*, *Acacia floydii* and *Pultenaea pycnocephala*. None of the four are listed on either Schedules 1 or 2 of the TSC Act.

One taxon of a threatened plant has been confirmed on the project site subsequent to the publication of the FIS and EIS; *Eucalyptus rubida* ssp. *barbigerorum*. This rare taxon is distributed through the swamp system in the west of the project site, totals 35 mature or old trees and over 100 juveniles. No indication of the impact of clearing the swamp for the leach pad and associated infrastructure on this species is given.

The FIS proposed a number of measures to mitigate the impact of the proposed activity on flora:

- Clearing of areas, where ever practicable, will be carried out in stages.
- All disturbance will be restricted to defined disturbance areas shown on figure 3 in the FIS.
- Particularly sensitive vegetation would be clearly marked and if necessary fenced to ensure its protection. Those areas to be marked and fenced were not identified in the FIS.
- The rehabilitation measures have been designed to mitigate the impacts and provide native vegetation cover as similar as possible to the pre-existing, naturally occurring communities. Attempts would be made to attain pre-mining levels of species diversity. No details of how this will be achieved were provided in the FIS.
- Only on-site seed sources and plant material would be used. Source of exotic species such as hay will not be used for erosion control measures.
- Work procedures to minimise the potential for vehicles to bring new weeds into the project site would be adopted. It was recommended to the company that education of people working on site be undertaken to achieve this aim.
- A vehicle wash facility be constructed on the access road to the site to restrict the movement of weeds into the site.
- Special attention be given to collecting and propagating species of conservation significance that occur on site, such as: *Acacia floydii*, *Eucalyptus olida*, *E. scias apoda*, *Pultenaea pycnocephala* and *Syzygium oleosum* for rehabilitation works. Seeds of *Eucalyptus rubida barbigerorum* have been collected and being tested for propagation.
- A bush fire management program would be developed to ensure that the frequency of fires does not increase as a result of the development and that rehabilitated areas are not subject the to adverse effects of uncontrolled fires.

4.2 CONSIDERATION OF ANY ASSESSMENT REPORT PREPARED BY OR ON BEHALF OF THE PROPONENT

This section considers any other assessment report prepared by, or on behalf of the proponent.

Under Section 112E(b) of the EP&A Act the Minister for the Environment must take into consideration any assessment report prepared by or on behalf of the proponent. This section gives consideration to the Environmental Impact Statement (EIS): Capricornia Prospecting Pty. Ltd. 1995 **Environmental Impact Statement for the Timbarra Gold Project via Tenterfield**. Prepared by R.W. Corkery & Co. Pty. Ltd.

The EIS was prepared in accordance with the provisions of Part V of the EP&A Act. The EIS provides descriptions of the project, the existing environment, the environmental safeguards and impacts and provides an evaluation of the proposal. Concerns of the National Parks and Wildlife Service with respect to the project were provided in a letter from NPWS Northern Zone to the Department of Mineral Resources, dated 14 August 1995.

The EIS summarises much of the information provided in the FIS. Mitigation or amelioration measures additional to those provided in the FIS include:

For flora

- all rainforest areas should be avoided where possible given their sensitivity to disturbance;
- the extent of disturbance upon the sedgeland and wet heath communities on the western side of the Project Site should be minimised, and where possible, this community should be re-instated as part of the rehabilitation in that area. Particular emphasis should be placed upon replanting *Eucalyptus olida* and *Pultenaea pycnocephala*;
- the patches of *Eucalyptus scias* should be avoided by all site activities;
- "populations of *Acacia floydii* and *Pultenaea pycnocephala* should be monitored throughout the life of the project to ensure the extent of disturbance and regeneration is documented." EIS p.129

For fauna

- "the wetland habitat immediately north of the Storm Pond (the sites of the trap location of the Eastern Chestnut Mouse) should be protected with a buffer at least 30 metres and preferably 50 metres in width" EIS p.140
- in recognition of the project site being located in an area not subject to substantial human related activities and predation from feral animals, the proponent agreed to undertake considerable care in planning and undertaking a range of activities that may impact upon threatened species on the project site.

4.3 CONSIDERATION OF ANY REPRESENTATIONS MADE UNDER SECTION 113 CONCERNING THE SPECIES IMPACT STATEMENT

This part of the report considers any public submissions which were received by the Director-General in response to the publicly exhibited SIS. Any fauna issues related to the licence application are identified and summarised.

PUBLIC EXHIBITION

Representations concerning the Species Impact Statement, in this case the FIS, were not made under section 113 of the EP&A Act but under section 92B(2) of the NPW Act. Section 92B(5) of the NPW Act, requires that a FIS be placed on public exhibition and that public submissions be invited for a period of at least 28 days following the Director-General's public notification of the exhibition.

The Capricornia Prospecting Pty Ltd Timbarra Gold Project FIS was placed on public exhibition from 29 June 1995 to 2 August 1995. The document was further exhibited from 6 September to 4 October.

The Fauna Impact Statement was displayed at the following locations:

NPWS Cadman's Cottage, George Street, Sydney.
NPWS Northern Region, Victoria Street, Grafton.
NPWS Head Office, Bridge Street, Hurstville.
NPWS Glen Innes District, Church Street, Glen Innes.
NSW Government Information Centre, Cnr Phillip and Hunter Streets, Sydney.
NSW Environment Centre, George Street, Sydney.
Tenterfield Shire Council, Rouse Street, Tenterfield.
Auralia Resources NL, Mary Street, Brisbane.
Dept. Urban Affairs and Planning, Cnr Bent and Phillip Streets, Sydney.
Dept. Mineral Resources, Christie Street, St Leonards.

In response to the public exhibition of the FIS, 32 submissions were received by the Director-General.

ISSUES RAISED IN SUBMISSIONS

Issues raised in objection to the proposed mining operation are summarised as follows:

The Timbarra Plateau is an area of outstanding and unique conservation value:

- The Timbarra Gold Mining Project falls within the richest and most diverse part of the plateau.

- The Timbarra Plateau is situated in an important biogeographical overlap zone conferring a very high conservation status. Faunal influences from the central west, coastal east, subtropical north, and temperate south overlap with local tablelands influences to produce a rich and seemingly unique vertebrate zoo-diversity. The Timbarra Mine project site occupies a diverse and important part of the greater plateau area and is crucial to the area's fauna.
- The Timbarra Plateau whole has been identified as one of 24 new National Parks to be established by the State Labour Government (under the name of Demon National Park proposal). Given its overwhelming known and predicted conservation values, the entire plateau area should qualify for National Park status under any set of reserve selection criteria. The environments found in the proposed mine site are not represented in existing national parks in the region.

Endangered fauna:

- NSW NPWS predictive models for forest fauna highlight the Timbarra Plateau, including the project site as predicted regional core habitat for the Powerful and Sooty Owls and the Glossy Black Cockatoo.
- The Timbarra Plateau is a known key area for native mammals, with 42 species having been recorded within the project site.
- The Project site supports highly significant native fauna populations. Outstanding features include three species of *Pseudomys*, 16 known bat species (and probably more), important populations of Hastings River Mouse and Brush-tailed Rock Wallaby, core regional habitat for the Tiger Quoll and Parma Wallaby.
- The presence of populations of Critical Weight Range (CWR) species, including several endangered species, is a key feature of the project site. This can be attributed, at least in part to the current absence or very low presence of feral predators on the site. The FIS does not consider the significance of the area for CWR species.
- The co-occurrence of the three endangered forest owls is highly significant. The presence of three endangered forest owls at the one site suggests that the area's animal communities and the food chains have been little disturbed.
- The reptile fauna of the project site is rich; up to 35 species have been recorded at or near the site or are predicted to occur; the known occurrence of five species of *Egernia* skinks within one location is significant. The high reptile diversity reflects the site's biogeographical position and high inherent habitat value.
- The Timbarra Plateau is the northern known limit for the distribution of the endangered Stuttering Frog (*Mixophyes balbus*).

Impacts on proposed disturbance area:

- Proposed mitigation measures are unrealistic and unlikely to be implemented.
- Ameliorative measures will not prevent significant impact on native fauna in the area to be cleared for the leach heap pad.
- The FIS does not address potential impact of the leach heap pad on wildlife. For example, how will wildlife be protected from drinking contaminated water? How will endangered species be protected from possible leakage of cyanide?
- The leach pad is located on part of a rare wetland/ sedgeland vegetation community. No rehabilitation of this area will occur. The FIS fails to address the fauna of the wetland/ sedgeland area. The Eastern Chestnut Mouse has been trapped in the wetland just outside the proposed disturbance area, and is highly likely to be found in the part of the wetland

- which is to be destroyed.
- The records of six endangered bat species and ten other bat species indicates that suitable foraging areas and roosting sites are present. The FIS discussion concentrates on roosting requirements. The presence of a large number of insects above the wetland may be significant but is not mentioned. Caves within the boulder-strewn mining sites may be important nursery caves.
 - The FIS proposes to protect the Hastings River Mouse by trapping and removing individuals. Trapping is known to be difficult. The Timbarra Plateau colony is an isolated population with no chance of re-establishment through mitigation should it be destroyed.
 - Current forestry licences prevent operations within 800 metres of a known Hastings River Mouse site. Similar restrictions should be imposed on the mine.
 - The area is extremely important for the Brush-tailed Rock Wallaby - a species which has disappeared from most of its former range in the past 100 years. No broad survey has been conducted to determine if the area is core habitat. The likely impact of fox predation has not been assessed.
 - The removal of old growth trees and vital ground habitats that cannot be rehabilitated.
 - At the end of the proposed development an area of 12 hectares will be left as a water body. The impact of this on flora and fauna has not been addressed by the FIS.
 - It is improbable that any level of conditions could ensure that important regional populations of endangered fauna are not pushed significantly closer to localised extinction.
 - The mining will leave a major scar on the landscape which may be visible from the Washpool Wilderness Area.
 - Impacts of proposal have been underestimated for the Hastings River Mouse, Eastern Chestnut Mouse, Masked Owl, Sooty Owl, Powerful Owl, Tiger Quoll, Brush-tailed Rock Wallaby, Rufous Bettong, and Parma Wallaby. The proposed activities are likely to result in the elimination of the only population of the Hastings River Mouse, Eastern Chestnut Mouse, Brush-tailed Rock Wallaby, Eastern Little Mastiff Bat, and Yellow-bellied Sheathtail Bat on the Malara Plateau.
 - The proposed disturbance will lead to habitat fragmentation and introduction of exotic plants and feral animals. The absence of foxes has been noted by the FIS but its significance has been down-played. The FIS recommends that a feral animal monitoring program be implemented, apparently relying on company personnel to report any sightings. There is no consideration of control measures or what will be done once the mine is closed.
 - Roads potentially increase road kills, noise disturbance, potential chemical spills, and form barriers to the movement of murids and other small ground dwelling mammals. Barrier effect could only be overcome by construction of suitably protected tunnels, similar to those built for the Mountain Pygmy Possum in the Southern Alps.
 - Introduction of vehicles, trucks, bulldozers, graders, crushers and dynamite will have a severe impact on the habitat and cause localised extinctions.
 - The lack of controls on monitoring will not prevent full scale destruction of this unique habitat.

Impacts on surrounding area:

- FIS assumes impacts will be restricted to the 20-25% of the site to be physically cleared. Impacts will extend beyond the area to be cleared. Edge effects and fragmentation of habitats will be significant.

- The FIS states that the proposed pipeline would not significantly affect the vegetation communities and fauna along the proposed pipeline. The pipeline track is extremely steep and it would be impossible not to impact on this area. The FIS fails to address this issue.
- Effects on fauna and flora from sediment generated from the proposal are not addressed in the FIS.
- No impact study has been done on the aquatic environment and fauna of the Timbarra River or its tributaries.
- The project will have major impacts on the headwaters of Williams, Duncan's and Nelson Creeks, with major downstream impacts.
- The mine project will negatively impact the whole Timbarra catchment by significantly changing the flow contours and water quality which in turn will irreparably affect the habitat of native species.
- Effect of cyanide leaching would damage waterways in the catchment, people, animals, and any potential tourist development.

Other Values:

- The Drake area has three major streams, two of which have been destroyed by mining. Water levels in the Timbarra River are at present very low. Residents rely on the water for drinking purposes and for watering stock. Possible contamination from cyanide leakage into the Timbarra River would result in a health hazard from that point to the Pacific Ocean.
- The long-term flora, fauna, environmental, heritage, and aesthetic values, and the value of possible alternatives such as ecotourism, outweigh the short term financial benefits of the proposed mining operation.
- The risks to the environment outweigh any direct return to the community.

One submission offered support for the proposed mining operation based on the following:

- The impact of mining will not threaten the survival of Schedule 12 fauna species. The conclusions drawn by the FIS are based on one of the most extensive surveys undertaken in NSW. Strict environmental management and control by the Department of Mineral Resources will ensure minimal impact.

The Department of Mineral Resources requested a set of draft licence conditions to be sent to the Department's Mining Rehabilitation and Environmental Management Plan committee for review and comment prior to finalisation.

4.4 CONSIDERATION OF THE LONG-TERM VIABILITY OF THE SPECIES IN THE REGION

This section considers whether the activity is likely to reduce the long-term viability of the species in the region.

Section 112E(d) of the EP&A Act requires the Minister to consider whether that activity is likely to reduce the long-term viability of the species in the region.

In assessing the likelihood of reducing the long term viability of the species in the region only species considered threatened under the *Threatened Species Conservation Act, 1995* were assessed.

A number of threatened species are likely to be affected by the development. Assessments of the impact of the activity on the individual species' long-term viability in the region are provided in Appendix I. In assessing that impact those species whose known distribution in the region was limited were considered at higher risk than those species that had wider distribution; Those species that were known to use a limited number of habitats or have specialised habitat requirements were considered to be greater risk than species that use a wider range of habitats and have less specialised habitat requirements; and consideration was given to those species that exhibit particular behavioural patterns that may increase the risk of local extinction eg. colonial species.

