



BROCKS CREEK GOLD PROJECT

ENVIRONMENTAL ASSESSMENT REPORT AND RECOMMENDATIONS

by the

**ENVIRONMENT PROTECTION DIVISION
DEPARTMENT OF LANDS, PLANNING AND ENVIRONMENT, NT**

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EXECUTIVE SUMMARY

This report assesses the environmental impact of a proposal by Solomon Pacific Resources NL (Solomon) to establish and operate a two pit open cut gold mine and associated infrastructure at the Brocks Creek Prospect, approximately 45 km northwest of Pine Creek in the Northern Territory.

The report reviews the draft Environmental Impact Statement (draft EIS), public comments on the draft, and the proponent's response to these comments in the Supplement to the draft EIS. It is based on information and advice provided by Northern Territory Government agencies.

Environmental impact assessment is based on fully defining those elements of the environment which may be affected by a proposed development, and on quantifying the significance, risks and consequences of the potential impacts of the development at a local and regional level.

This report assesses the adequacy of the EIS in achieving the above objectives, and evaluates the undertakings and environmental safeguards proposed by the proponent to mitigate against the potential impacts. Further suggestions are recommended as appropriate.

The contents of this report form the basis of advice to the Northern Territory Minister for Environment on the environmental issues associated with the Brocks Creek Gold Project.

Major Issues

The major issues associated with the construction and operation of the Brocks Creek Gold Project raised during the review of the draft EIS and Supplement are listed below and are the focus of the contents of this assessment report.

- *identification of parameters and commitments*
- *wetland filter design and management*
 - *water and habitat quality*
 - *insect vectors of disease*
- *waste rock and residue design and management*
- *flora and fauna survey*
- *heritage and Aboriginal archaeological site conservation*
- *rehabilitation*

It is important for interpretation purposes that the recommendations in this report are not considered in isolation, as the text contains a number of identified concerns, suggestions, and some considerations to assist decision-making.

It is acknowledged that during detailed implementation of proposals, flexibility is necessary and desirable to allow for minor and non-substantial changes to the design and specifications which have been examined as part of this assessment. It is considered that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

Subject to decisions which permit the Brocks Creek Gold Project to proceed, the primary recommendation resulting from the assessment is as follows:

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards identified in the Brocks Creek Gold Project draft Environmental Impact Statement, or as modified in the Supplement to the draft EIS, this assessment report, or an approved Environmental Management Plan.

A. Recommendation associated with identification of parameters and commitments

Recommendation 2

- i) The proponent shall ensure that a detailed summary of environmental commitments is submitted to the Department of Mines and Energy for approval prior to commissioning.**
- ii) The proponent shall submit a complete baseline and operational monitoring programme, including identified parameters and thresholds in an Environmental Management Plan (EMP). The EMP is to be prepared and submitted in accordance with DME requirements.**

B. Recommendation associated with design and management of wetland filter - water and habitat quality and insect vectors of disease

Recommendation 3

- i) The proponent is to consult with the Department of Mines and Energy, Power and Water Authority, Territory Health Services and the Conservation Commission to ensure the design and management of the wetland filter fulfils water quality, flora habitat, fauna protection and biting insect management specified by the authorities.**
- ii) After consultation, the proponent is to submit the completed plan for the wetland filter in an EMP to the Department of Mines and Energy for approval.**

C. Recommendation associated with design and management of waste rock dumps

Recommendation 4

- 1) The proponent is to consult with the Department of Mines and Energy to resolve:
 - a. the establishment and implementation of a preferred method for waste rock characterisation;
 - b. the design and construction methods for waste rock dumps;
 - c. operational waste rock monitoring requirements; and
 - d. contingency measures for acid mine drainage.
- 2) The proponent is to present the agreed details in an EMP.

D. Recommendation associated with an aquatic fauna survey

Recommendation 5

The proponent shall undertake a wet season aquatic fauna survey prior to commissioning, with survey methodology to be confirmed with the Department of Mines and Energy and Conservation Commission.

E. Recommendation associated with rehabilitation

Recommendation 6

The proponent shall consult with the Department and Mines and Energy to determine the requirements on implementation of a rehabilitation plan for disturbed sites and construction sites associated with the project.

F. Recommendation associated with Beneficial Use and licensing

Recommendation 7

The proponent shall liaise with the Power and Water Authority to assist in establishing Beneficial Use and licensing requirements for the Howley Creek drainage system, under the provisions of the *Water Act*.

G. Recommendation associated with proposed access road and rail corridor right of way

Recommendation 8

The proponent shall consult with the Department of Transport and Works regarding approvals for:

- a. the alignment and design of the proposed access road; and
- b. right of way requirements associated with the rail corridor.

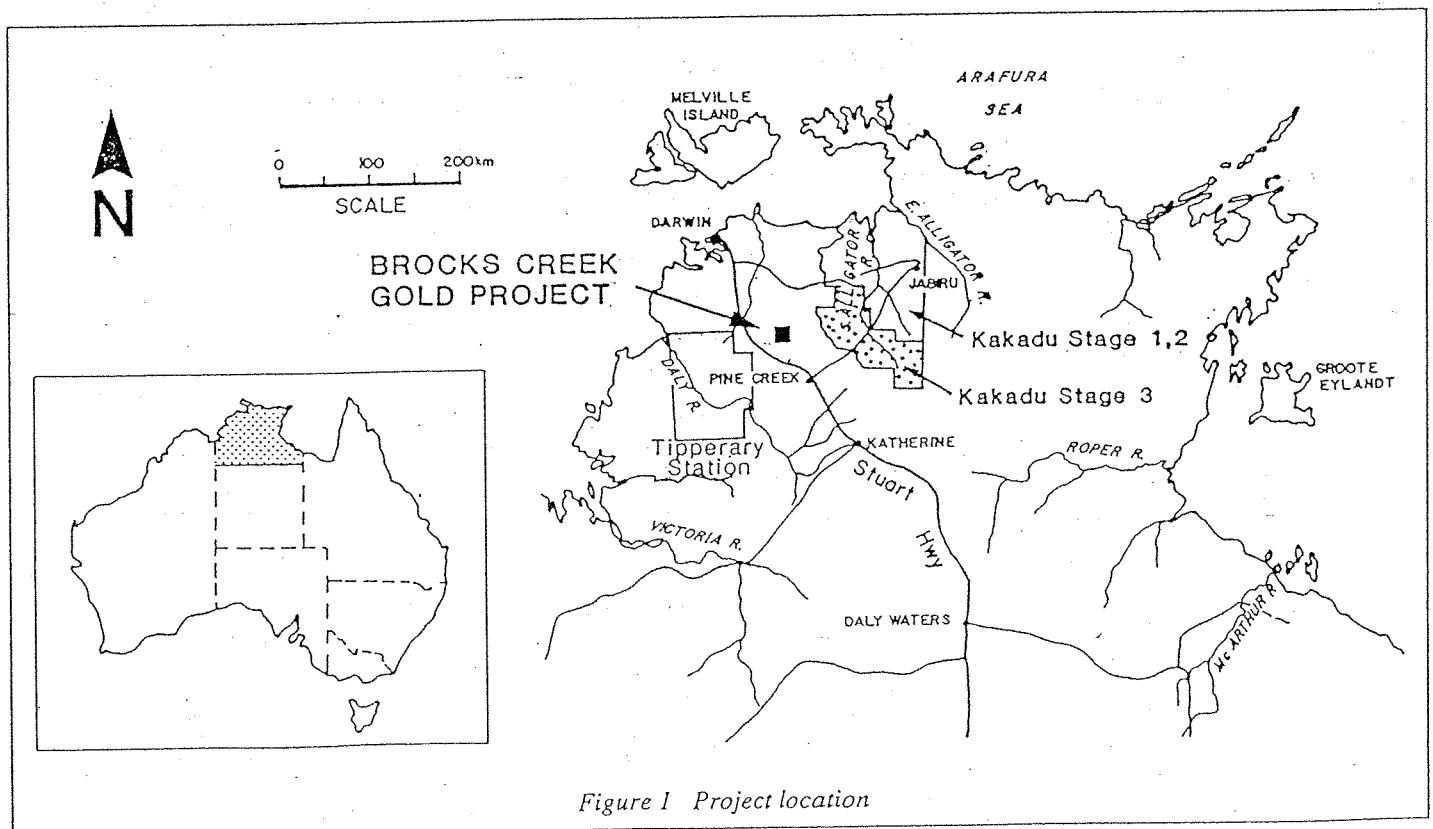
H. Recommendation associated with a separate landfill site

Recommendation 9

The proponent shall construct a separate landfill site on the lease. The proponent shall consult with the Department of Mines and Energy, Department of Lands, Planning and Environment and Territory Health Services over its design, siting and construction.

