Ludlow Titanium Minerals Mine, 34 Kilometres South of Bunbury

Cable Sands (WA) Pty Ltd

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Cable Sands (WA) Pty Ltd proposes to develop a mineral sands mine in a section of State Forest No.2, near Ludlow. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

The EPA decided that the following environmental factors relevant to the proposal required detailed evaluation in this report:

(a) Tuart conservation;

(b) Rehabilitation; and

(c) Fauna.

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

Conclusion

The EPA has considered the proposal by Cable Sands (WA) Pty Ltd to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury.

Cable Sands (WA) Pty Ltd has worked hard with the community and government to develop an environmentally acceptable proposal in a region which has high significance for conservation. The proposal is located in a section of the Ludlow Tuart Forest which is planned to be added to the Tuart Forest National Park after the restoration of its original forest values. Early in the development process, Cable Sands established the Ludlow Working Party, which is comprised of a number of community groups and government agencies with interests in the Ludlow Tuart Forest. The work of this party resulted in early identification of the environmental issues and has allowed for well informed debate on the remaining issues of concern, thus assisting the EPA in its assessment. The EPA appreciates the efforts of the community in participating in the working party and commends their efforts and the initiative of Cable Sands in establishing it.

The potential for long-term impacts on the conservation value of the area has been the most important consideration for the EPA in assessing this proposal. In particular, the issues of whether the likely rehabilitation outcome is consistent with the long-term

conservation plans for the area and how this outcome might affect the conservation of Tuart in the Ludlow area have been closely examined.

In the long-term, there would be a neutral-to-positive outcome for Tuart conservation as a result of the proposal. In the Ludlow area, Tuart is well represented in relation to its pre-European extent and in conservation reserves. While the assumed rehabilitation outcome would result in some change to the current conservation potential of the land, this would be compensated for by a number of offset measures. These include the provision of additional areas of land for Tuart conservation and funds for Tuart conservation initiatives in the Ludlow area. The EPA has set out the priorities it believes should be applied in distributing the funds and recommends that a Specific Purpose Account be set up in the Conservation and Land Management Fund to do this.

After adopting a precautionary approach, the EPA has concluded that an acceptable rehabilitation outcome can be achieved. Cable Sands has demonstrated an understanding of the issues involved in regenerating a Tuart forest and has set out appropriate rehabilitation measures. The EPA considers that a sustainable Tuart forest can be returned to the mined area, but that there may be some reduction in vegetation productivity and vigour as a result of changes to the soil structure. Rehabilitation of the remainder of the mining lease is not expected to be difficult, and would enhance the conservation value of the area.

Fauna of the State Forest and the National Park is not likely to be significantly affected by the proposal. The impacts on fauna are likely to be short-lived, due to the short mine life and the early rehabilitation of un-mined areas within the mining lease.

The EPA has therefore concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the development of a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Cable Sands (WA) Pty Ltd to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury, is approved for implementation. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfill the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) that the proponent prepare and implement a Soil Profile Reconstruction Plan to ensure that soil profile reconstruction methods are optimised; and

(c) guidelines for the Specific Purpose Account that will distribute the funds provided for Tuart conservation initiatives in the Ludlow area.

Contents

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal by Cable Sands (WA) Pty Ltd, to develop a mineral sands mine in a section of State Forest No.2, near Ludlow.

There has been a relatively long history to the competing interests of conservation and mining in the Ludlow Tuart Forest. The Ludlow Tuart Forest generally refers to those areas that now comprise of the Tuart Forest National Park and State Forest No. 2. Since the 1970's the Ludlow Tuart Forest has been included in recommendations for conservation management (CTRS 1974). Over the same period, much of the same area was subject to mineral claims, many of which have since been refused. In 1987, the establishment of the Tuart Forest National Park in the adjacent areas was gazetted. In the same year a proposal was also submitted for mining within Mining Lease 70/86, which is outside the National Park but within State Forest No. 2. The EPA decided to formally assess that proposal under the *Environmental Protection Act* 1986 at the level of an Environmental Review and Management Programme (ERMP). However, the assessment was not progressed very far and was eventually deactivated in 1989.