Based on the assessments in Appendix I it is considered that the proposed activity will not reduce the long-term viability of the following species in the region:

Endangered Species

Bush Thick-knee *Burhinus magnirostris*
Regent Honeyeater *Xanthomyza phrygia*
Black-striped Wallaby *Macropus dorsalis*

Vulnerable Species

Peppered Tree Frog *Litoria piperata*
New England Tree Frog *Litoria subglandulosa*
Yellow-bellied Mountain Frog *Philoria kundagungan*
Square-tailed Kite *Lophoictinia isura*
Rose-crowned Fruit Dove *Ptilinopus regina*
Glossy Black-Cockatoo *Calyptorhynchus lathami*
Turquoise Parrot *Neophema pulchella*
Powerful Owl *Ninox strenua*
Masked Owl *Tyto novaehollandiae*
Sooty Owl *Tyto tenebricosa*
Painted Honeyeater *Grantiella picta*
Tiger Quoll *Dasyurus maculatus*
Brush-tailed Phascogale *Phascogale tapoatafa*

Parma Wallaby *Macropus parma*
Red-legged Pademelon *Thylogale stigmatica*
Yellow-bellied Glider *Petaurus australis*
Squirrel Glider *Petaurus norfolcensis*
Koala *Phascolarctos cinereus*
Rufous Bettong *Aepyprymnus rufescens*
Long-nosed Potoroo *Potorous tridactylus*
Hoary Bat *Chalinolobus nigrogriseus*
Golden-tipped Bat *Kerivoula papuensis*

Based on the assessments in Appendix I it is considered that the proposed activity may reduce the long-term viability of the following species in the region:

Endangered Species

Hastings River Mouse

Vulnerable Taxa

Eucalyptus rubida ssp. *barbigerorum*
Stuttering Frog *Mixophyes balbus*
Eastern Bristlebird *Dasyornis brachypterus*
Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris*
Brush-tailed Rock Wallaby *Petrogale penicillata*
Becarri's Mastiff Bat *Mormopterus beccarii*
Eastern Little Mastiff Bat *Mormopterus norfolkensis*
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*
Large Pied Bat *Chalinolobus dyweri*
Troughton's Vespertilion *Vespertilio troughtoni*
Great Pipistrelle *Falsistrellus tasmaniensis*
Little Bent-wing Bat *Miniopterus australis*
Common Bent-wing Bat *Miniopterus schreibersii*
Greater Broad-nosed Bat *Scoteanax rueppellii*
Large-footed Mouse-eared Bat *Myotis adversus*

Eucalyptus rubida ssp. *barbigerorum* is known from a population on the western swamp. This taxon is likely to be affected by the proposed activity through clearing of individual plants and changes in the hydrology of the wetland as a result of the construction of the leach heap pad and associated complex. Other populations of *Eucalyptus rubida* are known from north west of the project site and from the Tin Swamp, though their subspecific identity has yet to be confirmed. Currently the only known population of this taxon in the region will be impacted upon by the proposed activity and it cannot be guaranteed that the population's long-term viability is secure. If other *Eucalyptus rubida* populations are not this subspecies then additional mitigation and amelioration measures will be required.

The Hastings River Mouse is known to occur in small localised populations, most of the records for New South Wales are of relatively few individuals. Two substantial populations are known from the broader region around the Project Site: Forestlands and Billilimbra State Forests. The species has not been recorded at Forestlands SF since a wildfire burnt the site. The Billilimbra site was burnt in a wildfire in late 1995, post fire trapping indicates that the

population has been adversely affected by the fire. The population on the project site currently represents the only substantially undisturbed population in the region. A patch of potential habitat lies close to the proposed Poverty Main/South Open Cut (Andrew Smith pers. comm.). Trapping of this potential habitat has not been undertaken. The NPWS considers that further trapping on the Timbarra Plateau should be undertaken in an effort to find a population off the project site and do further trapping on the mining lease in an attempt to establish if suitable habitat away from disturbed areas supports this species. If populations off site cannot be found additional mitigation and amelioration measures will be required.

The Stuttering Frog is confirmed as being on the site and will be impacted upon by the proposed activity. Additional surveys of surrounding creeks should be undertaken to determine if they occur elsewhere on the area surrounding the Project site. Standards for water quality the proponent will be required to meet by the Environment Protection Authority may mitigate the impact of the activity.

The Eastern Chestnut Mouse was only recorded on the western swamp immediately north west of the proposed leach pad and associated complex. This species status is uncertain on the Timbarra Plateau, apparently suitable habitat occurs elsewhere on the Plateau (Tin Swamp) additional surveys determining the occurrence of this species elsewhere will allow for a more accurate assessment of the impact of the activity on the regional status of this species. If other populations cannot be found on the Plateau then additional mitigation and amelioration measures will be required.

The Eastern Bristlebird may occur in the wetland/heathlands of the western swamp. The survey work did not target this species and it is reasonable that it may have been overlooked given its cryptic habits. If this species did occur on site the proposed activity may significantly impact upon its region conservation status. Targeted surveys of suitable habitat are required to determine if this species occurs on site.

The records of the Brush-tailed Rock Wallaby on the project site are unusual and unexpected as the rock shelters on site are not of the quality usually associated with rock wallaby colonies. The activity may threaten the status of the population on the site. Determining the distribution and abundance of this species off the project site would allow for a more accurate assessment of the impact of the activity on the long-term viability of the population in the region.

Threatened bats: as indicated above there is a number of threatened bat species that are either known to occur or may occur on the project site and may be impacted upon by the activity. The impact of the activity on the regional conservation status was assessed either as on site impacts where clearing of roost or nest trees or damage to caves or mine shafts of bat species known to form colonies may impact upon a significant proportion of the region population. Pre-clearing surveys for bat roost sites should be undertaken. Such surveys would allow for an assessment of the likelihood of destroying roost or nest trees. If such trees were detected then specific mitigation or amelioration measures would be required. Off site impacts where the activity may impact upon the water quality and quantity in the creeks and streams downstream from the project site. The Environment Protection Authority will be requiring the proponents to meet performance targets or adopt best practice with respect to water quality.

The measures detailed with regard to further surveys should ensure that the conservation status of the species in the region are fully assessed and that additional mitigation or amelioration measures be undertaken for those species that will be significantly impacted upon by the activity.

4.5 CONSIDERATION OF SPECIES AT RISK OF BECOMING ENDANGERED.

This section considers whether the activity is likely to place the species at risk of becoming endangered as described in section 10 of the Threatened Species Conservation Act 1995.

Section 112E(e) of the EP&A Act requires the Minister to consider whether the activity is likely to place the species at risk of becoming endangered as described in Section 10 of the *Threatened Species Conservation Act 1995*.

In assessing the likelihood of the activity placing at risk the species of becoming endangered only species considered threatened under the *Threatened Species Conservation Act, 1995* were assessed.

Section 10 of the TSC Act describe the criteria for listing a species as "endangered" as:

- a) it is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate, or
- b) its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction, or
- c) it might already be extinct, but is not presumed extinct.

The NPWS considers that, based on the information provided in Appendix I no vulnerable species is likely to be placed at risk of becoming endangered as a result of the activity.

4.6 CONSIDERATION OF THE PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

In this section consideration is given to the principles of ecologically sustainable development, as described by section 6(2) of the Protection of the Environment Administration Act 1991.

[Ecologically] Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

p. 43, *Our Common Future* World Commission on Environment and Development (1987).

Under Section 112E (f) of the EP&A Act the Minister is required to take into consideration the principles of ecologically sustainable development as described by section 6(2) of the *Protection of the Environment Administration Act 1991* (PEA Act).

Section 6(2) of the PEA Act states that ecologically sustainable development requires the effective integration of economic and environmental considerations in the decision-making process. This integration can be achieved through implementing the following four principles:

a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

c) Conservation of biological diversity and ecological integrity.

d) Improved valuation and pricing of environmental resources.

a) The **precautionary principle** requires a cautious approach to decision-making where there are threats of serious or irreversible environmental damage.

The NPWS has assessed the risk posed by the development to threatened species known to occur on the Project Site (sections 4.4 and 4.5). For those species where there is uncertainty regarding the impact of the activity on their regional status the NPWS recommends that further survey work be carried out to clarify the species' distribution and abundance on the Timbarra Plateau. The NPWS considers, that conditional upon the results of the additional survey work, additional mitigation and amelioration measures maybe required.

The FIS and EIS provides for additional work to be undertaken to gain additional information regarding the status of particular species and the impacts of the proposed activity upon them. This additional work includes research on Hastings River Mouse, monitoring and propagation work on plants listed on the Rare or Threatened Plant Database (ROTAP) and work on propagation of plant species that occur on site. Information gained from such studies will be used to develop site specific rehabilitation strategies. The NPWS considers that such an

adaptive management approach will enhance the management and the eventual rehabilitation of the Project Site.

b) **Inter-generational equity** requires that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for future generations.

In the context of this report it was considered that questions of inter-generational equity related to the persistence of threatened species on the Project Site and that habitats of threatened species will not be significantly and irreversibly changed.

The EIS states that the proposed activity will not threaten the survival of any population of a threatened species in the Project Site or local area.

The NPWS considers that, as detailed in Section 4.5, that the development will not result in the transfer of a species from the vulnerable species to the endangered species category. Subject to the results of the additional surveys recommended, and the implementation of measures for mitigation and amelioration the proposed activity should not affect the long-term viability of any threatened species in the region.

The EIS states that the clearing of the majority of habitats within the Project Site are considered of minor significance.

The NPWS considers that the proposed activity is likely to result in significant and irreversible changes to some of the habitats on the Project Site. However, these changes will be localised, covering at maximum 80 hectares of the approximately 400 ha of the Project Site. These changes include: the creation of a deep water body in the Big Hill open cut, such a landform is not currently found on the Timbarra Plateau; the creation of new landforms associated with the Poverty Combined open cut, the waste rock emplacements and the spent ore heaps that will be rehabilitated. The FIS and EIS state that rehabilitation of some of these areas will aim to restore habitat to a state resembling the pre-mining condition.

The NPWS considers that while the proposed activities will affect some of the nature conservation values on the Project Site, the activity, as ameliorated, should not significantly compromise the nature conservation values of the bulk of the land.

The NPWS considers that the \$3,100,000 security required by the Department of Mineral Resources in the Mining Lease conditions should ensure that the costs of rehabilitating the Project Site will not be passed on to future generations.

c) **Conservation of biological diversity and ecological integrity** is required to be maintained or at least not seriously compromised.

The NPWS considers that, subject to the results of the additional surveys recommended and the implementation of measures for mitigation and amelioration, the proposed activity should not affect the long-term viability of any threatened species in the region.

The rehabilitation works proposed in the FIS and EIS will contribute to maintenance of the

biological diversity and ecological integrity of the Project Site. The rehabilitation works aim to create communities with similar characteristics to the pre-mining communities. Mine management will aim to maintain the ecology integrity of the Project Site by ensuring exotic plants are not brought on to the Project Site and that seeds and other plant material used in rehabilitation are sourced from the Project Site. The EIS states that the rehabilitation program will commence before any construction activities begin on-site and will be ongoing over the life of the mine.

The NPWS considers that, an effective feral predator control program, as proposed in the Mining Lease conditions, will not only mitigate any effects of the proposed activities increasing feral predators on the Project Site, but may actually reduce existing numbers of feral predators, thus improving the ecological integrity of the Project Site. This constitutes an off-setting measure and is consistent with the principles of ecologically sustainable development.

d) The principle of **improved valuation and pricing of environmental resources** seeks to overcome the inefficient allocation of environmental resources that occurs due to market and Government failure by ensuring that the appropriate value of these resources is recognised and considered in decision making.

In this respect, it needs to be recognised that environmental resources have economic values and that in the case of the Timbarra Gold Project that there is a trade-off between the economic benefits associated with the obtaining the mineral resource and the economic benefits provided by the natural environment that will be foregone.

The economic benefits associated with the natural environmental include use values, such as recreation, tourism and amenity, together with non use values such as option values, bequest values and existence values.

The EIS itself is one mechanism that enables the environmental values and impacts of the proposal on these environmental values to be identified and considered alongside some of the economic benefits to be obtained from the extraction of the mineral resource. While no attempt has been made in the EIS to quantitatively consider the trade-off, the trade-off is treated in the EIS in a qualitative manner.

The recommendation of environmental prescriptions by NPWS is an explicit recognition of the values of the environmental resource impacted by the Timbarra Gold Project, whether these values are considered in biological or economic terms.

It is entirely consistent with the principle of improved pricing of environmental resources that the proponent bear the costs of implementing the recommended environmental prescriptions. Similarly, it is appropriate that the proponent provide a security of \$3,100,000 required by the Department of Mineral Resources to ensure that the costs of the rehabilitation of the project site are not borne by the community.

4.7 CONSIDERATION OF SOCIAL AND ECONOMIC ISSUES

This section considers the social and economic consequences if the activity is not carried out.

INTRODUCTION AND CONCEPTUAL FRAMEWORK

Introduction

Section 112E(g) of the EP&A Act requires the Minister to consider the likely social and economic consequences if the activity is not carried out.

While the process calls for consideration of the social and economic consequences if the activity is not carried out it does not specify what type of analysis is required. To facilitate assessment it is necessary to clearly identify the distinction between social and economic impacts and identify the main approaches.

Economic Analysis

Economic analysis is primarily concerned with the net effects on the economy of the nation or society as a whole i.e. efficiency considerations. These cover all consequences that impact the net welfare of society.

The main technique for considering the net economic effect of a proposal, including land-use changes, is cost benefit analysis. Two recent examples of how this technique can be applied to land use decisions are provided in Streeting and Hamilton (1991) and Henshall Hansen Associates and Read Sturgess and Associates (1992). NSW Treasury (1990) provides guidelines on the application of cost benefit analysis.

There are other techniques such as Multi-criteria Analysis (MCA) which can be used. However, MCA may be of limited use in assessing direct extraction versus conservation trade-offs.

Social Analysis

In contrast social impacts or consequences refer to the effects on the many individuals, firms and agencies which comprise the whole economy. That is, an evaluation of the social consequences of an action considers who gains and who loses from the action and where those people are located i.e. distributional considerations. Social impacts may include both real effects i.e. those that effect the net welfare of society, and pecuniary effects i.e. those that impact the individual or group but from a national perspective may be considered to be transfer effects.

A number of techniques can facilitate the consideration of the social consequences, or effects on individuals, firms and agencies, of a proposal.

Regional economic impact analysis can be used to measure the distribution of economic

impacts on certain industries and regions. Such analyses uses number of criteria such as employment, output and income, and therefore is an important adjunct to cost benefit analysis.

Regional economic impact assessment also contributes to an understanding of gross social impacts because consideration of employment effects can be translated into population effects and facilitate the consideration of impacts on housing, and the provision of social services.