1. INTRODUCTION AND BACKGROUND

This report assesses the environmental impact of a proposal by Solomon Pacific Resources NL (Solomon), to establish a gold mine consisting of two open cut pits and associated infrastructure at the Brocks Creek Prospect, approximately 45 km northwest of Pine Creek in the Northern Territory. Figure 1 shows the location of the project.



The report reviews the draft EIS, public comments on the draft EIS, and the proponent's responses to these comments in the Supplement to the draft EIS (the draft EIS plus the Supplement constitutes the EIS). It also relies on information, comments and advice provided by Northern Territory Government agencies.

1.1 Environmental Assessment Process

Environmental impact assessment is predicated on fully defining those elements of the environment which may be affected by a proposed development, and on quantifying the significance, risks and consequences of the potential impacts of the proposal at a local and regional level.

This report will assess the adequacy of the EIS in achieving the above objectives, and will evaluate the undertakings and environmental safeguards proposed by the proponent to mitigate the potential impacts. Further safeguards may be recommended as appropriate.

The safeguards may be implemented at various levels within the planning framework of the project. These are:

- *Site Selection**
- *Layout of Facilities**
- *Design of Facilities**
- *Processes used in facilities (ie. inputs and outputs)**
- *Management of Processes and Facilities**

The recommendations arising from the assessment of the proposal will refer to these different aspects of the project.

The contents of this report form the basis of advice to the Northern Territory Minister for Environment on the environmental issues associated with the project.

1.2 Environmental Assessment History

A Notice of Intent to mine was lodged in July 1994 and an Addendum to the Notice of Intent was lodged in February 1995. These reports formed the basis for a Preliminary Environmental Report (PER). The Minister for Conservation subsequently determined that an EIS was necessary to address the potential impacts arising from the project. In accordance with the provisions of the Northern Territory *Environmental Assessment Act 1982*, Solomon was directed to prepare an EIS on the project in May 1995.

Guidelines for the preparation of the EIS were prepared by the Conservation Commission (CCNT) in consultation with Northern Territory Government agencies and are included as Appendix 7 of the draft EIS.

On 3 July 1995 the proponent submitted the draft EIS to the Northern Territory Government, and placed the document on public exhibition until 8 August 1995.

A total of two submissions were received on the draft EIS: one from the NT Government (comprising 10 submissions from individual Departments) and one from the public. All

submissions were forwarded to the proponent to assist in the preparation of the Supplement to the draft EIS.

A list of respondents to the draft EIS is provided in Appendix 1 of this report. Appendix 2 provides a breakdown of the issues and sub-issues raised.

The Supplement to the draft EIS was received on 25 August 1995 and distributed to Northern Territory Government agencies for examination and comment. These comments are incorporated as appropriate in the body of this report.

2. THE PROPOSAL

2.1 The Mine

The Brocks Creek deposit is a small, low grade ore body averaging 1.6 g/t to 1.9 g/t gold (as defined in the draft EIS). The project will nominally produce 1 Mt/a of ore over a mine life of six years, based on identified ore resources at the Alligator and Faded Lily pits. Additional ore could be identified through continuing exploration drilling, however a further resource has not been confirmed at this stage.

The ore will be mined by open-cut methods and treated by cyanide leaching in a carbon-in-leach (CIL) processing plant. Process residues (tailings) will be contained by impoundment, and recovered water will be recycled to the mill. Waste rock will be placed in waste rock dumps.

All project components will be located on Mineral Lease 1139, which has a total area of 3990 ha. The project facilities will cover 4% of the lease area totalling some 279 ha. This will include major infrastructure such as a residue storage area, two waste rock dumps, and a wetland filter (Stages 1 and 2). The water supply will be supplemented by make-up water from the two pits, the residue storage area, and process water pond. **Figure Two** shows the project layout and associated infrastructure.

A water management system will be implemented for the whole site, in accordance with the following principles:

- minimum water consumption
- maximum water re-circulation
- a hierarchy of use based on water quality
- minimum discharges from operational areas of the lease
- maximum containment of contaminants
- minimum disturbance of land
- adequate storage to maintain supply during prolonged dry conditions

The emphasis is on re-use of as much of the mine water as possible throughout the operation of the mine, and the operation of a closed-circuit water system.

Mine staff will be accommodated on the lease site. The project will employ approximately 75 personnel during the operational phase of the project.

2.2 Major Issues

Major issues associated with the construction and operation of the Brocks Creek Gold Project raised during the review of the draft EIS and Supplement are listed below and are the focus of the contents of this assessment report.

- *identification of parameters and commitments*
- *wetland filter design and management*
 - *water and habitat quality*
 - *insect vectors of disease*
- *waste rock and residue design and management*
- *flora and fauna survey*
- *heritage and Aboriginal archaeological site conservation*
- *rehabilitation*

3. REGIONAL SETTING

The following information is based on material presented in the draft EIS.

3.1 The Region

The Brocks Creek Gold Project is located in the Pine Creek region, in the Top End of the Northern Territory. The mine is approximately 170 km southeast of Darwin, and 45 km northwest of Pine Creek. The site is secluded, being 7 km to the northeast of the Stuart Highway and 15 km from the next nearest settlement.

The project area has a history of gold exploration and mining, with gold first discovered in 1872. The area was predominantly worked by Chinese tributers working along the line of reef between Brocks Creek and John Bull, 4 km to the northwest. Mining comprised a mixture of alluvial mining, shafts, adits and small pits. The settlement at Brocks Creek peaked at 311 people in 1895, the majority of whom lived in Brocks Creek Chinatown. By 1897 Brocks Creek was the centre of a mining boom and was officially proclaimed a township in 1898. The township was developed north of Brocks Creek Chinatown. The boom was shortlived and by 1911 the population had dwindled to some 40 inhabitants.

The project area was also used during WWII as a detention camp for military prisoners. The camp comprised detention barracks, officer accommodation and service buildings. The Larrimah to Darwin railway line also ran through the centre of Brocks Creek Prospect prior to closure.

3.2 Biogeography

The gold deposits at Brocks Creek occur along the Brocks Creek-Zapopan Anticline/Shear Zone within the southern aureole of the Burnside Granite. Gold mineralisation is hosted by the Gerowie Tuff, composed of alternate volcanic and sedimentary layers with argillites as the dominant lithology, along with greywacke and a characteristic cherty tuff. Groundwater at Brocks Creek is associated with the geology of the Brocks Creek-Zapopan Anticline/Shear Zone.

There are three main geomorphic elements in the project area; hill slopes and summits, colluvial wash slopes and alluvial flats and channels. Gold mineralisation to be developed by Solomon is hosted in the hill slopes and summits, however gold has been worked from the colluvial wash slopes and alluvial flats in the recent past.

The alluvial flats are associated with Brocks Creek and Burgan Creek which subsequently flow southwest into the Howley Creek drainage system. Howley Creek flows west and north into the Margaret River system.