In 2001, a new proposal was put forward by Cable Sands (WA) Pty Ltd to develop a titanium minerals mine on Mining Lease 70/86. The EPA again set the level of assessment at an ERMP, for similar reasons as before. These reasons include: the potential impact of mining on the Ludlow Tuart Forest, concern over the ability to restore Tuart forest to mined areas, and the level of public interest in the proposal.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the environmental factors relevant to the proposal. The Conditions and Commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 presents the EPA's conclusions and Section 6, the EPA's Recommendations.

Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

The proponent, Cable Sands (WA) Pty Ltd wishes to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury. The mining area (refer to Figures 1 and 2) is located between the north and south parts of the Tuart Forest National Park. The mining phase is of short duration (4 years) and the proposal includes the rehabilitation of the entire mining lease (mined and un-mined areas) into a Tuart forest ecosystem suitable for future inclusion within the Tuart forest National Park.

Key aspects of the proposal include:

- disturbance of 147 ha of State Forest No. 2 (including the loss of 1700 Tuart trees, approximately 55% of the Tuarts on the mining lease);
- a 4-year mine life, during which 7 million tonnes of ore would be mined to produce 800 000 tonnes of heavy mineral concentrate;
- mining to a maximum depth of 6 m, then wet processing of the ore (which is principally a physical separation process requiring few chemicals, refer to Figure 3) to produce concentrate that is transported to Bunbury for further processing;
- return of waste materials to excavated pits to recreate the current landform and soil profile;
- revegetation of disturbed areas (147 ha) and unmined parts of the mining lease (69 ha) through the creation of ash-beds, and then seeding and planting of Tuart forest flora; and
- a number of proposed environmental "offsets", including:
    - a 56 ha land contribution that will provide a linkage between the Wonnerup Estuary and the National Park (and some rehabilitation of this land);
    - a 35 ha land do contribution nation adjacent to the Minninup Block of the Tuart Forest National Park;
    - contribution of funds to the Department of Conservation and Land Management (DCLM) for scientific studies to assist in the development of the Tuart Forest Management Plan; and
    - contribution of $750 000 for funding other Tuart conservation initiatives.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 2.6 and Section 5 of the ERMP (Cable Sands 2002).

Table 1: Summary of key proposal characteristics

ELEMENT	DESCRIPTION
Area of Disturbance	147 ha
Area of orebody	141 ha
Depth of orebody	Maximum 6 m
Size of orebody	Approximately 7,000,000 tonnes
Area of rehabilitation	215.95 ha
Life of mine	Up to 4 years
Production	200,000 – 280,000 tonnes HMC per year
Operating hours	24hrs, 7 days/ week
Deposit	Titanium Minerals
Mining method	Dry, using conventional earthmoving equipment.
	Progressive backfilling of mine pit

ELEMENT	DESCRIPTION
Stockpiles	
• Overburden	No overburden present
• Topsoil	2 metre maximum height
Stockpile area	Dependant on final topsoil strategies.
Processing Method	Wet separation
HMC	Approx. average 11%
Sand and fines	87.7%
Oversize	0.85%
Water dam	Up to 45 megalitres capacity
Water supply	Groundwater bore in Yarragadee formation
Process water	Maximum 1500 megalitres per year
Power source	Western power grid
Electrical energy	9000 Megawatt hours per year with 22kV supply.
Diesel fuel	Approximately 800 kilolitres per year

Since release of the ERMP, a number of modifications to the proposal have been made by the proponent. These include:

- changes to the initial layout of mine facilities in order to prevent impacts on groundwater levels in the National Park immediately to the north (Figure 4 and Response 81, Appendix 5);
- extending the commitment to rehabilitate the Wonnerup linkage land to include some rehabilitation of the entire area, rather than more intensive rehabilitation on a small portion (a 100 m wide corridor);
- the addition of $750 000 contribution to Tuart conservation initiatives once it was discovered that the proponent was not required to pay this money to the Department of Conservation and Land Management for land compensation; and
- the provision of a 35 ha area of land adjacent to the Minninup block of the Tuart Forest National Park.