However, to gain a clearer understanding of the social impacts on individuals and groups within an economy it is necessary to undertake some specific form of social impact assessment (SIA). SIA can be used to gather information on the values, attitudes and preferences of people with regard to resource uses and to assess their capacity to respond to, accept or absorb change.

Tradeoffs between economic efficiency and distributional effects in decision making require value judgements and are generally left to decision makers.

CONSIDERATION OF THE TIMBARRA GOLD PROJECT

It is clearly not possible to undertake the abovementioned types of analyses in the limited time frame available. Nevertheless, the principles certainly apply.

Net Economic Consequences

To understand what the net economic consequences to society would be if the Timbarra Gold Project were not carried out, it is necessary to know what the net economic benefits to society are from carrying out the project.

From the EIS it is possible to identify the major potential costs and benefits of the proposal. These are shown in Table 1.

Table 1 - Major Potential Costs and Benefits of Timbarra Gold Mine Proposal

Costs	Benefits
Construction - raw materials, labour overheads	Revenue from product and any consumer surplus
Operation - labour, overheads, materials	
Rehabilitation	
Foregone timber benefits	Timber savings including environmental
Opportunity cost of land (some overlap with	
Habitat loss	Privately funded research into species
Noise - construction, operations, transportation and blasting	Benefits from upgrading of the Timbarra Rd and Poverty Point Fire Trail
Leachate	
Sedimentation	
Vibration (blasting)	
Aesthetics	

Dust Water flow impacts

These costs and benefits occur at various points over time.

Many of the negative environmental externalities identified in Table 1 such as dust impacts, leachate seepage, water flow consequences in the Timbarra River may be minimal due to processes to be put in place by the proponent. With respect to flora and fauna the proponent has included site design considerations to minimise impacts on vegetation communities together with safeguards to minimise the extent of habitat disturbance and impacts on a range of flora and fauna species, including threatened species. Nevertheless, given that the proposal will result in clearing of up to 80 ha of native vegetation over the life of the proposal a significant negative externality from the proposal is the direct loss of habitat.

No attempt has been made in the EIS to consider all these costs and benefits in a quantitative and systematic manner within a cost benefit analysis framework and indeed this would be difficult to do so. It is therefore difficult to determine if, from an economic perspective, the proposal would have net economic benefits to society.

Nevertheless, if the proposal were not to proceed the economic costs identified above would be cost savings or benefits to society while the economic benefits identified above would become costs (foregone benefits). Again the net effect is uncertain.

Nevertheless, NPWS has not proposed that the Timbarra Gold Project not proceed but has recommended a range of prescriptions in an attempt to ameliorate, to some extent, the adverse impacts on the fauna and flora of the area. While the implementation of these prescriptions will themselves have costs associated with them it is considered that from a precautionary perspective and given the potentially irreversible impact from the mine on flora and fauna they are a minimum requirement.

Regional Economic and Social Impacts

Expenditure by the proponent in the locality is likely to have direct and indirect employment, income, output and value-added impacts for the local economy. That is, economic activity in the local region will increase.

For instance, the EIS refers to the site development and construction phase of the project generating 90 direct jobs and the four year operation of the project generating over 75 direct jobs of which approximately 45 would be filled by local residents. However, great care is needed in interpreting such information. For instance, it should be noted that the total number of jobs associated with the project does not represent the generation of additional jobs to the economy as a whole, since many of these jobs may be filled by currently employed people either within the region or from outside the region. It also needs to be recognised that the boost in regional employment is of only of a temporary nature and may itself have implications for local infrastructure such as housing and sewerage and water utilities etc. Nevertheless, to the extent that local unemployed people gain employment from the project, from a social perspective this would be considered a benefit to the local community.

It should also be recognised however that the project may also result in some loss of some jobs associated with current uses of the land such as the forestry activities. Furthermore, on cessation of the project there is likely to be some social impacts if local people who become unemployed do not find alternative employment.

If the project did not proceed then these job opportunities within the region would not arise and any subsequent social impact from loss of employment upon cessation of the project would also not occur. In the absence of the project there would also be no potential impact on local infrastructure.

Provided the recommended conditions of the NPWS aimed at addressing the flora and fauna externalities of the project do not prevent the project proceeding (which they will not) then they are unlikely to result in any reduction in the potential regional economic impacts for the local economy arising from the proposal. Indeed, since implementation of the NPWS's prescriptions will require some additional expenditure by the proponent they may add to the regional economic impacts of the proposal i.e. direct and indirect employment, income, output and value added for the region. Whether this occurs or not, however, will depend on whether the expenditure occurs within the local economy.

4.8 OTHER ISSUES

ADDITIONAL INFORMATION

NPWS engaged Michael Mahony, Harry Parnaby and Andrew Smith as independent consultants to undertake reviews of the proposed activity on endangered fauna. Peter Richards provided a review of *Eucalyptus rubida* ssp. *barbigerorum*. Comments and recommendations provided by the consultants have been incorporated into this report.

The following additional information was also consulted in assessing the impact of the proposed activity on endangered fauna in the project site:

- Aerial photograph of the project site and Timbarra Plateau.
- Binns, D., 1995. Flora Survey. Tenterfield Management Area Northern Region New South Wales. Tenterfield EIS Supporting Document No. 3. SFNSW Research Division, Sydney.
- Fanning, F.D., 1995. Tenterfield Management Area Environmental Impact Statement. Supporting Document No. 4. Native Fauna of the Tenterfield Management Area. EIS Study. SFNSW Northern Region.
- NSW NPWS, 1995. Computerised fauna location data.
- SFNSW, 1995. Proposed Forestry Operations in the Tenterfield Management Area. Environmental Impact Statement. Volume A. Main Report.
- SFNSW, 1995. Proposed Forestry Operations in the Tenterfield Management Area. Environmental Impact Statement. Volume D. Fauna Impact Statement.
- Martin, A. (undated) Progress report on rare plant species. An unpublished report by Greenloaning Biostudies on rare plants on the Project Site.

PROVISIONS OF DETERMINATION/CONSENT

The Department of Mineral Resources is the nominated determining authority for this activity under Part V of the *Environmental Planning and Assessment Act 1979*.

The proponent is required to obtain:

- mining leases from The Department of Mineral Resources (*Mining Act, 1992*);
- approvals from Department of Land and Water Conservation to clear or disturb land which have a slopes in excess of 18 degrees (*Soil Conservation Act, 1938*), a licence for the Big Hill open cut water storage (*Rivers and Foreshores Act, 1948*) and pumping licence to obtain water from the Timbarra River (*Water Act, 1912*).

- pollution control approval and pollution licence from the Environment Protection Authority (*Pollution Control Act, 1970* and *Clean Air Act, 1961*).

These approvals are in accordance with Part 5 of the *Environmental Planning and Assessment Act, 1979*.

5.0 CONSIDERATION OF THREATENED SPECIES ISSUES

This section of the report draws together the relevant threatened species issues identified in the preceding sections and which the Director-General considers to be the main issues relevant to the recommendations to the Minister for the Environment regarding the issuing of the mining lease

The NPWS considers that, on the basis of the information presented in the FIS and EIS and the analysis of that information in sections 4.1 to 4.7 of this report that the Minister for the Environment should agree to the Minister for Mineral Resources issuing the mining lease for MLAs 4 and 5 Inverell subject to the conditions detailed in section 3.0 of this report.

The NPWS considers that the information in the FIS and EIS was generally adequate to enable an assessment of the threatened species and their habitats that occur on the project site. For those species where the assessment was, in the opinion of the NPWS, inadequate further surveys have been recommended to enable more informed assessments of their status on the Timbarra Plateau to be made. The NPWS notes that these recommended survey have been agreed to by the proponent and are conditions of the proposed mining lease.

The NPWS considers that as a result of the survey work undertaken the conservation significance of the project site for a range of flora and fauna, including threatened species has been appropriately assessed. The NPWS acknowledges the public concern expressed regarding the conservation values of the project site and the Timbarra Plateau, as detailed in section 4.3 of this report.

The NPWS acknowledges community concern over the impact of the activity on threatened species but considers that based on the analysis detailed in sections 4.4 and 4.5 of this report the proposed activity, as ameliorated and conditional upon the results of the additional surveys, should not reduce the long-term viability of the threatened species region that are known to occur on the project site, or risk a species shifting from the vulnerable category to the endangered category. The NPWS notes that extensive mitigation and amelioration measures are provided in the FIS and EIS, but recommends additional measures to further mitigate and ameliorate the impacts of the proposed activity on threatened species, as detailed in section 3.0 of this report.

The NPWS considers that the \$3,100,000 security, required by the Department of Mineral Resources, should ensure that the mitigation and amelioration measures are implemented and that the cost is not borne by the community.

The NPWS considers, based on the analysis detailed in section 4.6 of this report that aspects of this activity are consistent with the principles of ecological sustainable development. The NPWS considers that the precautionary principle has been appropriately applied, recommending further survey work be undertaken to clarify the status of particular species. The NPWS considers that activity is not likely to compromise intergenerational equity given that the activity, as ameliorated and conditional upon the results of the additional surveys, should not reduce the long-term viability of populations in the region or risk a species shifting from the vulnerable category to the endangered category. The NPWS considers that the

\$3,100,000 security required by Department of Mineral Resources should ensure that rehabilitation costs are not borne by future generations. The NPWS considers for reasons outlined above the conservation of biological diversity should be achieved and that much of the ecological integrity of the project site will be maintained and possibly enhanced with the implementation of an effective feral predator control program. However, the NPWS considers that some of the irreversible changes to the landforms will occur. The NPWS considers that the \$3,100,000 security; and the expenditure required on measures for mitigation, amelioration and rehabilitation (including additional surveys) represents improved valuation and pricing of environmental resources.

7.4 DISCUSSION OF AMELIORATIVE MEASURES

The FIS proposes a range of general safeguards and management procedures to maintain the fauna species diversity on the project site. These are summarised as follows:

- restricting disturbance to areas defined as proposed development areas;
- avoiding the removal of old growth trees outside development areas and checking for signs of use as habitat trees of old growth trees to be felled;
- progressive rehabilitation of disturbed areas;
- rehabilitation to reinstate appropriate landforms, vegetation types and community structure to conform with existing habitat characteristics favouring specific fauna species;
- implementation of a feral animal monitoring program and control program if appropriate;
- pre-clearing searches for mobile ground fauna in the proposed disturbance area;
- restriction of vehicle speed along access roads and haul road; and
- monitoring of impact of proposed activity on potentially sensitive endangered species.

In addition to the above general measures, the FIS proposes specific measures to mitigate impacts on Schedule 12 species occurring within the Project site and study area:

Hastings River Mouse

Protection of core population habitat by

- I. restriction of all disturbance to the proposed development areas;
- II. potential development areas will be quarantined and detailed trapping surveys undertaken prior to any significant additional disturbance within these areas. Any disturbance proposed will be subject to an assessment of significant impact;
- III. sectors of the project site outside proposed development areas will be excluded from any disturbance;
- IV. ongoing surveys and monitoring programs will be undertaken in conjunction with the mine operation;
- V. trapping of the Poverty Main disturbance area prior to commencement of mining to collect any individuals present. Captured animals will be incorporated into research programs or relocated to areas immediately outside mine disturbance site; and
- VI. on completion of operations at Poverty Main the area be rehabilitated with re-creation and enhancement of Hastings River Mouse habitat.

Rose-crowned Fruit Dove

Protection of rainforest habitat with no clearing and protection from fire hazard.

Glossy Black Cockatoo

Preservation of stands of Oak (*Casuarinaceae*) trees as far as is practical. Enhancement plantings of Oak stands in appropriate locations as a matter of priority. Protection of old growth/ hollow bearing trees.

Powerful Owl

Protection of old growth/ hollow bearing trees (predominantly along Duncans Creek and associated gullies, the original Malara State Forest and the north-western sector of the Project site). Protection of any identified nesting trees from disturbance during the breeding season (May - October) - (a 200 metre buffer zone) and protection of any roosting sites (100 metre buffer zone).

Masked Owl

As for Powerful Owl, with protection of densely vegetated gullies. Any observed nesting site should be protected (200 metre buffer).

Sooty Owl

Protection of old growth forest along Duncans Creek, Billys Creek and the head of Spring Creek. Any identified nest site should be protected from disturbance (200 metre buffer zone) and any roost sites should also be protected (100 metre buffer zone).

Tiger Quoll

Preservation of creek bank and gully vegetation, feral animal monitoring program implementation.

Rufous Bettong

Minimisation of disturbance supporting dense ground cover. Prior to any disturbances in potential habitat, the area should be inspected for nest/roost sites. Implementation of feral monitoring program. Rehabilitation of suitable areas to promote dense grass growth will be part of the overall rehabilitation program.

Brush-tailed Rock Wallaby

The Bold Top extended ridgeline will be protected from any disturbance from the proposal. The proposed haul road will be designed and constructed to ensure minimum crossing width at the most likely wallaby crossing points and minimum speed of trucks. Rehabilitation of Big Hill mine area to enhance potential Rock Wallaby corridor for access to water habitat.

Parma Wallaby

Protection of the majority of dense understorey areas in the vicinity of Duncans Creek. Reduction of potential hazards from the haul of road traffic by safeguards minimising traffic speed and width of carriageway.

Bat species

General mitigation measures, as above.

Eastern Chestnut Mouse

The immediate habitat of the capture specimen will be protected from disturbance as will potential habitat to the west, within the northern finger of the Wetland system extending eastwards and the isolated wetland and associated seepage areas west and north-west of North Sill.

Stuttering Frog

Erosion controls to protect gullies and small streams within the vicinity of the proposed disturbance areas will be implemented and monitored. Rainforest and Wet Sclerophyll habitats along gullies will be protected outside the proposed disturbance areas.

NPWS proposes additional ameliorative measures to mitigate the impacts of the proposed activity on endangered fauna known or considered likely to occur in the Project site. These have been listed on the licence, which also incorporates some of the measures proposed in the FIS.

The FIS proposes monitoring of the impact of the proposed activity on potentially sensitive endangered species on the project site. The FIS suggests that an annual review of the

operational procedures of the mine should be incorporated into the management program to explore further ways to minimise, if possible, any adverse impact on sensitive endangered fauna. The FIS does not provide how the impact or effectiveness of ameliorative measures will be measured.

The FIS also recommends that a feral animal monitoring program be implemented, and that if the occurrence of feral predators or species such as Feral Goats was found to be increasing, then an appropriate control program would be implemented.