The colluvial wash slopes land unit is the most widespread on the lease and comprise gentle slopes which fringe the hill slopes and summits and are vegetated commonly by *Eucalyptus polycarpa*, *E. clavigera*, *Syzgium eucalyptoides* ssp. *bleeseri* and *Alstonia actinophylla*.

The hill slopes and summits land unit is common at the northern end of the lease and is commonly vegetated with *Eucalyptus tectifica*, *Eucalyptus setosa*, *Eucalyptus nesophila*¹, *Gardenia megasperma*, *Cochlospermum fraseri* and *Grevillea heliosperma*. The shrub layer is poor, dominated by *Calytrix* spp.

The climate is tropical monsoonal; dominated by hot, humid monsoonal conditions during the wets season, and dry warm weather during the dry season. Rainfall is strongly seasonal, and the project area receives in excess of 1000 mm/year. The nearest recorded average rainfall is at the community of Pine Creek, which has an annual average record of 1113 mm. Air temperatures are high and relatively constant throughout the year. The annual mean maximum is approximately 33°C and the annual mean minimum is approximately 21°C. The annual average evaporation is 3360 mm, and based on an average year of evaporation is well in excess of rainfall, subsequently there is a moisture deficit by 2200 mm. The wind pattern is distinctive and predictable, with strong southeast trade winds in the dry season, and variable, but predominantly northwest winds in the wet season.

¹ Solomon should note it is unlikely that *Eucalyptus nesophila* (Melville Island Bloodwood) occurs at Brocks Creek as its habitat is restricted to Melville and Bathurst Islands and Cobourg Peninsula in the Northern Territory.

3.3 Areas of Conservation Significance

There are no parks or reserves in the vicinity of the project and none of the flora species (recorded and from records) are considered rare or endangered. Two species are included on the Northern Territory list of plant species of conservation significance, namely; *Acacia praetermissa* and *Eragrostis rigidiuscula*.

The project area does fall within the habitat region for the Ghost Bat, Gouldian Finch and Hooded Parrot.

The Brocks Creek prospect also has historical significance in regards to its development as a gold mining community in the late 1800's and the remains of infrastructure associated with WWII activities. Aboriginal archaeological sites and artefacts are also associated with specific geological features of the region.

3.4 Demography

The region is sparsely populated, with the communities of Adelaide River and Pine Creek being the focus of social and economic activity in the region. The current population for Pine Creek is estimated at 650, and 360 for Adelaide River. There are an estimated 150 additional people on the surrounding properties and mines.

The nearest dwellings not associated with the project are Ban Ban Springs Homestead and Hayes Creek Inn, both located some 15 km to the northeast and southeast from the site, respectively.

3.5 Economy

Mining is the significant contributor to employment in the Adelaide River to Pine Creek region, while both communities benefit from their juxtaposition on the tourist crossroads between Darwin, Katherine and Jabiru. The pastoral industry is also a contributor to the economy of the region. This also includes pastoral/tourism ventures.

4 ENVIRONMENTAL ASSESSMENT

It is important for interpretation purposes that the recommendations (in **bold type**) are not considered in isolation, as the text identifies concerns, suggestions and undertakings associated with the project.

It is acknowledged that during detailed implementation of proposals, flexibility is necessary and desirable to allow for minor and non-substantial changes to the design and specifications which have been examined as part of this assessment. It is considered that subsequent statutory approvals for these proposals could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

Subject to decisions which permit the Brocks Creek Gold Project to proceed, the primary recommendation resulting from the assessment is as follows:

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards identified in the Brocks Creek Gold Project draft Environmental Impact Statement, or as modified in the Supplement to the draft EIS, this assessment report or an approved Environmental Management Plan.

4.1 Major Issues

Six major issues associated with the construction and operation of the mine project have been identified.

The definition of "mine project" for this assessment includes operations associated with the extraction and processing of ore, surface and groundwater management, appropriate disposal of waste and residue, rehabilitation, and supporting on-site infrastructure.

Respondents considered that there were a number of deficiencies in the EIS, for example the lack of presentation of a table of commitments, inadequate flora and fauna survey and lack of a biting insect survey. As the environmental impact assessment process is the means by which all impacts, their significance and the proposed management practices for minimising these impacts are identified and assessed, all issues associated with the project should have been included in the EIS. These matters are addressed in the following text.

4.1.1 Identification of Parameters and Details on Commitments

The draft EIS provides an outline of Solomon's approach to environmental management and monitoring. Included in the outline are two tables on water monitoring, dot points listing further monitoring programme and a list of potential impacts, safeguards and predicted residual impacts.

Adequacy of Description of Parameters and Details on Commitments

The proponent has not fully provided monitoring details and parameters associated with the proposal as outlined in the Guidelines such as waste rock characterisation, disturbance and rehabilitation, tailings system operation, flora/fauna and hazardous substances. Water management issues were scattered throughout the draft EIS rather than consolidated. The Supplement did not draw together any newly acquired baseline data or responses to comments in a revised table on proposed monitoring or additional monitoring requirements. This would have assisted in assessing the adequacy of the monitoring programme and safeguards against the predicted impacts.

The proponent did not, as a precursor to identifying environmental monitoring and management details, provide an outline of environmental commitments, preferring to defer such undertakings to the EMP process.

Evaluation of Potential Impacts

It is recognised that full details on all monitoring requirements are not always available in a complete form prior to a project. However, the EIS is designed to identify issues and impacts which should lead to monitoring, safeguards and management practices. The proponent thus should be in a position to identify minimum expected parameters and periods for monitoring from their assessment of impacts associated with the project.

If these are not placed in the EIS, confirmation and approval of the monitoring programme is delayed until production of the first Environmental Management Plan (EMP), often 12 months after approval to commence the project is provided. The construction phase of a proposal also imposes direct and significant environmental impacts on the site which should be detailed (such as design, layout, construction, monitoring and safeguards) prior to construction commencing.

It is also important to note that monitoring is not a safeguard. Monitoring provides the confirmation that predicted impacts are, or are not occurring, feedback on the adequacy of safeguards and management practices, and early warning of below expected quality results. Monitoring in isolation will not prevent an impact. Baseline data, monitoring and response measures provide the framework for a management system.

Solomon has stated the objectives by which it will manage the waste rock dumps, tailings storage facility, water management system, land-based issues, health issues, safety, and Aboriginal and post-Aboriginal heritage issues. The proponent has also provided information on proposed environmental management and monitoring programmes. These include: baseline and preliminary water monitoring details in table form in the draft EIS, a list of environmental and monitoring undertakings in Section 7 of the draft EIS, and a list of potential impacts and safeguards, and predicted residual impacts in Appendix 1 of the draft EIS.

The proposed monitoring programme will assist in meeting the principles of the water management system, specifically turbid, mine and process water; however the lack of completeness and detail on the overall environmental management programme for the proposal prevents a full evaluation of predicted impacts and planned safeguards. The level of significance of this omission (or deferral) is difficult to judge, however the proponent's undertaking to provide environmental commitments, to continue and carry out baseline and operational monitoring, and identify parameters in an EMP process are expected to complete the detail not provided in the EIS, and fulfil the required monitoring and safeguard mechanisms.

Recommendation 2

- i) The proponent shall ensure that a detailed summary of environmental commitments is submitted to the Department of Mines and Energy for approval prior to commissioning.
- ii) The proponent shall submit a complete baseline and operational monitoring programme, including identified parameters and thresholds in an Environmental Management Plan (EMP). The EMP is to be prepared in accordance with DME requirements.

4.1.2 Design and Management of the Wetland Filter

The main objective of the wetland filter is to capture and attenuate concentrations of contaminants (such as arsenic and waterborne metals) in the mine water prior to release off-site. As outlined in the draft EIS, the wetland filter comprises a two stage filter in the valley of Brocks Creek, downstream of both the tailings storage area and processing plant. It has a catchment of 100 ha, including dewatering water from the two pits, occasional runoff from the plant site, and run-of-mine (ROM) stockpile after passing through a sediment trap.

Adequacy of Description of the Existing Environment

The description of the proposed wetland filter in the draft EIS included location details, site description, the two-stage design, the philosophy behind the design, and expected outcomes from the operation of the wetland filter in regards to the attenuation of arsenic and waterborne metals. The report also outlined the potential effects of the filter on downstream water quality and provided a summary table of proposed operational monitoring of the water supply (ie. pit water) and the facility itself. Solomon propose that the filter (Stage 2 lagoon) will, at peak dewatering rates for the mine, provide a retention time of four days. An overflow spillway will be cut at the western edge of the filter to allow peak flow release from the facility.

The draft EIS did not detail potential impacts of the water quality of the wetland filter on fauna (both as inhabitants and as visitors), nor did it offer any predicted water quality levels (or monitoring targets) for water entering, within, or leaving the filter.

Solomon did not link directly the potential for the filter to exacerbate insect vectors of disease, and how it would incorporate design features to minimise biting insects breeding. However, Solomon did undertake in the draft EIS to liaise with Territory Health Services and complete a baseline survey of the mine site. In addition, as detailed in the Supplement, Solomon have undertaken to include an operational monitoring programme on biting insects.

Solomon propose in the draft EIS that the filter will remain in a passive but operating state at the end-of-mine-life, however they left the decision on the ultimate fate of the filter to the EMP process.

In response to comments from the NT Government, Solomon did outline additional information in the Supplement on the design of the filter and its potential to dilute the discharge to a suitable level of water quality.

Evaluation of Potential Impacts and Safeguards

The description of the philosophy behind the filter and the theoretical design, operation and monitoring programme outlined by Solomon is considered adequate as a precursor to more detailed plans for the facility. The difficulty lies in determining the most suitable design and operational requirements of the wetland filter for this site. The effectiveness of the proposed wetland filter to attenuate arsenic and waterborne metals has not been fully demonstrated at this site. The uncertainty regarding the level of risk is due to the lack of detailed design and operational criteria, and predicted water quality levels expected with the management of the filter. However, Solomon's assessment on arsenic mobility is

consistent with current knowledge and consequently the level of risk associated with the operation of the filter is considered minimal. It is expected that a further reduction in risk can be achieved by an appropriate design for the facility.

There is also a level of uncertainty related to whether the filter can achieve all of the expected outcomes. A number of respondents raised this issue and expressed concern over the operation of a wetland filter particularly in balancing potentially conflicting objectives of the filter. These are; to attenuate contaminants, maintain minimum water quality standards for eventual discharge, maintain minimum water quality standards for fauna protection, identification and establishment of appropriate flora species to both service the main objective of the filter and create a viable wetland habitat, and minimise the breeding of insect vectors of disease. The pros and cons of using the *Typha* spp. to vegetate the filter and whether or not aquatic plants should be maintained (reduction) are examples of potentially conflicting objectives and requirements.

The undertaking by Solomon to conduct a baseline and operational monitoring programme for biting insects is noted, however the baseline survey (which was listed in the Guidelines) should have been completed well in advance of the 1995/96 wet season and the results included in the draft EIS. Territory Health Services has advised that it is important to carry out a full 12 month biting insect sampling programme before any earthworks commence.

Solomon is advised to consult with Territory Health Services as soon as practicable to discuss the design and implementation of the surveys.

If the wetland is designed and managed to a standard which fulfils the requirements of relevant authorities, it is expected that the risk to local and regional fauna from degraded water quality, and the risk of insect-based health issues will be negligible. If it is not, there is a potential for the wetland filter to become a major source of vectors of disease and increase the potential for mosquito borne arbovirus disease in the general area.

The establishment of Beneficial Use and licensing (see Section 4.2) will further ensure that offsite water quality is maintained.

The associated issue of aquatic fauna survey is discussed at Section 4.1.4.

Recommendation 3

- i) **The proponent is to consult with the Department of Mines and Energy, Power and Water Authority, Territory Health Services and the Conservation Commission to ensure the design and management of the wetland filter fulfils water quality, flora habitat, fauna protection and biting insect management specified by the authorities.**
- ii) **After consultation, the proponent is to submit the completed plan for the wetland filter in an EMP to the Department of Mines and Energy for approval.**

4.1.3 Waste Rock and Residue Management

The Brocks Creek Gold Project will involve the establishment of two waste rock dumps directly south of the Alligator and Faded Lily pits (Figure 2). The nominal waste production is 22.1 Mt, comprising approximately 50% oxide, 14% transitional and 36% primary rock.

Tailings residue will be stored in an impoundment constructed in a shallow valley floor due north of the processing facility. The tailings will be pumped to the impoundment and distributed via a discharge point as a beach slurry. The discharge point will be rotated around the impoundment as mining progresses and embankments are completed. The decant pond will be kept to a minimum as excess water is pumped as return water to the processing plant.

There are three issues relevant to waste rock and tailings residue management: the formation of acid rock drainage (ARD), the production of leachate containing acid or water-soluble contaminants; and toxicity to flora or fauna.

Adequacy of Description of Existing Environment

The draft EIS recognises the problem of acid rock drainage and leachate issues associated with some gold mines in the Northern Territory and discusses in some detail the siting, design and construction of the waste rock dumps and tailings impoundment in the light of the geochemical studies conducted.

As a result of the studies, the waste rock and tailings were classified as non-acid forming (NAF), potentially acid forming - low capacity (PAF) and potentially acid forming (PAF).

Waste Rock

Solomon undertook geochemical characterisation studies on 59 waste rock samples from 10 drill holes in the Alligator and Faded Lily deposits. The samples were selected to provide a reasonable spatial coverage of the two deposits and provide representative coverage of the various types of waste and ore zone materials expected to be encountered in the mine.

The draft EIS concluded:

- All oxide waste rock are NAF.
- The transitional waste rock in the Alligator pit is NAF, whereas the transitional waste rock in the Faded Lily pit is predominantly PAF.
- Most of the primary waste rock in the Alligator pit is expected to be NAF, with some PAF (low capacity) present in small quantities.
- The majority of the primary waste rock in the Faded Lily pit is PAF.

As a consequence of the results, Solomon propose to arbitrarily classify all transitional and primary waste as PAF. Solomon propose to construct the Alligator waste dump via

blending of the NAF and PAF (low capacity) waste rock and the Faded Lily waste dump via encapsulation of the PAF waste rock in NAF waste rock.

Concern was expressed over the representativeness of the sample size for geochemical testing of waste rock, and that the level of sampling may not allow for accurate estimation of the acid forming potential of the waste rock. The results to date are likely to be accurate for the samples tested, however there is a high level of uncertainty in extrapolating the results for the life of the mine.

There is also concern over the use of visual methods to class waste rock as oxide, transitional or primary. Previous attempts with this method in some Top End mines have not always been successful. This has led to incidents of acid mine drainage from waste rock dumps constructed from purportedly oxide material. This issue will need to be resolved with the Department of Mines and Energy.

In response to a number of comments, Solomon has provided further details in the Supplement on the siting, sampling methodology, geochemical results, blending and buffer capacity, design criteria and rehabilitation of the waste rock dumps. Solomon also reaffirmed confidence in the geochemical studies, preferred option for construction, blending, encapsulation and compaction methods. The methods of construction and operation will need to be resolved with the Department of Mines and Energy, particularly the height of lifts, compaction and surface configuration.