NPWS requires further survey to be undertaken on the Timbarra Plateau to determine whether the high species diversity of endangered fauna on the Project site is unusually high or indicative of the species diversity of endangered fauna in the region. The information gained from the further survey work will help to assess whether the proposed activity is likely to have a significant impact on the endangered fauna on the site. Surveys are specifically required for the Hastings River Mouse, Eastern Chestnut Mouse, Stuttering Frog, and Brush-tailed Rock Wallaby. Requirements of the survey are detailed on the conditions of the licence.

Pre-clearing surveys will also be required for owl roosting and nesting sites, Koalas and evidence of Koalas (scratch marks on trees, scats), endangered bat roosting and nesting sites, Square-tailed Kite nests, and Eastern Bristlebirds.

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Appendix I: Threatened Species assessments

This section of the report analyses the relevant factors considered when assessing the impact of the proposed activity on the conservation status of threatened species including the long-term viability of the species in the region, as required by Section 112E(d) of the EP&A Act, and whether the activity is likely to place the species at risk of becoming endangered, as required by Section 112E(e) of the EP&A Act.

ENDANGERED SPECIES

Bush Thick-knee	<i>Burhinus magnirostris</i>
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The Bush Thick-knee is listed on Schedule 1 of the TSC Act as an "Endangered" species.

The Bush Thick-knee is found across much of mainland Australia, but is more common only in the north and north-east of the continent (Anderson 1991). It typically inhabits open forest and woodland with a dry, grassy understorey and forest edges, with flat terrain and low elevation. Native grasses are preferred (Schodde and Tidemann 1986). It requires habitats with abundant fallen timber, branches and logs, as it nests and forages on the ground (Schodde and Tidemann 1986). The Bush Thick-knee feeds mainly on seeds, fruit, insects and other invertebrates, and is known to prey on small frogs and reptiles.

The usual nesting period is from August to January (Anderson 1991). Bush Thick-knees tend to nest in the same area, if not the same site, both within a single breeding season and in successive breeding seasons (Garnett 1985). The usual clutch size is two eggs (Anderson 1991).

The distribution of the species has been dramatically reduced in NSW due to extensive loss of habitat (Blakers *et al.* 1984, NSW NPWS 1995). The decline of the species has been most pronounced in coastal catchments where preferred habitat has been largely cleared.

The Bush Thick-knee has not been recorded on the project site and was not considered in the FIS. Tanton (1995) notes that the Bush Thick-knee is included in the Royal Australasian Ornithologists Union ten-minute blocks that cover the Tenterfield region. NPWS notes that the FIS surveys did not target this species which is cryptic by nature. NPWS considers that the preferred habitat of this species exists on the project site. The proposed activity may therefore significantly modify the habitat of the Bush Thick-knee.

The NPWS considers that, based on the information currently available, the long-term viability of the Bush Thick-knee in the region should not be affected. However, the proposed activity is likely to damage the habitat of this species.

Regent Honeyeater	<i>Xanthomyza phrygia</i>
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The Regent Honeyeater is listed on Schedule 1 of the TSC Act as an "Endangered" species.

The Regent Honeyeater was historically distributed from near Rockhampton in Queensland, south and west to Kangaroo Island and the Mount Lofty Ranges in South Australia. The species' range has contracted and abundance declined and is now only recorded sporadically (NSW NPWS 1994). In NSW it is more common west of the Great Dividing Range and along the NSW central coast.

Optimal habitat is eucalypt dominated woodland and dry sclerophyll forest with high nectar flows (Webster and Menkhorst 1992). The Regent Honeyeater's numbers continue to decline along with an incremental decline in habitat quality due to the continued loss of old, high nectar yielding trees within forested and rural landscapes (Webster and Menkhorst 1992).

Diet is comprised primarily of nectar and arthropods, with the species returning to areas that provide reliable nectar flows.

The Regent Honeyeater has not been recorded on the or project site, and was not considered in the FIS. Tanton (1995) states that it is known from the northern part of Forestland State Forest, 20 kilometres west of the project site.

NPWS considers that the preferred habitat of this species exists on the project site. The proposed activity may, therefore, significantly modify the habitat of the Regent Honeyeater.

NPWS considers that, based on the currently available information, the long-term viability of the Regent Honeyeater in the region should not be affected. However, the proposed activity is likely to damage the habitat of this species.

Black-striped Wallaby	<i>Macropus dorsalis</i>
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The Black-striped Wallaby is listed on Schedule 1 of the TSC Act as an "Endangered" species.

The Black-striped Wallaby occurs either side of the Great Divide in North east New South Wales and central coastal Queensland.

The species is considered relatively common in suitable habitat in central eastern Queensland but rare in New South Wales (Strahan 1995). In NSW it is restricted to the far north and reliant upon rainforest areas of the Upper Richmond and Clarence valleys in the north west and Brigalow communities around Mooree in the north-west (NPWS 1994).

The Black-striped Wallaby requires dense understorey vegetation under a forest canopy as shelter during the day and it establishes semi-permanent camps. It has been mainly recorded from rain-forest margins, brigalow scrub particularly with a dense regrowth, open forest with a thick acacia understorey and lantana thickets (Strahan 1995). The small mobs of about 20 animals rest during the day and move into open forest with a grassy understorey to feed from dusk to dawn (Jarman et al 1991; Jarman et al 1987). The Black-striped Wallaby rarely ventures far from suitable cover even when searching for grazing areas.

The Black-Striped Wallaby eats a wide range of monocotyledonous species from both daytime shelter habitat and night time foraging habitat. They principally select leaves, and in some seasons seed heads. Reserves for the conservation of this species need to include nocturnal foraging as well as diurnal sheltering habitats.

The Black-Striped Wallaby is considered to be disadvantaged by the simplified forest structure resulting from broad-scale, frequent fire. Management practices which reduce the shrub component of the understorey and increase fox numbers are likely to have an adverse impact on local populations. The Black-Striped Wallaby is one of the CWR (Critical Weight Range) species; that is, mammals in the weight range 200g to 5,000g which are known to be particularly threatened by feral carnivores.

Records of Black-Striped Wallaby exist for, Bald Rock N.P. (NPWS), Donnybrook State Forest and Girard State Forests and are referred to in the Fauna Impact Statement for the Tenterfield Forest Management Area (p. 407) (Fanning 1994). The NEFBS identified records in the Richmond, Toolom and Koreelah Ranges District.

The FIS indicates that the species potentially occurs in the area of the proposed development (Appendix 5, FIS) but also suggests that the species is unlikely to occur (p102). Given the diversity of habitats in the area it is reasonable to suggest that unless specific surveys have been undertaken to target this species there is a potential that the species occurs on site. Since the species relies on both dense rainforest habitat and grassy open forest the impact on this species would stem from clearing of a range of forest types or modification of these habitats through operations.

NPWS considers that targeted surveys for the Black-Striped Wallaby should be conducted in conjunction with the recommended surveys for Brush-tailed Rock Wallaby.

The FIS proposes no specific ameliorative measures for the Black-Striped Wallaby. However, the NPWS considers that the recommended feral predator control program may ameliorate threats to the species. Further measures may be required subject to the results of the surveys.

Hastings River Mouse	<i>Pseudomys oralis</i>
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The Hastings River Mouse is listed on Schedule 1 of the TSC Act as an "Endangered" species.

In NSW the Hastings River Mouse is known from Mount Royal (Barrington Tops) in the south to Poverty Point (proposed project site) in the north. Its range extends into Queensland to Gambubal State Forest, east of Warwick. The Hastings River Mouse is known from Forestland State Forest to the south-west of the project site, and Billilimbra State Forest to the south-east of the project site in the Tenterfield region (NSW NPWS 1995). The Forestland site was burnt in a wildfire and no animals have been trapped there since. The Billilimbra State Forest has been recently burnt by a wildfire and recent trapping indicates that the population has been adversely affected (S. Townley, pers. comm.). The population on the project site is conceivably the only known population in the Tenterfield region.

The Hastings River Mouse is herbivorous, feeding on seed and other plant foliage. Habitat features considered in the FIS to be likely indicators of the presence of Hastings River Mouse are:

- surface water;
- open eucalypt forest;
- shrubs (*Acacia*, *Leptospermum*, *Leucopogon*); and
- ground cover (*Poa* spp., *Carex* spp., *Rubus parvifolius*, *Lomandra* spp., *Juncus* spp., *Restio stenocoleus*, *Blechnum nudum*).

One individual of the Hastings River Mouse was trapped during the field survey in November 1993. The individual was recorded in the locality of the Poverty Main/ South Sill previous mining disturbance area. A targeted survey subsequently undertaken in September 1994 resulted in the capture of an additional individual within 100 metres of the previous capture site. The FIS provides that the record of the Hastings River Mouse in the project site is a new record for the region, and represents the northern-most extent of its range in NSW.

NPWS considers that the conclusion in the FIS that the core population is not present in the disturbance area is not justified on the basis of present information, and could be incorrect. The best known patch of potential habitat on the Timbarra Plateau lies within the proposed disturbance area (Andrew Smith, pers. comm.).

For the Hastings River Mouse the FIS recommends capture and relocation to suitable habitat immediately adjacent to the open-cut as one of the proposed amelioration measures. NPWS considers that relocation to adjacent undisturbed areas is unlikely to mitigate adverse impacts on the species. If habitat in the proposed relocation site is suitable for Hastings River Mouse, it is likely to already be occupied (Andrew Smith, pers. comm.).

The FIS provides that on completion of the proposed activities at Poverty Main, the area will be rehabilitated with re-creation and enhancement of Hastings River Mouse habitat as the main objective.

The FIS also proposes that individuals captured may be available for research projects such as a captive breeding program. NPWS considers that prior to the commencement of any captive breeding programs, further consideration would be required by the NPWS and Hastings River Mouse Recovery Team.

NPWS recommends additional surveys for the Hastings River Mouse on the Timbarra Plateau to determine the status of the species in the region. Information obtained from this survey would assist in determining whether the regional status of the species will be affected by the proposed activity.

NPWS considers that if regional surveys find other secure populations of this species on the Timbarra Plateau, the proposed activity, as ameliorated, should not affect the long-term viability of the Hastings River Mouse in the region. If secure populations are not found on the Timbarra Plateau the proposed activity is likely to have an impact on the long-term viability of the Hastings River Mouse in the region. NPWS, State Forests of NSW, and the Australian

Nature Conservation Agency are currently undertaking research on the Hastings River Mouse to gain more information on its distribution, habitat requirements and population dynamics. The Recovery Team provides advice to NPWS on the research programs and recovery actions. Any additional ameliorative measures should be assessed according to the information currently available from the research programs. The proposed activity is likely to harm this species and damage its habitat. Therefore, the issuing of the mining lease should be conditional upon further surveys and additional ameliorative measures being undertaken by the proponent.

VULNERABLE SPECIES

Eucalyptus rubida ssp. *barbigerorum*

Eucalyptus rubida ssp. *barbigerorum* is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

This threatened subspecies occurs only on the northern tablelands on NSW, mainly in the Glen Innes-Guyra-Tingha district, but it is also known from the Nundle-Hanging Rock area north-east of Tamworth, and the Dundee area north of Glen Innes (K. Hill pers. comm.).

This taxon is known to occur in grassy or sclerophyll woodlands on soils of medium fertility on cold flats (Hill 1991); grassy woodland on deep, fertile clay-loams (Hill and Johnson 1991); on deep, nutrient rich clay loams in grassy woodlands (Quinn *et. al.* 1995); and on flatter country, often on the edge of swamps, in cold, frosty places (K. Hill pers. comm.).

It is considered at risk of becoming endangered due to the inadequacy of reservation of populations and vulnerable habitat of known populations. Considerable areas which once would have supported this taxon have been cleared for agriculture (Hill and Johnson 1991). Existing populations are on farmland or roadside verges and some populations are currently threatened by road widening and clearing for power line corridors (Quinn *et. al.* 1995).

The identity of this taxon on the project site was confirmed by the National Herbarium, Sydney after the publication of the FIS and EIS. Its occurrence on the project site represents a substantial range extension and the population is on the limit of its known range of this taxon. The population on the project site comprises 35 mature and senescing plants and over 100 juvenile plants (Allison Martin pers. comm.). Such an age structure suggests that adequate recruitment may be occurring. Other populations of *Eucalyptus rubida* are known from the north-west of the project site and from Tin Swamp; identification of these plants to subspecific level is required.

Propagation of this taxon is proposed as part of the rehabilitation program for the project site.

Threats to this taxon on the project site include the removal of individuals located in the areas defined as proposed development areas, and changes to the hydrology of the western swamp as a result of the clearing and construction of the leach heap pad and associated complex.

The NPWS considers that, based on the current information available, it cannot be guaranteed that the long-term viability of *Eucalyptus rubida* ssp. *barbigerorum* in the region will not be affected by the proposed activity until the taxonomy of the other populations of *Eucalyptus rubida* identified on the Timbarra Plateau is clarified. Should the population of this taxon be the only one known in the region then additional mitigation and amelioration measures will be required, including a propagation program.

Peppered Frog

Litoria piperata

The Peppered Frog is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Peppered Frog is considered as extremely rare (NSW NPWS 1994). Historic records of the species are restricted to a small number of sites on the eastern edge of the New England Tablelands (NSW NPWS 1994). Further research into likely habitats on the north-eastern slopes of the New England Tableland have succeeded in locating a possible population on the upper reaches of the Timbarra River, to the north of the known former range of the species in Curramore State Forest (Mahony, 1995).

There is virtually no information on the habitat, habits, or ecology of the Peppered Frog, as these details were poorly recorded when this species was last collected in the 1970s.

The Peppered Frog has not been recorded on the project site and was not considered in the FIS. However, the species is likely to occur along creeks which drain the development site (Michael Mahony, pers. comm.), and there is a distinct possibility that the species would occur on the various creeks flowing from the Timbarra Plateau.

NPWS requires clarification of the current status of the Peppered Frog on the Timbarra Plateau. This species should be recorded, if it occurs in the area, as part of the Stuttering Frog surveys, as this species are likely to occur in similar habitat. NPWS considers that any negative impacts on water quality resulting from the proposed activity could potentially affect the Peppered Frog. The Environment Protection Authority has confirmed that the proponent will be required to meet performance targets or adopt best practice with respect to water quality. NPWS considers that this will ameliorate any major impacts on this species.

NPWS considers that, based on the little information currently available, the proposed activity may affect the long-term viability of the Peppered Frog in the region if it occurs on the project site. The proposed activity may damage the habitat of this species.