The proponent has indicated that additional multi-element scans will be undertaken on waste rock and ore samples to further refine the results obtained on concentrations and solubility of some metals. Results to date indicate that the waste rock shows that concentrations of arsenic, sulphur, selenium, boron, antimony, lead, silver and cadmium are elevated, but only arsenic (all samples) and lead (one sample) exceed the ANZECC environmental criteria of 20 and 300 mg/kg respectively. Consequently any mobilisation of arsenic or lead may lead to unacceptable impacts on offsite water quality. Solomon suggest in the draft EIS that the arsenic may have a low mobility due to its chemistry and low solubility. To determine the significance of the elevated arsenic levels and whether it is mobile, Solomon proposes to commence long-term column leach tests to simulate the natural acid-forming and acid-neutralising processes associated with the waste rock. They concluded that the results from the tests are expected to provide early warning of the onset of acid rock drainage.

Both undertakings are supported.

It is considered that the geochemical results to date are a conservative estimate of the potential for the waste rock to produce acid mine drainage. The small sample size (albeit based on a best estimate of representative samples) creates doubt on the certainty of the results presented by Solomon to accurately predict the potential for acid mine drainage. The risk that the Faded Lily waste rock dump in particular may generate acid leachate is considered high and of some significance as Solomon has not outlined how it will respond to the onset of acid drainage.

Residue

Residue will be a final product of the carbon-in-leach (CIL) process to extract gold from the ore. The process will produce a slurry thickened to approximately 40% solids by

weight prior to discharge to the tailings storage impoundment. Decant water collected in the impoundment will be progressively returned to the processing plant. The tailings storage impoundment will be operated as a closed (no release) water management system during its operational life.

The results from testwork by Solomon on eight ore zone samples and two additional samples of tailings (one oxide and one sulphide) from composite samples of ore from both deposits are summarised as follows in the draft EIS:

- The oxide tailings sample was non acid forming.
- The primary tailings sample is potentially acid forming.
- Multi-element scans of tailings solids showed enriched elements similar to the waste rock, with arsenic (both samples) and sulfur (primary sample) being the significant elements.
- Multi-element scans of the liquor showed the liquors were alkaline and saline.
- The main trace elements included arsenic, copper and zinc, with the latter two attributed to complexation with cyanide.

The results appear valid as an adequate reflection of the expected residue chemistry.

In response to a number of comments Solomon provided further details on the water balance for the impoundment (rainfall coefficients, runoff and evaporation), design of the impoundment, and the expected relative level (RL) through the development of each stage of the impoundment. Design detail included the addition of an emergency spillway. Solomon indicate that the spillway would only be used if the design rainfall event was exceeded, which they consider highly unlikely.

Solomon has calculated the design wet season rainfall event from data over a 120 year period. It is associated with an abnormally wet year with a return period of 1 in 100 year, recording a total rainfall of 1832 mm. Solomon report that such a rainfall event would include a 72 hour extreme rainfall event as part of the abnormally wet year.

The design, operation and monitoring programme for the tailings residue impoundment is considered adequate, however the Department of Mines and Energy (in consultation with the Power and Water Authority if required) will need to be satisfied with the final design plans prior to approving the Mine Plan and EMP.

Evaluation of Potential Impacts and Safeguards

Waste Rock

The approach by Solomon for the design, construction and management of the Faded Lily waste rock dump is to "control surface runoff and erosion, minimise the potential for acid

rock drainage, facilitate progressive rehabilitation and reduce visual impact after mine closure." The proposed control measures include:

- An on-going programme of column leach testing of transitional and primary waste rock.
- Use of oxide waste rock to build the outer perimeter.
- Encapsulate primary and transitional waste in the centre of the dump.
- Utilise stockpiled oxide waste for the final layer.
- Progressive rehabilitation of the outer slopes.
- Monitor the column leach tests.
- Collect runoff and leachate from the dump for treatment prior to discharge.

The draft EIS also mentions additional control measures if necessary, such as use of selective blending as a geochemical control; mechanical measures such as smaller lifts, compaction; and increased thickness of the final oxide layer.

For the construction of the Alligator waste rock dump, Solomon has indicated that "blending of non acid waste rock with potentially acid forming (low capacity) waste rock is expected to occur naturally and thereby provide adequate buffering within the dump of any small amounts of generation that may occur". A final layer of non acid forming waste will be spread over the surface and outer slopes. Solomon propose to utilise the results of the column leach tests to modify the design/construction of the dump if required (above).

The draft EIS states that monitoring of the waste rock dumps will include routine monitoring of surface water, waste dump runoff, leachate quality and sediment traps. Included in the monitoring programme are the proposed column leach tests.

It is considered that the proponent has not fully addressed the predicted impacts associated with the characterisation, design, construction and management of the waste rock dump. Of concern is the representativeness of the sample size and accuracy of prediction, proposed method of characterisation, and construction methods. The long term impacts are uncertain and the level of impact for either waste rock dump cannot be predicted accurately.

The validation (column leach tests) and monitoring programme outlined by Solomon will assist in reducing the uncertainty of the results over time and allow for contingency measures to be implemented in a timely manner. It is acknowledged that the time lag prior to constructing the Alligator waste rock dump will provide up to four years of results. This will assist in further refining the initial design for the Alligator dump.

The issue of rehabilitation is discussed at Section 4.1.6.

Residue

The residue storage proposal is based on the ability to contain all the tailings residue, and accommodate the design wet season rainfall.

Site selection was on the basis of its proximity to the processing plant, limited catchment area, and the containment capacity offered by the favourable topography. Geotechnical tests also indicate that the soils have medium to low permeability. Solomon report that the impoundment will have the capacity to store the expected 6 Mt of tailings, decant water and design wet season rainfall.

Tailings storage will follow the construction of a southern embankment and a saddle embankment to the east. A northern diversion embankment and channel will be constructed to divert the up-slope catchment around the impoundment. A western embankment will be constructed as the capacity of the impoundment increases. Solomon contend (from their water balance calculations) that there will be a minimum freeboard of at least 1.5 m over the sill of the emergency spillway. A central decant point will be established and later moved as the impoundment fills to facilitate the configuration of the final surface.

The impoundment design and proposed construction method for the residue storage is considered adequate as the basis for further detailed design plans and construction details. The potential of residue entering the surface water regime is considered minimal due to the proposed design of the impoundment. Design criteria such as the design wet season rainfall will ensure residue will only flood beyond the impoundment when dilution rates are high due to extreme wet conditions.

The draft EIS contends that the combination of medium to low permeable surface layer, thickened slurry and maximisation of beaching, construction of low permeability embankments, and construction of key-trenches will assist in reducing the potential for seepage. Seepage from the tailings storage is estimated by Solomon to be approximately 900 m³/d.

Seepage quality has been discussed by Solomon in the draft EIS and the results of the test work indicate the decant water will initially contain elevated levels of arsenic and various metal-cyanide complexes. The report contends that cyanide forms of low toxicity (such as iron-cyanide complexes) will be dominant in the lower levels of the deposited tailings and in seepage water. The report also contends that arsenic in seepage water will show a strong affinity for absorption onto hydrous iron oxides in the tailings solids and in the soil layer below storage. The attenuation of cyanide and arsenic seepage relies on slow downward movement of the wetting front allowing natural geochemical ageing process to occur. The report does not provide estimates on actual plume seepage rates, potential levels of concentrates, nor the extent of the potential plumes.

Solomon proposes a series of monitoring bores and regular sampling to test the predicted outcomes. This is supported.

Assessment of the impact of residue seepage relies heavily on the test work and results presented in the draft EIS. Based on these results the risk associated with the potential impact is considered low. The implementation of the proposed operational monitoring programme is expected to provide early warning if contaminated seepage does occur. The

proponent will need to satisfy the Department of Mines and Energy in regards to identifying predicted seepage rates and levels of contamination.

Issues associated with decant water quality relate to the level of cyanide and the level of arsenic expected in the residue liquors.