New England Tree Frog

Litoria subglandulosa

The New England Tree Frog is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The New England Tree Frog is restricted to the forests of the Great Escarpment north from Barrington Tops to the far south of Queensland, particularly along the eastern margin of the Northern Tablelands (NSW NPWS 1994). The species is generally associated with well vegetated montane streams in a range of forest types. The New England Tree Frog has been recorded from Spirabo and Girard State Forests (Tanton 1995).

The New England Tree Frog has not been recorded on the project site and was not considered in the FIS. However, the New England Tree Frog may potentially occur in the project site

based on the presence of suitable habitat (Michael Mahony, pers. comm.). The New England Tree Frog has been recorded four times in the Tenterfield region. The species is most likely to occur along the creeks which drain the project site, and there is a distinct possibility that the species would occur in the various creeks flowing from the Timbarra Plateau. This species should be recorded, if it occurs in the area, as part of the Stuttering Frog surveys.

NPWS considers that, based on the current available information, the proposed activity should not impact on the long-term viability of the New England Tree Frog in the region. However, the proposed activity may damage the habitat of this species.

Stuttering Frog

Mixophyes balbus

The Stuttering Frog is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The historical distribution of the Stuttering Frog extends from East Gippsland in Victoria to the Richmond River in northern NSW. The species has suffered a decline in distribution and abundance (Mahony and Knowles 1994). There have been only two records of the species in the southern portion of its range in the past five years (Michael Mahony, pers. comm.). In northern NSW the Stuttering Frog occurs in coastal valley headwaters, generally at higher elevations.

The danger of continuous incremental loss of habitat or its modification by alteration to water tables appear to be the greatest threats to this species.

The FIS notes that the Stuttering Frog has previously been recorded immediately south of the project site. Tanton (1995) also lists it from Sandy Creek about 15 kilometres to the north of the project site.

Tadpoles of the Stuttering Frog were observed in the upper reaches of Duncan's Creek at the end of the 4WD access track to the proposed Big Hill Open Cut during a field inspection of the site on 30 November 1995 (Michael Mahony, pers. comm.). The tadpoles were observed in the creek above and below the site where the road crosses Duncan's Creek.

The FIS provides that management procedures to mitigate the impact of the proposed activity include implementation and monitoring of erosion controls to protect gullies and small streams within the vicinity of the proposed disturbance areas.

NPWS considers that the proposed activity will impact on the Stuttering Frog. Conditional upon further surveys ascertaining the presence of this species elsewhere on the Timbarra Plateau, the activity should not affect the long-term viability of the Stuttering Frog in the region. The Environmental Protection Authority has confirmed that the proponent will be required to meet performance targets or adopt best practice with respect to water quality. NPWS considers that this will ameliorate any major impacts on this species. However, the proposed activity will damage the habitat of this species.

Yellow-bellied Mountain Frog

Phyloria kundagungan

The Yellow-bellied Mountain Frog is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Yellow-bellied Mountain Frog is known to be comprised of three species (Mahony and Knowles 1994): *Phyloria kundagungan* and two previously undescribed species, *Phyloria* sp. 2 and *Phyloria* sp. 3. *Phyloria* sp. 2 is known from Billilimbra and Forestland State Forests and Washpool National Park (Mahony and Knowles 1994). Until they are formally described, the species should continue to be referred to as *Phyloria kundagungan*.

The Yellow-bellied Mountain Frog is restricted to north-east NSW in mid to high elevation rainforest areas (NSW NPWS 1994). Individuals are typically located in the headwaters of creeks and soaks in rainforest or very wet sclerophyll forest (Mahony and Knowles 1994). Microhabitat requirements generally include a constant source of gently seeping water and usually protection of a overhanging streambank or streamside crevices (NSW NPWS 1994).

Based on the presence of suitable habitat on the project site, the Yellow-bellied Mountain Frog may occur on the site (Michael Mahony, pers. comm.). The species is known from Forestland and Spirabo State Forests of the Tenterfield Management Area (south-west of the Timbarra Plateau), Billilimbra State Forest (south-east of the Plateau), and the Gibraltar Range and Washpool National Parks to the south of the Timbarra Plateau. High altitude riparian habitats with rainforest provide suitable habitat for this species. This habitat does occur on the Timbarra Plateau and suitable microhabitat occurs along the small rainforest creeks which drain the Plateau.

The Yellow-bellied Mountain Frog has not been recorded on the project site and was not considered in the FIS. However, NPWS considers the species could occur based on the presence of suitable habitat (Michael Mahony, pers. comm.). NPWS requires clarification of the status of the Yellow-bellied Mountain Frog on the Timbarra Plateau. This species should be recorded, if it occurs in the area, as part of the Stuttering Frog surveys.

Based on the available information, NPWS considers that the proposed activity will not have an impact on the long-term viability of the Yellow-bellied Mountain Frog in the region. However, the proposed activity may damage the habitat of this species.

Square-tailed Kite

Lophoictinia isura

The Square-tailed Kite is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Square-tailed Kite is widely distributed across Australia, but breeds only in coastal and sub-coastal regions. A significant population of the Square-tailed Kite is known in the north

coast region. The preferred habitat is forests and woodlands where the species preys on small birds, rabbits and reptiles (Blakers *et al.* 1984). The species has a low annual recruitment and disturbance to active nests may have a significant impact on the regional viability of the species. The Square-tailed Kite has not been recorded in the Tenterfield region, but is known from the Washpool National Park (NSW NPWS 1995) south-east of the Timbarra Plateau and from the Torrington State Forest, west of the Timbarra Plateau (Fanning 1995).

Although not detected at the project site, it is considered that the species could occur and could be adversely affected if a nest site occurred within the project site (Andrew Smith, pers. comm.). NPWS recommends that an inspection for Square-tailed Kite nests should be undertaken prior to clearing activities in the breeding season. Nest sites should be protected during the breeding season.

NPWS considers that, based on the information currently available, the proposed activity should not affect the long-term viability of the Square-tailed Kite in the region. However, the proposed activity is likely to damage the habitat of this species.

Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>
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The Rose-crowned Fruit-Dove is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Rose-crowned Fruit-Dove inhabits coastal and subcoastal northern and eastern Australia from the Kimberley region to central NSW. The Rose-crowned Fruit-Dove is a small frugivorous pigeon that in NSW is a altitudinal and latitudinal migrant in response to season and food availability.

The Rose-crowned Fruit-Dove is recorded from Washpool National Park (FIS) and Bookookoorara State Forest (Fanning 1995).

This species was not recorded on the project site, but there exists an unconfirmed record from Malara State Forest. The FIS states this species may use the rainforest habitats on the Project Site on an irregular basis.

Based on the information currently available, the NPWS considers that the proposed activity, should not affect the long-term viability of the Rose-crowned Fruit-Dove within the region. The NPWS notes that the habitat of this species present within the study area will be damaged.

Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>
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The Glossy Black Cockatoo is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

Once present across most of south-east Australia, the Glossy Black Cockatoo now has a patchy distribution from Eungella, eastern Queensland, to Orbost, Victoria (NSW NPWS 1994). The species has been categorised as rare and is generally sparsely distributed across its range (Garnett 1992).

The Glossy Black Cockatoo inhabits eucalypt forest and woodland communities and feeds exclusively on *Allocasuarina* seeds (Clout 1989). The principal habitat requirements are forests with *Allocasuarina* spp. (Morris 1993; Clout 1989; Magrath 1994) and tree hollows for nesting. The species' dependence on limited food resources and tree hollows is considered the principal reason for the Glossy Black Cockatoo's vulnerability (Blakers *et al.* 1984).

This species requires large hollows for nesting, showing a preference for large and tall eucalypts in more open forest types. The breeding season is from March to August and the species is generally secretive about the location of the nest tree in that season: males may refuse to approach the nest if disturbed (Saunders 1982), and females will remain on the nest until the hollow entrance is struck (Forshaw and Cooper 1981).

Evidence of the Glossy Black Cockatoo feeding was recorded in November 1994 near the western access point of the Poverty Point Fire Trail within the project site. A number of other records have been made within the study area. The FIS provides that records of the Glossy Black Cockatoo from the local area indicate that the species ranges over most of the Timbarra/ Malara Plateau. A number of records exist for public lands to the north and south of the Timbarra Plateau (NSW NPWS 1995).

The FIS provides that the Glossy Black Cockatoo would not be expected to utilise the project site extensively as the feeding location record is the only significant stand of Oak trees on the project site. However, the FIS recommends preservation of stands of Oak (*Casuarinaceae*) trees as far as is practical, and enhancement planting of Oak trees in the western and central sectors of the project site as a matter of priority. The FIS also recommends protection of old growth/ hollow bearing trees to mitigate the impact on the species. NPWS concurs that planting of Oak trees and protection of old growth/ hollow bearing trees will help ameliorate impacts of the proposed activity on the Glossy Black Cockatoo.

Based on the information currently available, the NPWS considers that the proposed activity, should not affect the long-term viability of the Glossy Black Cockatoo within the region. The NPWS notes that the habitat of this species present within the study area will be damaged.

Turquoise Parrot	<i>Neophema pulchella</i>
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The Turquoise Parrot is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Turquoise Parrot inhabits woodlands, open forests and timbered grasslands from the granite belt of south-east Queensland to north-east and south-east Victoria. Its distribution is patchy in areas of suitable habitat (Forshaw and Cooper 1991). The species is typically recorded west of the escarpment on the tablelands and western slopes, extending to coastal districts through the dry forest corridor of the Hunter Valley (NSW NPWS 1994). There is some evidence that populations are increasing (Blakers *et al.* 1984, B. Quin, pers. comm.).

The Turquoise Parrot has not been recorded in the project site or the Timbarra Plateau, but is known from Torrington State Forest to the west (Fanning 1995) and Washpool National Park to the south-east (NSW NPWS 1995). It may be found to occur in the project area if more

intensive surveys are conducted (Andrew Smith, pers. comm.). A significant portion of its preferred habitat will be cleared by the proposed activity.

The Turquoise Parrot has not been recorded on the project site and was not considered in the FIS. The protection of old growth/ hollow bearing trees on the project site as recommended in the FIS will help ameliorate adverse impacts from the proposed activities.

NPWS considers that, based on the available information, the proposed activity will not have an effect on the long-term viability of the Turquoise Parrot in the region. However, the proposed activity may damage the habitat of this species.

Powerful Owl	<i>Ninox strenua</i>
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The Powerful Owl is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

In NSW the Powerful Owl occurs mostly in tall open and open forest (Debus and Chafer 1994). Preferred areas are cool to moderate mean annual temperature and low to intermediate mean annual rainfall of the high elevation eastern tablelands from south-east Queensland to the Victoria/ South Australia border (NSW NPWS 1994).

The species nests from late autumn to mid winter, in large hollows in very large trees. The species mates for life and breeding lasts from winter to early summer (Debus and Chafer 1994). It has a low recruitment rate with less than one fledgling per pair per year (Debus and Chafer 1994). Nests are used again in subsequent years. A large proportion of the diet is comprised of arboreal marsupials (Debus and Chafer 1994; Seebeck 1976; Chafer 1992).

The Powerful Owl has a large home range, approximately 800 - 1000 hectares, which allows it to hunt intensively, but sporadically in different parts of this home range (Tilley 1982; Kavanagh 1988; Traill 1993; Debus and Chafer 1994). This implies, and is supported by field observations, that the Powerful Owl may not be recorded regularly at a given site within its home range.

There are a number of records of the Powerful Owl from the Tenterfield region including Boonoo Boonoo National Park; Boorook, Girard, Malara, Forestland and Spirabo State Forests. It has also been recorded in Ewingar, Billilimbra and Washpool State Forests and Washpool National Park (NSW NPWS 1995).

The FIS proposes that if nesting sites of the Powerful Owl are identified during field observations, mine development activity and associated disturbances in the area should be avoided if possible between May to October, the breeding season for the Powerful Owl, as the species is sensitive to disturbance while nesting.

The FIS also proposes protection of old growth/ hollow-bearing trees, predominantly along Duncans Creek and associated gullies, the original Malara State Forest, and the north-western sector of the site. Identified nesting trees and roosting trees will be protected from disturbance by a buffer zone during the breeding season.

NPWS recommends that potential nesting and roosting trees be inspected prior to clearing, and if roosting or nesting trees are identified, then clearing should not occur within a 200 metre radius of a nest site and a 100 metre radius of a roost site without written approval from the NPWS Manager, Northern Zone.

The NPWS considers that, given the extent of suitable habitat in the region and the large home range of this species, the long-term viability of the Powerful Owl in the region should not be affected by the proposed activity as ameliorated. However, the proposed activity is likely to damage the habitat of this species

Masked Owl

Tyto novaehollandiae

The Masked Owl is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

Most records of the Masked Owl are from coastal regions (Debus and Rose 1994). In north-east NSW the species has been found to prefer drier forest areas that include moist forest components. The diet consists mainly of small and medium-sized terrestrial mammals (Debus and Rose 1994). Nests are constructed in large hollows of live and dead eucalypts and crevices in cliffs and caves, with the same cavity being used over a number of years (Hollands 1991, Lindsey 1992). Laying is commonly from March to July (Debus and Rose 1994).

Home ranges of the species in south-east Australia have been recorded as covering 500 - 1000 hectares (Blakers *et al.* 1984). Diet of the species includes insects, mammals and birds. The FIS provides that the Masked Owl is sensitive to removal of large, old growth trees, but is unlikely to be sensitive to small localised disturbances given its broad feeding habitats and large territory.

The FIS provides that, based on current knowledge, the Masked Owl appears to be rare to uncommon in the local area, with the only records being within the Malara State Forest. The species was recorded at two locations within the project site: in 'predominantly Dry Sclerophyll Forest/ Woodland' in the south east of the project site; and on the boundary between 'predominantly Dry Sclerophyll Forest/ Woodland' and 'Dense Forest - predominantly Wet Sclerophyll' in the south-west of the project site.

The Masked Owl has been recorded from Gilgurry, Girard, Ewingar and Forestland State Forests and Boonoo Boonoo National Park in the Tenterfield region (NSW NPWS 1995).

The FIS provides that the protection of old growth trees with mature hollows is critical for this species, and that a small number of such trees may be removed as part of the Big Hill open-cut. The FIS specifies that prior to any such removal a careful inspection of each tree will be undertaken to ensure that individual trees are not being utilised as a roosting or nesting site. The FIS also recommends a 200 metre radius buffer zone around any nest site, and a 100 metre radius buffer zone around any roosting site, and protection of densely vegetated gullies.