Results of tests reported in the draft EIS indicate residual total cyanide and weak acid dissociable cyanide concentrations are estimated to be of the order of 15 to 20 mg/L, given a residence time of a few weeks. These levels are similar to levels currently maintained in other Top End gold mines and no adverse effects have been observed in visiting fauna.

Levels of soluble arsenic in the alkaline ore process water will exceed the ANZECC (1992) guidelines for stock water quality (recording 5.2 mg/L arsenic for oxide ore tailings liquor and 17.5 mg/L arsenic for primary ore tailings liquor, compared to the ANZECC guideline of 0.5 mg/L for arsenic)². Solomon contends that the guideline is designed to provide long-term protection for regular consumption and that a toxic response from occasional drinking of the decant water would be unlikely.

The proposed operational monitoring programme is supported. The proponent will need to ensure the proposed operational monitoring programme (including the undertaking to monitor the general wildlife activity and well-being in the vicinity of the impoundment) identifies changes in the quality of the decant water to ensure timely implementation of contingency measures to prevent birds from accessing the water if levels rise above the threshold levels.

The issue of rehabilitation is discussed at Section 4.1.6.

Recommendation 4

- 1) The proponent is to consult with the Department of Mines and Energy to resolve:**
 - a. the establishment and implementation of a preferred method for waste rock characterisation;**
 - b. the design and construction methods for waste rock dumps;**
 - c. operational waste rock monitoring requirements; and**
 - d. contingency measures for acid mine drainage.**
- 2) The proponent is to present the agreed details in an EMP.**

² Solomon should note that the ANZECC water quality guideline for livestock watering in relation to arsenic is 0.5 mg/L, not 0.5 mg/L to 5 mg/L as quoted in the Brocks Creek Gold Project Draft EIS.

4.1.4 Flora and Fauna Survey

This section will discuss the issues associated with the surveys for flora and fauna and regional and local significance in relation to the mine project.

Adequacy of Description of Existing Environment

A four day flora survey was completed in November 1994. It was based on a ground survey and interpretation of 1:25 000 aerial photographs. Tree density was utilised as the basis for identifying communities, as a recent fire had destroyed the understorey.

None of the flora species recorded during the survey are considered rare or endangered, however two species are listed on the list of Northern Territory plant species of conservation significance, viz *Acacia praetermissa* and *Eragrostis rigidiuscula*.

A fauna survey was concurrent with the flora survey. Four sites were selected for intensive sampling and surveyed for reptiles, frogs, birds and mammals. A regional study of Kakadu Stage III was used to infer the presence of other species not observed in the sampling programme. Solomon did not undertake an aquatic fauna survey because the project area is drained only by short ephemeral creeks and there is no permanent water in the immediate vicinity of the site. This is not sufficient justification.

A total of 13 mammal species were recorded during the survey including cave dwelling bats in an old mine adits. Three species were identified; Common Sheathtail Bat, Northern Brown Bat and the Ghost Bat. The Ghost bat is recognised by IUCN as "vulnerable", with rare and declining status across northern Australia.

The report records that reptile activity was low (nine species recorded) and three species of frog were recorded. A total of 55 species of birds were recorded during the survey, including both residential and nomadic species.

Four weed species were recorded by Solomon during the survey; Rubber Bush, Black Speargrass, Hyptis and Couch Grass, and four species of feral animal (cats, horses, water buffalo and pigs).

Evaluation of Potential Impacts and Safeguards

From the results of the flora and fauna survey, Solomon contend that the flora and fauna of the project area is typical of that which occurs in similar habitats in the region.

A number of respondents raised concern over the limited period for the flora and fauna survey, and the reliance on a regional survey to interpolate species for the project site. In response Solomon acknowledged the brevity of the survey, but discounted it as an issue by contending that no survey can adequately supply a complete inventory. This contention is not supported, as surveys can be (and are) designed to cater for statistically sound results and provide for a sound evaluation of those results. Such a survey should provide baseline information and account for seasonal and relative abundances.

To enhance flora management, Solomon has undertaken to minimise vegetation clearing, prevent the spread of weeds, and undertake a progressive rehabilitation programme throughout the project area. These undertakings are supported.

In response to a number of concerns raised on the Ghost Bat, Solomon presented further details in the Supplement on the nature and size of the roost and relocation procedures. The data presented in the draft EIS and Supplement is considered to be an accurate description of the habitat; that is, it is quite small, unlikely to be a maternity roost, and able to relocate successfully if the procedures outlined in the Supplement are followed. It is suggested that Solomon consult with the Conservation Commission for advice and assistance prior to exclusion of the bats from the adit.

The draft EIS provided details on two fauna species which are known to be endangered and are recorded as occurring in the region of Brocks Creek, viz the Hooded Parrot and Gouldian Finch. Neither species were recorded during the limited survey, however the draft EIS discussed the potential impacts of the mine proposal on their habitat. Solomon concluded that the birds were unlikely to suffer any detriment as the possible loss of habitat is not considered significant in a regional context.

The level of risk and significance as a result of the project on the birds is considered low and Solomon's undertakings to minimise vegetation clearance, maintain water quality, and commence progressive rehabilitation will further reduce the risk. Due to the assessed low level of risk and significance, further searches are not considered necessary.

A respondent raised the need to complete a further survey for the Narbalek and Rock Ring-tailed Possum. In response, Solomon contend that the habitats for these marsupials are not represented at Brocks Creek. This is at odds with advice received from the Conservation Commission which has indicated that the project area is a suitable habitat. It is difficult to assign a level of risk and significance associated with the mine proposal and the two species due to the lack of baseline information.

It is recommended that Solomon discuss this issue further with the Conservation Commission to provide clarification and consensus. Solomon is reminded that the *Territory Parks and Wildlife Conservation Act* governs both flora and fauna species.

An aquatic survey should have been completed for the project area as part of the flora and fauna survey. Consequently it is difficult to make an assessment of risk and significance. The survey would have provided for a more complete understanding of the baseline environment and an assessment of the potential impacts. The survey would have also assisted in determining local aquatic fauna which may be suitable to populate the wetland filter, or which may need to be excluded from the filter due to incompatibility with the objectives of the facility.

In summary, the flora and fauna survey should have been designed to provide for a more comprehensive understanding of the complete flora and fauna habitats in the project area, including an aquatic fauna survey, and a wet and dry season comparison. The survey did however allow some assessment of local and regional significance despite the lack of comprehensiveness. It is concluded that the project will result in minor habitat loss in a regional context.

Recommendation 5

The proponent shall undertake a wet season aquatic fauna survey prior to commissioning, with survey methodology to be confirmed with the Department of Mines and Energy and Conservation Commission.

4.1.5 Heritage and Aboriginal Archaeological Site Conservation

This section will discuss the issues associated with historical mining, WWII and Aboriginal archaeology sites associated with the site.

Adequacy of Description of Existing Environment

Historical Site

The character of the project area is strongly influenced by the activities of past mining and WWII activities.

The Brocks Creek Prospect was heavily worked at the turn of the century for gold. Adits, shafts and mullock are still evident, as well as evidence of miner's accommodation, mining infrastructure and the Brocks Creek township. WWII sites consist mainly of infrastructure associated with the detention barracks.

Solomon undertook a historic survey for heritage sites in the project area, which was reported in the draft EIS.

Seven previously recorded sites were re-surveyed (sites A to G) and all are outside the area to be disturbed by the project. The Chinese oven and WWII artefact scatter site (site C/BCH5) was reassessed and rated as being of high archaeological significance.

Solomon has been advised by the Heritage Advisory Council that it intends to recommend that sites A, B and D be declared Heritage Places under the *Heritage Conservation Act*.