NPWS recommends that potential nesting and roosting trees be inspected prior to clearing,

and if roosting or nesting trees are identified, then clearing should not occur within a 200 metre radius of a nest site and a 100 metre radius of a roost site without written approval from the NPWS Manager, Northern Zone.

The NPWS considers that, given the extent of suitable habitat in the region and the large home range of this species, and with the implementation of ameliorative measures, the long-term viability of the Masked Owl in the region should not be affected by the proposed activity as ameliorated. However, the proposed activity is likely to damage the habitat of this species.

Sooty Owl

Tyto tenebricosa

The Sooty Owl is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Sooty Owl is restricted to tall wet forests and rainforests of south-east Australia (Blakers *et al.* 1984, NSW NPWS 1994). North-east NSW is a population stronghold for the species (NSW NPWS 1994).

In studies in the south-east NSW forests, Kavanagh and Peake (1993) observed a strong association with mesic environments, and a greater likelihood of occurrence in gullies and sheltered south-easterly aspects. The Sooty Owl has been described as a specialist inhabitant of rainforest and tall open forest (Debus 1994).

Tree hollows are an important habitat component for the Sooty Owls for nesting and roosting sites. A large proportion of the diet of the species consists of the Common Ringtail Possum (*Pseudocheirus peregrinus*), Sugar Glider (*Petaurus breviceps*), and rats (*Rattus* spp.) (Debus 1994). Reductions in hollow bearing trees are a threat to the species due to loss of nest and roost sites and a reduction in hollow dependent prey.

The FIS provides that Sooty Owls in the Timbarra locality are approaching the western extent of their known range. On a local basis, the FIS provides that the species is rare. The Sooty Owl was recorded in three locations in the south-east of the project site. The proximity of the records within the project site indicate that they are probably from the same bird or pair of birds.

In the Tenterfield region, the species is known from Boonoo Boonoo National Park and Washpool National Park, and Boorook, Girard, Gilgurry, Ewingar and Washpool State Forests (NSW NPWS 1995).

The FIS provides that management procedures to mitigate impacts on the Sooty Owl include protection of old growth forest along Duncans Creek, Billys Gully and the head of Spring Creek. Any identified nest site should be protected from disturbance (200 metre buffer zone) and any roost sites should also be protected (100 metre buffer zone).

NPWS recommends that potential nesting and roosting trees be inspected prior to clearing, and if roosting or nesting trees are identified, then clearing should not occur within a 200 metre radius of a nest site and a 100 metre radius of a roost site without written approval from

the NPWS Manager, Northern Zone.

The NPWS considers that, given the extent of suitable habitat in the region and the large home range of this species, the long-term viability of the Sooty Owl in the region should not be affected by the proposed activity as ameliorated. However, the proposed activity is likely to damage the habitat of this species.

The occurrence of the three species of forest owls, the Powerful, Masked and Sooty Owls, at the one site has been suggested as being of high faunal significance (see Debus and Peake 1994). The demand for hollows where the three species occur in sympatry would be greatly increased to accommodate roosting and nesting sites for the species, as well as for their prey. It is feasible that the predator-prey relationship of the three owls in sympatry may be finely balanced.

Eastern Bristlebird	<i>Dasyornis brachypterus</i>
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The Eastern Bristlebird is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Eastern Bristlebird is restricted to coastal south-east Australia, from the Conondale Range in south-east Queensland to east Victoria. Populations are isolated and the northern populations have declined dramatically in recent years (Blakers *et al.* 1984, Hartley and Kikkawa 1994). In north-east NSW, the birds occupy predominantly tussock grass communities in open eucalypt forests close to a rainforest ecotone and have also been recorded in montane heath (Hartley and Kikkawa 1994).

Eastern Bristlebirds are particularly vulnerable because of their reluctance to fly, their small size, low fecundity and isolated populations. The birds form permanent pairs and occupy a permanent territory.

There is an unverified record of the Eastern Bristlebird in the Tenterfield region from Boonoo Boonoo National Park to the north-east of the project site (NSW NPWS 1995). NPWS considers that the survey did not target this species: call broadcast was not used, and the bird survey did not target this species (Andrew Smith, pers. comm.). A significant portion of the preferred habitat of the species will be cleared by the proposed activity.

The Eastern Bristlebird was not recorded on the project site and was not considered in the FIS. NPWS considers that, based on the current information, it is not possible to assess the effect of the proposed activity on the regional conservation status of the Eastern Bristlebird. NPWS recommends that, prior to the commencement of any clearing activities a survey for Eastern Bristlebirds should be undertaken in potentially suitable habitat for the species. If the Eastern Bristlebird is recorded, measures would be required to mitigate the impacts on the proposed activity.

The NPWS considers that, subject to further survey work, and with the application of additional amelioration measures, the long-term viability of the Eastern Bristlebird in the region should not be affected by the proposed activity. However, the proposed activity may

harm this species and damage its habitat.

Painted Honeyeater

Grantiella picta

The Painted Honeyeater is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Painted Honeyeater is most often recorded in dry inland forests and woodlands and rarely recorded on the coast (Gilmore and Parnaby 1994). The species is migratory, breeding mostly in Victoria and NSW and moving north for winter. It feeds principally in mistletoe berries and appears to move in response to mistletoe fruiting patterns (NSW NPWS 1994).

The Painted Honeyeater has not been recorded on the Timbarra Plateau or Project site, but has been recorded in the surrounding region (Fanning 1995). The Painted Honeyeater was not considered in the FIS. NPWS considers that the preferred habitat of this species exists on the project site. The proposed activity may therefore significantly modify the habitat of the Painted Honeyeater.

The NPWS considers that, based on the currently available information, the long-term viability of the Painted Honeyeater in the region should not be affected by the proposed activity. However, the proposed activity may damage the habitat of this species.

Tiger Quoll

Dasyurus maculatus

The Tiger Quoll is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The range of the Tiger Quoll has been reduced by as much as 50 to 90% since the advent of European settlement (IUCN 1992). The species' current estimated range extends along the east coast of Queensland through NSW to western Victoria and Tasmania. North-east NSW is a national stronghold for the Tiger Quoll, with comparatively high numbers reported from a number of localities (NSW NPWS 1994).

The Tiger Quoll is known to inhabit a variety of forest types and coastal heaths. It is considered to be dependent on old growth forest attributes (Scotts 1991), and the integrity of riparian habitats are crucial for this species (Watt 1993).

A study by Watt (1993) indicated that the species can have a mean home range of 875 hectares, and overlap between individuals does occur.

The Tiger Quoll dens in small caves, rock crevices, or between granite boulders, in tree hollows, or hollow logs (Scotts 1991; Watt 1993). The Tiger Quoll is an opportunistic predator, feeding on a variety of prey, including birds and their eggs and/ or their young, small terrestrial and arboreal mammals, gliding possums, small macropods, reptiles and arthropods.

The Tenterfield region forms part of the species' main range, although its distribution within

this range is patchy (NSW NPWS 1994). The FIS provides that the Tiger Quoll has been recorded in the vicinity of Trap Line 15 (hair sample from hair tube program), along Trap Line 4 (scat specimen), and from two observations along the track beside Duncans Creek.

Elsewhere in the Tenterfield region the Tiger Quoll is known from Jenner, Boorook, Boonoo, Forestland and Spirabo State Forests. It is also known from Ewingar, Billilimbra and Washpool State Forests and Washpool National Park. There are a number of records from private land in the region.

The Tiger Quoll is sensitive to land clearing, loss of habitat and competition for prey from feral carnivores (NSW NPWS 1994). The FIS considers it likely that remaining populations of Tiger Quolls are suffering from competition with the introduced fox and feral cat. To date, no foxes have been recorded in the project site.

The FIS considers that no individual animals would be expected to be lost in association with clearing operations, although it is possible that an occasional animal will be affected within the Wet Sclerophyll Forest habitat, and there will be some reduction in potential feeding habitat and prey species within the cleared areas.

The FIS recommends the preservation of creek bank and gully habitat, and the northern side of Duncans Creek to ameliorate the impact of the proposed activity on the Tiger Quoll. The FIS also recommends strict control of access to the site and careful management of main access points. In association with this, the FIS recommends a feral animal monitoring program be undertaken and a control program be implemented if necessary. This should not include poison baiting as it is likely to endanger the Tiger Quoll.

NPWS considers that programs to control feral predators as proposed in the FIS will ameliorate the impact of the proposed activities on this species. However, it is important that any feral predator control program be designed so as to minimise any negative effects on the Tiger Quoll.

The NPWS considers that, based on the information currently available, and with the implementation of amelioration measures, the long-term viability of the Tiger Quoll in the region should not be affected by the proposed activity. However, the proposed activity is likely to damage the habitat of this species.

Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>
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The Brush-tailed Phascogale is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Brush-tailed Phascogale has a patchy and seemingly disjunct distribution in forests and woodlands around the margin of Australia (NSW NPWS 1994). The species is most often encountered in low elevation, dry sclerophyll forests, but in north-east NSW it is also known from mesic forests including high elevation, cool temperate rainforest (NSW NPWS 1994).

The Brush-tailed Phascogale has not been recorded on the Timbarra Plateau or project site,

but it has been recorded in the surrounding region to the north of the project site in the Girard State Forest and north of Drake (NSW NPWS 1995). It may be found on the project area if more extensive surveys are conducted, and a significant portion of its preferred habitat will be cleared by the proposed activity.

NPWS considers that programs to control feral predators and protecting old growth/ hollow bearing status as proposed in the FIS will ameliorate the impact of the proposed activities on this species.

The NPWS considers that, based on the information currently available, and with the implementation of amelioration measures, the long-term viability of the Brush-tailed Phascogale in the region should not be affected by the proposed activity. However, the proposed activity may harm this species and damage habitat of this species.

Yellow-bellied Sheathtail Bat

Saccolaimus flaviventris

The Yellow-bellied Sheathtail Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Yellow-bellied Sheathtail Bat is rare, although it has a widespread distribution across northern Australia north of the Tropic of Capricorn, extending south through western NSW to Victoria and South Australia (NSW NPWS 1994). The precise habitat requirements of this species remain uncertain. The species has been found in a wide range of forest types including rainforest, moist hardwood forest and dry sclerophyll forest, and also in mallee, woodland, and open country. It is thought to forage above the canopy on flying insects. The species roosts in hollows, and is thought to occur at low elevations below about 500 metres (NSW NPWS 1994). Single young are born between December and March.

The available data (NSW NPWS 1995) suggests that the apparent scarcity of this species in north-east NSW is real and not just a reflection of the difficulty of trapping and netting this above-canopy forager.

In the region the Yellow-bellied Sheathtail Bat is known from the Girard State Forest extension and Ewingar State Forest (NSW NPWS 1995). One record of the Yellow-bellied Sheathtail Bat was obtained within the project site. The habitat at the site of the record comprises Eucalypt Forest to Woodland adjacent to Pasture-land. The FIS provides that there are no other known records of the species in the local area.

The FIS provides that the vast majority of old growth trees will be retained on the project site, thus continuing to provide suitable habitat for most of the bat species. The avoidance of impact on all habitat outside the disturbance areas will protect any potential habitat for cave/ tunnel roosting species. The possible impact of noise and vibrations from the proposed activity, and the likely impact of dust settling on surrounding vegetation have not been assessed, and the FIS provides no supporting evidence or references for the above FIS statements.

NPWS recommends that, prior to the commencement of clearing activities, a survey of

endangered bats to locate roost and nest sites must be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone. Written approval should be obtained from the Manager, Northern Zone, prior to commencement of clearing.

The NPWS considers that, until preclearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it can not be guaranteed that the long-term viability of the Yellow-bellied Sheath-tail Bat in the region will not be affected by the proposed activity. The proposed activity may harm this species and is likely to damage its habitat.

Parma Wallaby	<i>Macropus parma</i>
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The Parma Wallaby is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

Historically, the Parma Wallaby occurred from the Nightcap and Richmond ranges in north-east NSW to the Bega district in south-east NSW. It is now extinct south of Gosford and endemic to north-east NSW (NSW NPWS 1994). The Parma Wallaby is considered to be especially vulnerable to extinction owing to its restricted range and continuing pressures on its forest habitat (Read and Fox 1991).

The species favours wet sclerophyll forest with a ground layer mosaic of dense mesophytic shrub areas mixed with more open grassy areas, presumably reflecting its shelter and foraging requirements (NSW NPWS 1994). Dry sclerophyll forest and rainforest margins are also inhabited (NSW NPWS 1994). Parma Wallabies typically feed on grasses and shrubs.

The FIS provides that the Parma Wallaby has been recorded from a number of locations within the region: Ewingar and Washpool State Forests and Washpool National Park (NSW NPWS 1995); and local area: immediately west of the project site (NSW NPWS 1995) and on the Timbarra Road in the north-west of the Malara State Forest (Fanning 1995). Two sightings and a probable scat record for the species were located within the project site. The FIS provides that the species would be expected to frequent wet sclerophyll forest habitat with a dense understorey within the project site.

The FIS provides that the removal of 17 hectares of Wet Sclerophyll Forest in the vicinity of the Big Hill open-cut has the potential to affect individual Parma Wallabies. The clearing activities will result in loss of foraging habitat and potential shelter sites. A small amount of habitat may be permanently removed and some of the rehabilitated landforms may be more suitable to drier forest types.

The FIS provides that protection of the majority of dense understorey areas in the vicinity of Duncans Creek, and reduction of potential hazards from haul road traffic by safeguards minimising traffic speed and width of carriageway, will be implemented to mitigate the impacts of the activities on this species.

The FIS provides that much larger areas of suitable habitat occurs outside the disturbance areas within the Project site and within the local area. This statement is irrelevant to the impact of the proposals on individuals within the site. If suitable habitat is available, it is

likely to be already utilised by other individuals of the species or by other species.

NPWS considers an effective feral predator control program will ameliorate impacts associated with the proposed activities.

The NPWS considers that, based on the information currently available, and with the implementation of ameliorative measures, the long-term viability of the Parma Wallaby in the region should not be affected by the proposed activity. However, the proposed activity is likely damage the habitat of this species.