The survey identified four previously unrecorded historic sites which were a result of activity during WWII through to the mid twentieth century (BCH1 to BCH4). The sites have been rated as having low to moderate archaeological significance. Two sites of low archaeological significance (BCH2 and BCH3) will be buried by the tailings residue impoundment.

The survey work and reporting by the proponent has provided a sound knowledge of the historical background of the Brocks Creek Prospect.

Aboriginal Archaeology

The proponent has undertaken a prehistoric (Aboriginal) archaeological survey of the Brocks Creek Prospect to locate and record sites likely to be impacted by the project.

The survey identified six prehistoric sites which were rated as low to high archaeological significance (BCP1 to BCP6). The sites comprise open stone scatters and quartz quarries. Sites BCP2, BCP3, BCP4 and BCP5 will be destroyed by the establishment of the residue tailings residue impoundment.

Survey work by Solomon has been sound and provides a good understanding of the sites in the project area.

Evaluation of Potential Impacts and Safeguards

Historic Sites

Sites BCH2 and BCH3 will be inundated by the tailings residue.

Site BCH2 comprises a small scatter of historic materials dating to the mid-twentieth century and has a low level of archaeological significance. Solomon has completed a record of the site and do not propose to undertake any further action to mitigate against damage. Site BCH3 is a small scatter of WWII material which has a low level of archaeological significance. Solomon has completed a record of the site and do not propose to undertake any further action to mitigate against damage.

It is considered that the destruction of sites BCH2 and BCH3 is not significant in a regional context due to the conservation and protection of the more substantial and significant Chinese and WWII sites in the project area. The recommendation that no further action is required for sites BCH2 and BCH3 is supported.

In regards to the sites to be conserved, Solomon has undertaken to enforce a policy that all historic sites are to be treated with the utmost respect. All employees will face dismissal if they are caught wilfully damaging any such sites or removing artefacts. Solomon has also undertaken to display all sites on mine plans and site lay-out drawings, mark the sites on the ground, and brief employees, contractors and visitors on the presence, significance and location of the sites.

The protection and management measures outlined by Solomon for historic sites in the project area is considered appropriate and is supported.

Aboriginal Archaeology

Sites BCP2, BCP3, BCP4 and BCP5 will be destroyed by construction of the tailings residue impoundment.

Solomon will apply to destroy the four prehistoric archaeological sites as required under the *Heritage Conservation Act*. As mitigation, Solomon has proposed to enlist an archaeologist to undertake detailed recording of the artefacts (rather than collection) at sites assessed as of moderate to high archaeological significance (ie. BCP 4 and BCP5). Solomon has obtained permission to undertake recording of the artefacts at sites BCP4 and BCP5.

It is assessed that the impact of destroying the four sites, while being of some significance at the local level, will not reduce the overall quality of such sites in the region.

The undertakings outlined by Solomon to apply for a permit to destroy the four prehistoric sites (BCP2 to BCP5) and record sites BCP4 and BCP5 is supported.

Solomon has undertaken to apply the same policy, protection and management measures for conserved Aboriginal archaeological sites as outlined for historic sites. This undertaking is supported.

Solomon should maintain close consultation with the Heritage Conservation Unit throughout the life of the mine to ensure the requirements of the *Heritage Conservation Act* are fulfilled.

4.1.6 Rehabilitation

Solomon propose to adopt the modified natural ecosystem with some conservation value as a flora and fauna habitat as their objective for rehabilitation of the project site.

The objective implies:

- The stable and safe condition of the site.
- Drainage and soil erosion control.
- No residual toxic hazards on the site and no contamination of the surrounding environment.
- Revegetation of the project area to a self-sustaining community.

Adequacy of Description of Existing Environment

Solomon reported in the draft EIS that the project area has experienced both historical and recent mining activity which has altered a substantial portion of the site. Solomon further contend that areas which were disturbed by mining at the turn of the century have undergone 'natural' revegetation to some extent.

The information base for determining Solomon's concept for rehabilitation is based on studies which have characterised the physical and chemical properties of mine materials viz geochemistry of waste rock and tailings residue, soil descriptions, flora survey, and available rehabilitation materials. The focus of Solomon's concept is progressive rehabilitation during the life of the mine.

Facilities which Solomon has identified as requiring rehabilitation are; construction areas, roads, drains, the waste rock dumps (perimeter and surfaces) tailings impoundment embankments, tailings residue top surface and the wetland filter embankment.

Solomon's description of the environment (while limited in terms of detailed description of flora and fauna, and aquatic fauna) is considered adequate in regards to placing the mine in a "local habitat" context and linking this to the mine areas which will require rehabilitation.

Evaluation of Potential Impacts and Safeguards

It is considered that the procedures and methods outlined by Solomon for control of erosion, turbid water runoff and rehabilitation of construction areas, roads and drains will minimise erosion and enhance rehabilitation as the mine progresses.

Solomon should ensure all design and site plans associated with these facilities are endorsed and approved by the Department of Mines and Energy.

The draft EIS and Supplement outlines how Solomon proposes to design and construct the waste rock dumps and tailings residue impoundment. The rehabilitation concepts for these facilities is discussed below.

The principal design features common to the Alligator and faded Lily waste rock dumps are reverse-grading of benches, drainage to prevent water ponding, drop structures and drainage to direct runoff to natural drainage lines, a final layer of non acid forming waste rock on the dump surface, and progressive rehabilitation of the outer slopes. Solomon do not anticipate the need for seeding or tubestock, relying on natural regrowth for its revegetation programme.

The particular design principles applied to the tailings residue impoundment include progressive rehabilitation of the downstream side of the embankments, alteration of tailings discharge arrangements to the northern end of the facility 12 months prior to closer of the project, processing of oxide ore during the last six months of operation, and construction of a final spillway southwest of the southern embankment so that runoff water can drain freely.

The draft EIS provided an outline on the philosophy of stripping, storing and using top soil. Solomon propose to salvage only topsoil that can be used when reasonably fresh, intending that the majority of topsoil will be utilised for embankments of the tailings impoundment, and on the faces of the waste rock dumps. Solomon do not intend to cover the surfaces with topsoil, treating them with material from oxide ore and oxide waste respectively. It is considered essential that all available topsoil be salvaged for rehabilitation purposes.

Due to the lack of detail on specific rehabilitation procedures, timing, and actions, the level of uncertainty about the degree of success of the rehabilitation programme is considered high. There is a risk that the rehabilitation will not necessarily proceed as forecast by Solomon.

To cater for concerns raised by respondents to the draft EIS and ensure that rehabilitation is appropriate for the site, Solomon is to ensure the EMPs fulfil all requirements as specified by the Department of Mines and Energy.

Recommendation 6

The proponent shall consult with the Department and Mines and Energy to determine the requirements on implementation of a rehabilitation plan for disturbed and construction sites associated with the project.

4.2 Other Issues

Beneficial Use and Licensing

Solomon identified in the draft EIS that there may be a requirement to be licensed for off-site water release from the wetland filter under the provisions of the *Water Act*. The primary function of the filter is to assist in the attenuation of arsenic or water-borne metals arising from pit and process water at the mine.

The rest of the mine water management system is designed to be a closed-circuit system catering for the design wet season rainfall. The tailings residue impoundment has been designed to cater for this abnormal wet season. If overtopping occurs, the flow will enter the wetland filter.

Prior to licensing any water release from the filter there is a need to establish Beneficial Use associated with the drainage regime on and off-site of the mineral lease. The filter is not expected to release water until the 1996/97 wet season.

The Power and Water Authority will establish the Beneficial Use after consultation with relevant authorities, the public and Solomon. To achieve this, the Power and Water Authority will require Solomon to assist in the process to establish Beneficial Use.

Solomon's commitment in the Supplement to follow all due procedures for the declaration of Beneficial Use is noted.

Recommendation 7

The proponent shall liaise with the Power and Water Authority to assist in establishing Beneficial Use and licensing requirements for the Howley Creek drainage system, under the provisions of the *Water Act*.