Brush-tailed Rock Wallaby

Petrogale penicillata

The Brush-tailed Rock Wallaby is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Brush-tailed Rock Wallaby inhabits north facing rocky outcrops in sclerophyll forests of inland and subcoastal south-eastern Australia between central Queensland and the Grampians in central western Victoria (NSW NPWS 1994, Strahan 1991). Once widespread and abundant, it has declined at many sites, seemingly due to competition from goats and predation by foxes. The species has suffered regional extinction from parts of its range and an overall reduction in its range, particularly in the western and southern sectors (Hill 1991).

North-east NSW is one of the Brush-tailed Rock Wallaby's primary strongholds (NSW NPWS 1994). The species remains locally common in the upper reaches of many east flowing rivers in north-east NSW (Short and Milkovits 1991), and the Tenterfield region is part of this distribution.

In the Tenterfield region the Brush-tailed Rock Wallaby has been recorded from Bonalbo, Gilgurry, Ewingar and Malara State Forests, Boonoo Boonoo National Park, and Red Rock Road north of the Bruxner Highway (Tanton 1995, NSW NPWS 1995).

The Brush-tailed Rock Wallaby has been recorded at 10 locations within the project site, mostly in association with the Massive Granite Rocky Outcrop habitat at Bald Top Mountain and the adjoining ridgeline to the north-west. The FIS provides that no other records to date are known from the local area. After additional surveys for the species and habitat investigations conducted in September 1994, the FIS considers that the species' use of the Project site would be primarily as a movement corridor, with individuals expected to move between primary habitat areas to the north and south-east of the Project site.

Records of the Brush-tailed Rock Wallaby in the project site, however, are unusual and unexpected (Andrew Smith, pers. comm.). Rock shelters in the surrounding area are not of the quality usually associated with rock wallaby colonies. This suggests that dingo and fox predation rates are unusually low in this area, enabling the wallabies to utilise lower quality rock shelter, alternatively, that the species is exploiting old mine workings (Andrew Smith, pers. comm.). No details of the extent of loss of old gold mine workings is given. Consequently the conclusion that the proposal will not threaten the local population is not justified on the basis of current evidence. Further surveys to determine the distribution of the

Brush-tailed Rock Wallaby population on the Timbarra Plateau are required. Persistence of Brush-tailed Rock Wallaby populations in and adjacent to areas disturbed by dust, noise and vibration by mining vehicles and other activity can not be assumed.

The FIS provides that clearing of 6 hectares of Moderate Granite Outcrop habitat would remove an area of marginal corridor habitat for the species.

The FIS proposes that any direct disturbances to major rocky outcrops occurring within the Project site would be avoided. Particular care would be taken in the vicinity of William's Gully between Lush's Hill prospecting area and the Poverty North open-cut. The Brush-tailed Rock Wallaby is known to frequent the rocky cliffs directly below these sites. Access to the Lush's Hill area and the Bald Top Mountain has already been closed.

The FIS provides that the Bold Top extended ridgeline will be protected from any disturbance by the proposal. The proposed haul road will be designed and constructed to ensure minimum crossing width at the most likely crossing points of the Brush-tailed Rock Wallaby, and minimum speed of trucks. Rehabilitation of the Big Hill mine area to enhance potential Rock Wallaby corridor for access to water habitat.

NPWS recommends additional surveys for the Brush-tailed Rock Wallaby on the Timbarra Plateau to determine the status of the species in the region. Information obtained from this survey would assist in determining whether the regional status of the species will be affected by the proposed activity.

NPWS considers that, unless further survey determine the distribution of this species extends beyond the area impacted by the activity the long-term viability of the Brush-tailed Rock Wallaby in the region can not be guaranteed. If the population is confined to the project site then additional measures will be required to mitigate or ameliorate the impact of the activity.

Red-legged Pademelon	<i>Thylogale stigmatica</i>
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The Red-legged Pademelon is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Red-legged Pademelon is restricted to the north-east coast of Australia from the tip of Cape York Peninsula south to the Hunter Valley on the NSW central coast. The Red-legged Pademelon is restricted to rainforests and wet sclerophyll forests, but in north-east NSW it is found in dry and subtropical rainforests where it feeds on fallen fruits and leaves of rainforest trees.

The Red-legged Pademelon has not been recorded on the project site, and the FIS provides that it is unlikely to occur. The species is not known from the Tenterfield region, but is known to occur in the Washpool National Park (Tanton 1995). NPWS considers that the preferred habitat of this species occurs on the project site. The proposed activity may, therefore, significantly modify the habitat of the Red-legged Pademelon.

The NPWS considers that, based on the information currently available, the long-term viability of the Red-legged Pademelon in the region should not be affected by the proposed

activity. However, the proposed activity may damage the habitat of this species.

Beccari's Mastiff Bat	<i>Mormopterus beccarii</i>
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The Beccari's Mastiff Bat is included on Schedule 2 of the TSC Act as a "Vulnerable" species.

Very little ecological information for this species exists. Beccari's Mastiff Bat is the largest species of the genus in southern Australia. Although this species is common in northern Australia, it is known from very few records in NSW, all from upper north-east NSW (Parnaby 1995). Records from NSW are mainly from dry sclerophyll forests or woodlands. The few records of roost sites for this species are in hollows in trees. It occurs from Northern Territory (West Australian border) through Queensland to NSW.

Beccari's Mastiff Bat seems, at best, to be only marginally distributed in extreme north-east NSW (NSW NPWS 1994). Only ten records of the species are known in the north-east forests, those being from Sheas Nob and Candole State Forests near Grafton, two records between Candole State Forest and Grafton (NSW NPWS 1995), Spirabo, Gilgurry and Malara State Forests, Morgans Creek and Tabulum near Tenterfield (Tanton 1995). There is an unconfirmed report of one in a house at Murwillumbah (Parnaby 1992).

Beccari's Mastiff Bat was not recorded within the project site, but has been recorded nearby, and is likely to be affected by the proposal (Harry Parnaby, pers. comm.). The species could be exposed to direct destruction of roosts and loss or modification of foraging habitats. Although the FIS states that mature trees will be largely retained in the area of proposed disturbance, roost site locations have not been surveyed for.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Eastern Little Mastiff Bat	<i>Mormopterus norfolkensis</i>
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The Eastern Little Mastiff Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Eastern Little Mastiff Bat is widely distributed east of the Great Dividing Range (Parnaby 1995) from south-east Queensland to the central coast of NSW (NSW NPWS 1994). Known from less than about 15 widely scattered localities within its range, it appears to be

sparse and localised within its range. Most records are from north-east NSW in dry sclerophyll forest and woodland, with a limited number of records from rainforest.

The species is known to roost in tree hollows (Allison 1989). Loss of roosting and foraging habitat, and loss of mature hollow bearing trees are major threats to this species. The species hunts by flying high above the canopy, probably feeding on a variety of flying insects.

The species was recorded within the project site in woodland forest habitat. The FIS provides that there are no records to date outside the project site within the local area, but the species would be expected to occur in this area.

The FIS provides that individuals may be sensitive to minor losses of trees and associated roost sites but these are not limited resources within the project site and study area. The FIS states that the vast majority of old growth and mature trees will be retained on the project site, thus continuing to provide suitable habitat for most of the bat species. The species is not considered by the FIS to be sensitive to small localised disturbances, however persistence of Eastern Little Mastiff Bat populations in and adjacent to areas disturbed by dust, noise and vibration by mining vehicles and other activity can not be assumed.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Eastern Chestnut Mouse

Pseudomys gracilicaudatus

The Eastern Chestnut Mouse is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Eastern Chestnut Mouse has a coastal distribution from north Queensland to central NSW (NSW NPWS 1994). In north-east NSW the species has a very patchy distribution and is known to inhabit wet heaths, grassy woodland and tussock grassland (Mahoney and Posamentier 1975). The Eastern Chestnut Mouse feeds predominantly on seeds, grasses and fungi, and also on insects.

The Eastern Chestnut Mouse was captured in the western swamp area of the project site in September 1994. There are no other records for the species in the local area, and this record extends the known western range of the species.

The FIS considers that the Eastern Chestnut Mouse would be sensitive to significant changes

to, or removal of, its wet swamp heathland habitat, and provides that the capture site of the individual specimen recorded and the adjoining habitat will not be affected directly by the proposal. A 50 metre buffer zone is proposed to ensure the protection of this species at the location. The construction of the heap leach pad would impact on potential habitat of the species, and any individuals occurring within the area would be expected to be lost during the clearing operations.

The FIS provides that other suitable potential habitat for the species occurs to the north-west and west of the project site, and therefore considers that the Eastern Chestnut Mouse would not be impacted by the proposal. This conclusion is not justified on the basis of available information. There are few records of the species in NSW. The species is either genuinely rare and localised, or difficult to detect by trapping (Andrew Smith, pers. comm.). NPWS considers that more surveys of potential habitat outside the project site and study area, using additional methods (pitfall trapping) are necessary to be certain that core populations of the species will not be lost if the proposal proceeds.

NPWS recommends additional surveys for the Eastern Chestnut Mouse on the Timbarra Plateau to determine the status of the species in the region. Information obtained from this survey would assist in determining whether the regional status of the species will be affected by the proposed activity.

Based on the information currently available, NPWS considers that until additional surveys detect secure populations of the Eastern Chestnut Mouse elsewhere on the Timbarra Plateau, it can not be guaranteed that the long-term viability of the Eastern Chestnut Mouse in the region will not be affected by the proposed activity. The proposed activity may harm and will damage the habitat of the species. The NPWS recommends that the issuing of the mining leases be conditional upon further surveys finding secure populations elsewhere on the Timbarra Plateau or special mitigation or ameliorative measures being undertaken on the project site by the proponent.

Yellow-bellied Glider

Petaurus australis

The Yellow-bellied Glider is included on Schedule 2 of the TSC Act as a "vulnerable" species.

The Yellow-bellied Glider has a patchy distribution along the east coast and adjacent ranges of mainland Australia from south-east South Australia to north Queensland. The NPWS databases provide numerous records of the species throughout the north-east forests (NSW NPWS 1995).

The Yellow-bellied Glider inhabits tall eucalypt forest. It is a habitat specialist depending on tree hollows for nesting and is apparently dependent on a small proportion of trees from a narrow range of eucalypt species for sap feeding (Goldingay 1991). The reasons for the selection of trees for sap feeding are not well understood, but particular trees may be used by gliders for decades (Goldingay and Kavanagh 1993). The Yellow-bellied Glider is territorial and occupies exclusive home ranges of approximately 30-65 hectares (Goldingay and Kavanagh 1991).

Critical elements of habitat needed by the Yellow-bellied Glider include sap-site trees, winter flowering eucalypts, mature trees with large and deep hollows suitable for den sites, and a mosaic of different forest types. The species is known to prefer tall, open sclerophyll forests where veteran trees provide shelter and nesting hollows and mixtures of canopy tree species provide the required diverse and seasonally available food resources (Kavanagh 1987).

Clearing of habitat poses a threat to all of these critical elements. The proposed clearing and mining may result in loss of foraging and den sites in tree hollows in the heath open forest and dry sclerophyll forest.

The Yellow-bellied Glider has not been recorded on the Timbarra Plateau or project site, but has been recorded in the Tenterfield region. The species has been recorded in Forestland, Spirabo, Boorook, Bookookarara, Boonoo and Gilgurry State Forests (Tanton 1995). It may be found to occur on the site if more extensive surveys are conducted (Andrew Smith, pers. comm.), and a significant portion of its preferred habitat will be cleared by the proposed activity.

The protection of old growth/ hollow bearing trees on the project site as indicated in the FIS will mitigate the effects of the proposed activities.

The NPWS considers that, based on the information currently available, the long-term viability of the Yellow-bellied Glider in the region should not be affected by the proposed activity. However, the proposed activity is likely to damage the habitat of the species.

Squirrel Glider	<i>Petaurus norfolcensis</i>
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The Squirrel Glider is included on Schedule 2 of the TSC Act as a "vulnerable" species.

The Squirrel Glider is restricted to a narrow range of habitats which include an abundance of hollow-bearing trees, and a mix of eucalypts/ banksias with at least one species which flowers heavily in winter, and one or more smooth barked eucalypts (which support a diverse invertebrate fauna beneath the decorticating bark). Populations of *Xanthorrhoea* sp. are known to provide a valuable food source for the Squirrel Glider, and mature *Acacia* sp. are also found in the understorey of forests supporting Squirrel Glider populations. Forests containing an abundance of hollow-bearing trees provide nest and refuge sites for Squirrel Gliders. The species has a diet of invertebrates and plant and insect exudates.

The species is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland (NSW NPWS 1994).

It is likely that clearing of open woodland areas has had a dramatic affect on the Squirrel Glider. Impacts of the proposed mining development on the Squirrel Glider are likely to include removal of nesting sites, food sources, and continuous tree cover between foraging areas, resulting in increased risk of predation.

The Squirrel Glider has not been recorded on the Timbarra Plateau or in the project site, but

has been recorded in the Tenterfield region. It is known from Gilgarry State Forest. It has been recorded in the Washpool State Forest and Washpool National Park. It may be found to occur in the project site if more extensive surveys are conducted; a significant portion of its preferred habitat will be cleared by the proposed activity (Andrew Smith, pers. comm.).

The protection of old growth/ hollow bearing trees on the project site as indicated in the FIS will mitigate the impacts of the proposed activities.

The NPWS considers that, based on the information currently available, the long-term viability of the Squirrel Glider in the region should not be affected by the proposed activity. However, the proposed activity may damage the habitat of the species.

Koala

Phascolarctos cinereus

The Koala is listed on Schedule 2 of the TSC Act as a "vulnerable" species.

The Koala occurs throughout eastern Australia from western Victoria to Cape York. Population strongholds occur in south-east Queensland and north-east NSW.

The Koala has not been recorded on the Timbarra Plateau or in the Project site. The Koala has been recorded in the Malara State Forest 15 kilometres north of the project site (NSW NPWS 1995). The species has been recorded in the Gilgurry, Boorook, Girard, Forestland and Ewingar State Forests. There are a number of records from private land within the Tenterfield region. It may be found to occur in the project site if more extensive surveys are conducted; a significant portion of its preferred habitat will be cleared by the proposed activity (Andrew Smith, pers. comm.).

NPWS considers that the removal of Koalas located during pre-clearing surveys from areas to be cleared will mitigate the impact of the proposed activities on Koalas.

The NPWS considers that, based on the information currently available, and with the implementation of ameliorative measures, the long-term viability of the Koala in the region should not be affected by the proposed activity. However, the proposed activity may damage the habitat of the species.