Proposed New Road Access and Rail Corridor Right of Way

In the draft EIS Solomon proposed to construct a new access road linking Fountain Head Road to the processing plant, camp and Brocks Creek heritage sites. The proposed new access road was planned to leave the Fountain Head Road some 3.5 km northeast of the current access on the southern side of the rail corridor.

In response to comments from respondents, Solomon have re-aligned the proposed new access road to run alongside the proposed rail corridor (abandoned railway). The re-alignment remains on the southern side of the rail corridor. The new access road alignment follows higher ground than the initial proposal and is shorter in length. Solomon have undertaken to have the proposed route reviewed and approved by the appropriate authority. This action is noted. Solomon will need to ensure the plan accommodates a 100 m wide right of way for the rail corridor.

The preferred route for the proposed Darwin to Alice Springs railway passes through the Brocks Creek Mineral Lease parallel to the abandoned North Australia Railway.

The access road and haul road will need to cross the rail corridor and the Northern Territory Land Corporation has approved the issue of a licence for the crossings.

Solomon has undertaken to provide detailed design plans of the proposed crossings to the Department of Transport and Works for agreement prior to construction commencing. Solomon's undertaking is noted.

Solomon will need to ensure all planned site works (including the new access road) will require to accommodate a 100 m wide right of way on the rail corridor.

Recommendation 8

The proponent shall consult with the Department of Transport and Works regarding approval for:

- a. the alignment and design of the new access road; and
- b. right of way requirements associated with the rail corridor.

Landfill

In the draft EIS Solomon propose to dispose of solid waste from the processing plant, workshop and accommodation camp in one of the waste rock dumps. In response to comments on the draft EIS, Solomon further re-iterated their plan to dispose of solid waste in a waste rock dump rather than a landfill site.

It is now accepted practice in new Northern Territory mines to dispose of solid refuse in a landfill site, rather than waste rock dumps. The reasons are three-fold; it ensures that the waste rock dumps are constructed from known materials, it is sound waste management practice to separate wastes into manageable categories, and the landfill site can be monitored independently.

It is considered that this practice should be mandatory at Brocks Creek.

Recommendation 9

The proponent shall construct a separate landfill site on the lease. The proponent shall consult with the Department of Mines and Energy, Department of Lands, Planning and Environment and Territory Health Services over its design, siting and construction.

5 CONCLUSIONS

The requirements of the *Environmental Assessment Act* and the Administrative Procedures have been met by the proponent.

It is considered that the issues raised in this report have been, or will be, satisfactorily addressed by the proponent provided that the undertakings and commitments made by the EIS, as modified by the recommendations in this report, are complied with.

Appendix 1

List of respondents to the Brocks Creek Gold Project EIS

1. Northern Territory Government
 - Department of Lands, Planning and Environment
 - Territory Health Services
 - Conservation Commission
 - Department of Primary Industries and Development
 - Department of Transport and Works
 - Power and Water Authority
 - Museum and Art Gallery of the Northern Territory
 - Department of Mines and Energy
 - Work Health Authority
 - Aboriginal Areas Protection Authority
2. Leckarm Proprietary Limited

Appendix 2

Issues raised in submissions on the Brocks Creek Gold Project EIS

Main Issues and Subissues	Submission Number
<i>The EIS Process</i>	
1 Timing of the project, adherence to due process	1
2 Contingency measures to respond to unlikely events	1
3 Liaison with Tourist Commission	1
4 Deferment of major design decisions to the Environmental Management Plan	1
5 Statement of Solomon's environmental commitments	1
6 Baseline monitoring should be included in DEIS as a commitment	1
7 Lack of geological background provided in Chapter 3 of the DEIS	1
<i>Water and Waste Management</i>	
8 Representativeness of waste rock geochemistry	1
9 Identification of other water uses	1
10 Contingency planning for acid rock drainage	1
11 Adequacy of surface and groundwater geochemistry baseline and operational monitoring	1
12 Use of dewatering bores to monitor groundwater levels	1
13 Pit water balance	1
14 Backfilling of Faded Lily pit with waste rock from the Alligator pit	1
15 Effectiveness of wetland filter	1
16 Potential for mobilisation of arsenic from the wetland filter	1
<i>Engineering Design</i>	
17 Seepage investigation	1, 2
18 Location of a fault through the project area	2
19 Need for an emergency spillway to prevent embankment overtopping	1
20 Tailings storage water balance	1, 2
21 Final RL of the tailings storage embankment	1
22 Tailings storage waste capacity	1, 2
23 Explanation of use of 125,913 m ³ /month water volume figure	2
24 Rainfall regime	2
25 Rainfall runoff coefficients for the catchment	2
26 Evaporation estimates	2
27 Availability of non acid-forming waste rock for encapsulation covering of waste dumps	1
28 Blending of waste rock material	1
29 Adequacy of design of waste dumps	1
30 Location of Alligator waste dump in drainage line	1
31 Apparent contradiction in waste rock buffering capacity	1
32 Contingency storage for excess contaminated water	1
33 Management of process water	1
34 Pit modelling and construction	1
35 Wetland filter design and maintenance	1
37 QA/QC of construction	1
36 Dilution of water released from the wetland filter	1

Main Issues and Subissues		Submission Number
<i>Impacts on Land Tenure and Infrastructure</i>		1
38	Protection of gas main	1
39	Operation of unregistered vehicles	1
40	Impact of mine access road on proposed agricultural block identified in the Concept Plan	1
41	Impacts on proposed Alice Springs to Darwin railway line	1
42	Drainage and water supply implications to other adjacent settlements	1
<i>Health and Safety</i>		1
43	Mosquito control and monitoring	1
44	Availability of fire equipment	1
45	Use of benign dust suppressants	1
46	Refuse disposal	1
47	Management of hazardous substances	1
48	Source of potable water	1
49	Incorrect departmental reference	1
50	Application of the Northern Territory Public Health Act and Regulations on the site	1
<i>Flora and Fauna</i>		1
51	Management of vegetation communities with respect to fire	1
52	Nature and size of the Ghost Bat roost	1
53	Safe procedure for relocation of Ghost Bat roost	1
54	Will the Ghost Bat colony successfully relocate?	1
55	Lack of aquatic fauna survey	1
56	Brevity of wildlife survey and use of regional flora and fauna lists	1
57	Search for <i>Acacia praetermissa</i>	1
58	Specific searches for the endangered fauna species Gouldian Finch, Hooded Parrot, Narbalek and Rock Ring-tailed Possum	1
59	Cyanide degradation and effects on wildlife	1
60	Risk of wildlife mortality from exposure to wetland filter	1
61	Control of feral animals	1
62	Lack of reference to the Territory Parks and Wildlife Act 1993 governing native flora and fauna	1
<i>Historical Sites and Aboriginal Sites</i>		1
63	Procedure for documentation and destruction of archaeological and historic sites	1
64	Duration of Authority Certificate	1
65	Public review of possible destruction of archaeological and historic heritage sites	1

Main Issues and Subissues		Submission Number
<i>Rehabilitation and Decommissioning</i>		1
66	Salvage of topsoil	1
67	Timing for mine decommissioning and rehabilitation	1
68	Control of weed infestation	1
69	Successful revegetation of oxide tailings has not been demonstrated in the NT	1
70	Long-term plan for the wetland filter	1
71	Can the natural colonisation of relatively small areas on natural subsoil, be extrapolated to large waste rock dumps or should these areas be seeded to achieve short to medium term revegetation aims?	1
72	Overflow of water from pits following mine decommissioning	1
73	Quality of water in the decommissioned pits	1
74	Harvesting of local provenance grass, shrub and tree seed for re-seeding into rehabilitation areas	1

Source: Supplement to the draft EIS, Brocks Creek Gold Project