Rufous Bettong

Aepyprymnus rufescens

The Rufous Bettong is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Rufous Bettong is discontinuously distributed from the Hunter Valley in central NSW to about Cooktown in north Queensland (NSW NPWS 1994). In north-east NSW, the species

typically occupies open forests and woodlands with an open structure where shrub layers are typically absent and native grasses are prevalent (NSW NPWS 1994, Southgate 1980, Schlager 1981). Rufous Bettongs feed predominantly on grasses, sedges and herbs and also forage for roots and tubers.

On a regional basis, the FIS provides that the Rufous Bettong appears to be widespread and moderately common within suitable habitat areas.

The FIS provides that the Rufous Bettong would be expected to occur throughout the local area in suitable grassy habitat, but that it is likely that grazing pressures and associated burning may have reduced habitat suitability in some locations. Within the project site, one individual, tentatively identified as a Rufous Bettong, was observed in the vicinity of Fauna Site 13. Another female carrying a pouched young was trapped on Trap Line 12. Two other observations of the species were made during the Hastings River Mouse surveys in September 1994.

The FIS considers that the Rufous Bettong is primarily sensitive to disturbances which will affect its habitat and which will encourage its predation by foxes. Some potential habitat may be removed through clearing of the heap leach pad in the western sector of the project site. The FIS provides that the majority (76%) of the area to be cleared occur in habitats depended upon by the Rufous Bettong. The Rufous Bettong is known to be breeding in the vicinity of Duncans Creek. Prime habitat will be protected on this locality, but the FIS considers the species sensitive to the proposed activity in the area.

The FIS provides that the retention and protection of the majority of areas of grassy understorey within the project site should ensure the survival of the species on the site. The FIS also proposes the implementation of a feral animal monitoring program, and rehabilitation of suitable areas to promote dense growth.

The NPWS considers that an effective predator control program may ameliorate impacts associated with the proposed activities.

The NPWS considers that, based on the information currently available, and with the application of ameliorative measures, the long-term viability of the Rufous Bettong in the region should not be affected by the proposed activity. However, the proposed activity may harm individuals of this species and is likely to damage habitat of this species.

Long-nosed Potoroo	<i>Potorous tridactylus</i>
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The Long-nosed Potoroo is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Long-nosed Potoroo has a restricted and patchy distribution from south-east Queensland to south-west Victoria and in northern and eastern Tasmania and some Bass Strait islands (NSW NPWS 1994). The species is typically associated with dense shelter characterised by a structurally complex ground layer, although access to small patches of more open vegetation may be required for foraging (Bennett 1987).

The Long-nosed Potoroo has not been recorded on the Timbarra Plateau or project site, but

has been recorded in the surrounding region, Washpool State Forest and National Park, and may be found to occur on the project site if more extensive surveys are conducted. A significant portion of its preferred habitat will be cleared by the proposed activity (Andrew Smith, pers. comm.).

The predator control program as proposed in the FIS would help mitigate impacts of the proposed activities.

The NPWS considers that, based on the information currently available, the long-term viability of the Long-nosed Potoroo in the region should not be affected by the proposed activity. However, the proposed activity may damage the habitat of this species.

Large Pied Bat	<i>Chalinolobus dwyeri</i>
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The Large Pied Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Large Pied Bat has a restricted range in south central Queensland and northern NSW with a few records from coastal catchments (NSW NPWS 1994). The species has been recorded at roosts in caves, disused mine tunnels, and under sandstone rock overhangs.

The species is known from relatively few records from a range of habitats including woodland which are apparently similar to that occurring on the project site. Records exist from both sides of the Great Dividing Range in northern NSW. The Large Pied Bat was not recorded on the project site, but could occur on the site or utilise the site at various times of the year (Harry Parnaby, pers. comm.).

The Large Pied Bat was not considered in the FIS.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Hoary Bat	<i>Chalinolobus nigrogriseus</i>
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The Hoary Bat is included on Schedule 2 of the TSC Act as a "vulnerable" species.

The Hoary Bat is considered to be at the southern limit of its range in north-east NSW, being distributed from northern Western Australia through the Northern Territory and north and south-east Queensland. The Hoary Bat has been recorded near Grafton in Bundjalung National Park and Ramornie State Forest (NSW NPWS 1995), in Divines and Newfoundland State Forests (NSW NPWS 1995), and near Tenterfield in Spirabo State Forest and near Tabulum (Tanton 1995). While the Hoary Bat is common in the northern section of its range and a number of records are known from south-east Queensland, prior to 1991 the only records of its occurrence in NSW were four specimens collected from the upper Clarence River in 1868 (Milledge *et al.* 1992). Given the complete absence of records over the past 130 years, particularly considering the recent proliferation of bat surveys, it appears that the Hoary Bat is an uncommon to rare species with a very restricted distribution in NSW. Five individuals were captured in October 1991 in Ramornie State Forest (Milledge *et al.* 1992).

The species is thought to roost in rock crevices and caves and in tree hollows (Allison 1989). However, in NSW it has not been recorded in caves or mine tunnels and is likely to roost in tree hollows (Tanton 1995). Diet consists of a variety of insects and other invertebrates, many of which are gleaned from the ground, surfaces of trees, and rocks (Strahan 1983).

The Hoary Bat is known from relatively few records from a range of habitats including woodland similar to that occurring on the site, and records exist from both sides of the Great Dividing Range in northern NSW. The species was not detected on the project site during surveys, and was not considered in the FIS, however, it is known from Spirabo State Forest in the Tenterfield region and from Tabulum to the north-east of the project site (Tanton 1995) and could occur on the site or utilise the site at various times of the year.

The NPWS considers that, based on the information currently available, and with the implementation of ameliorative measures, the long-term viability of the Hoary Bat should not be affected by the proposed activity. However, the proposed activity may damage the habitat of this species.

Troughton's Vespadelus	Vespadelus troughtoni
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Troughton's Vespadelus is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

Troughton's Vespadelus is distributed through eastern Queensland and eastern NSW. In north-east NSW the species has been recorded from Bonalbo district where it was observed to roost in caves, old mine tunnels and under rock overhangs (NSW NPWS 1994). Most records in the state are from dry sclerophyll forest and woodland.

Little is known about the biology, diet, demography or ecological requirements of the species. Intensive surveys in eastern NSW have resulted in very few records of this species, suggesting that it could be localised or rare. This species is known from two sites in north-east NSW, Bonalbo and between Bonalbo and Stanthorpe north of the project Site.

Disturbance to roost sites and modification of foraging habitat are considered threats to this species.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Great Pipistrelle

Falsistrellus tasmaniensis

The Great Pipistrelle is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Great Pipistrelle occurs from western Victoria and Tasmania to south-east Queensland. The species is insectivorous and feeds around or just below the forest canopy (O'Neill and Taylor 1986).

Calls of the Great Pipistrelle were recorded within the project site in Dense Forest - predominantly Wet Sclerophyll habitat during the field surveys of February 1994. The FIS rates the species as common throughout the region and it is expected to occur throughout the local area. The Great Pipistrelle is known from across the Tenterfield region (Tanton 1995).

The species is considered sensitive to habitat modification and destruction (NSW NPWS 1994). The FIS identifies potential impacts on the species as loss of feeding and roosting sites. The FIS states that the vast majority of old growth and mature trees will be retained on the project site, thus continuing to provide suitable habitat for most of the bat species. The species is not considered by the FIS to be sensitive to small localised disturbances, however persistence of Great Pipistrelle populations in and adjacent to areas disturbed by dust, noise and vibration by mining vehicles and other activity can not be assumed.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Golden-tipped Bat

Kerivoula papuensis

The Golden-tipped Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Golden-tipped Bat has a disjunct distribution in eastern Australia from Cape York Peninsula to southern NSW (Parnaby and Mills 1994).

The majority of records of the species have been from rainforest or adjacent wet or dry sclerophyll forest, however, a number of records are from dry sclerophyll forest a considerable distance from rainforest (Parnaby and Mills 1994).

The diet of the Golden-tipped Bat consists largely of orb-weaving spiders (Hall and Woodside 1989).

The Golden-tipped Bat is known from Girard, Forestland and Spirabo State Forests in the Tenterfield region (Tanton 1995). One specimen of the species was captured from Predominantly Dry Sclerophyll Forest/ Woodland during field surveys in February 1994. The FIS claims that the Golden-tipped Bat, thought to predominantly utilise rainforest areas, will be least impacted by the proposal because only three hectares of rainforest will be cleared. However, removal of three hectares of rainforest could involve destruction of individuals of individuals, roost sites, and foraging habitat, particularly as roost sites are not known. Further, the individual captured on the project site was trapped in woodland. The extent and significance of utilisation of dry habitats adjacent to rainforest by this species is not known, but is a possibility. A number of records exist of individuals trapped in dry sclerophyll forest adjacent to rainforest (NSW NPWS 1994). Such records presumably represent movements between habitat patches and/ or utilisation of dry habitat for foraging.

The possible impacts of noise and dust fallout on the species have not been considered. Persistence of Golden-tipped Bat populations in and adjacent to areas disturbed by dust, noise and vibration by mining vehicles and other activity cannot be assumed.

NPWS requires that, this species should be surveyed for as part of the survey of threatened bats. Any such information will contribute to a more accurate assessment of the status of this species on the project site.

The NPWS considers that, based on the information currently available, and with the implementation of ameliorative measures, the long-term viability of the Golden-tipped Bat in the activity should not be affected by the proposed activity. However, the proposed activity may harm this species and is likely to damage its habitat.

Little Bent-wing Bat

Miniopterus australis

The Little Bent-wing Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Little Bent-wing Bat occurs along the east coast of Australia from Cape York to north-east NSW (NSW NPWS 1994). The species occupies caves and tunnels during the day, typically located within or near dense vegetation, and forages on insects by night underneath the canopy of well timbered habitats.

The Little Bent-wing Bat was not recorded in the project site, but could occur on the site or utilise the site at various times of the year (Harry Parnaby, pers. comm.).

NPWS requires that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites must be undertaken. If threatened bats are recorded, amelioration measures must be provided to the Manager, Northern Zone. Written approval must be obtained from the Manager, Northern Zone, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Common Bent-wing Bat

Miniopterus schreibersii

The Common Bent-wing Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Common Bent-wing Bat occupies eastern and northern Australia. In north-east NSW the species is widely distributed, occurring from coastal areas to the western slopes (NSW NPWS 1994). The FIS provides that the species appears to be fairly widespread in the region. In the Tenterfield region it has been recorded in the Girard Extension Forest, Gilgurry and Forestland State Forests (Tanton 1995). The species was recorded within the project site in Dense Forest - predominantly Wet Sclerophyll habitat during field surveys in November 1993 and February 1994.

The FIS provides that there may be some potential impacts on individuals utilising the Poverty Main area. Mitigation measures incorporating protection of mature trees and minimising clearing and disturbance in general are proposed to protect the bats outside the proposed disturbance area.

The possible impacts of noise and dust fallout on the species has not been considered. Persistence of Common Bent-wing Bat populations in and adjacent to areas disturbed by dust, noise and vibration by mining vehicles and other activity cannot be assumed.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is

likely to damage the habitat of this species

Large-footed Mouse-eared Bat

Myotis adversus

The Large-footed Mouse-eared Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species

The Large-footed Mouse-eared Bat is widespread in the coastal regions of eastern and northern Australia (NSW NPWS 1994). The species is specialised for an aquatic feeding mode and is therefore always recorded in proximity to water. The Large-footed Mouse-eared Bat feeds on beetles and small fish (Robson 1984) and roosts close to water in caves, mines, and under bridges.

The Large-footed Mouse-eared Bat was not recorded on the project site. It is known from the Timbarra River south of the project site and north of Gilgurry State Forest (NSW NPWS 1995). The proposed activity could potentially have an impact on the species in the region. The Large-footed Mouse-eared Bat may be affected by reduction in the quality of downstream foraging habitat.

The proposed general amelioration measures proposed for the bat group (retention of trees outside the proposed disturbance areas) are unlikely to be affective in ameliorating potential impacts on the Large-footed Mouse-eared Bat.

The Environmental Protection Authority has confirmed that the proposed activity will meet performance targets or adopt best practice with respect to water quality.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species

Greater Broad-nosed Bat

Scoteanax rueppellii

The Greater Broad-nosed Bat is listed on Schedule 2 of the TSC Act as a "Vulnerable" species.

The Greater Broad-nosed Bat has a limited subtropical and temperate range in coastal eastern Australia (NSW NPWS 1994). The species is sparsely distributed in north-east NSW (Gilmore and Parnaby 1994), although north-east NSW is considered to be the species'

stronghold (NSW NPWS 1994).

The Greater Broad-nosed Bat prefers sclerophyll forest habitat and is considered threatened by forest management activities that lead to truncated tree age classes throughout its restricted range (NSW NPWS 1994).

The Greater Broad-nosed Bat is known from Boonoo Boonoo and Bald Rock National Parks, Girard, Spirabo, Forestland, Bookookorara State Forests, and Girard Extension State Forest in the Tenterfield region (Tanton 1995). Calls of the Greater Broad-nosed Bat were recorded in small - moderate Rocky Outcrop habitat in the south of the project site. This record is the only known record in the local area, but the species has been recorded in Washpool National Park and state forests in the region.

The FIS considers that individuals are likely to be sensitive to losses of tree hollows, but that tree hollows are not a limiting resource within the project site or study area. Further, the FIS considers that the species is unlikely to be sensitive to small localised disturbances. There is no indication in the FIS that studies on the effects of noise or dust, for example, on the species have been undertaken, and no other evidence has been provided to support the above FIS statements.

The FIS provides that the vast majority of old growth and mature trees will be retained on the project site, thus continuing to provide suitable habitat for most bat species. Similarly, the avoidance of impact on all habitat outside the proposed disturbance area will protect any potential roosting habitat for cave/ tunnel roosting species.

NPWS believes that, prior to the commencement of clearing activities, a survey of threatened bats to locate roost and nest sites should be undertaken. If threatened bats are recorded, amelioration measures should be provided to the Manager, Northern Zone, NPWS. Written approval should be obtained from the Manager, Northern Zone, NPWS, prior to commencement of clearing.

The NPWS considers that, until pre-clearing surveys demonstrate there are no roost or nest sites in the proposed disturbance area, it cannot be guaranteed the long-term viability of this species in the region will not be affected by the proposed activity. The proposed activity is likely to damage the habitat of this species