In developing its proposal the proponent has consulted widely with the community to identify the environmental factors of concern to the community and address them in its plans. This involved the establishment of the Ludlow Working Party with representatives from many community groups and government agencies. As a result of this consultation the information presented to the public and the EPA in the ERMP was of a high standard and covered all the issues of interest. This has allowed for well informed debate on the proposal

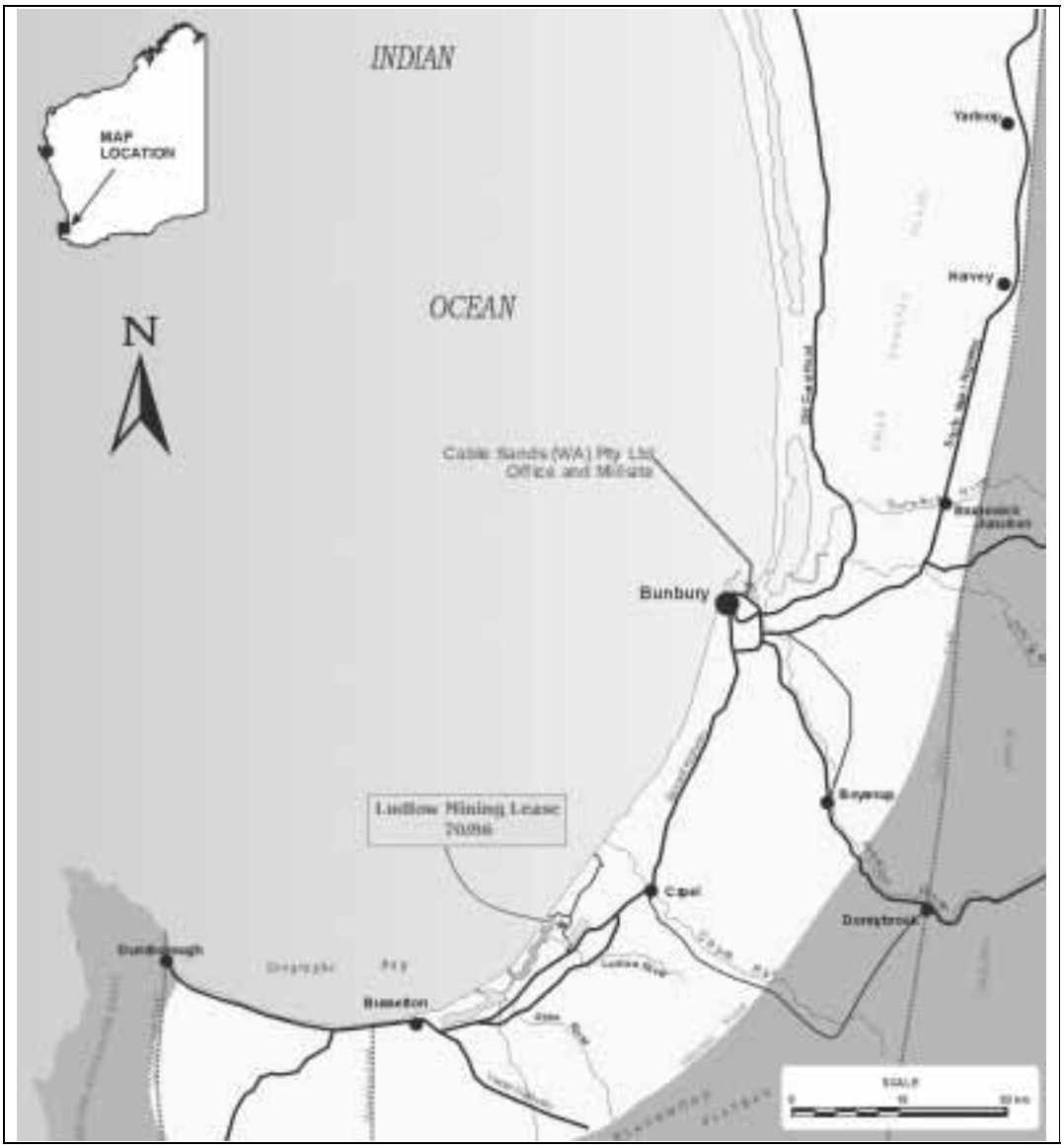

Figure 1: Regional location of the proposal (Cable Sands 2002)

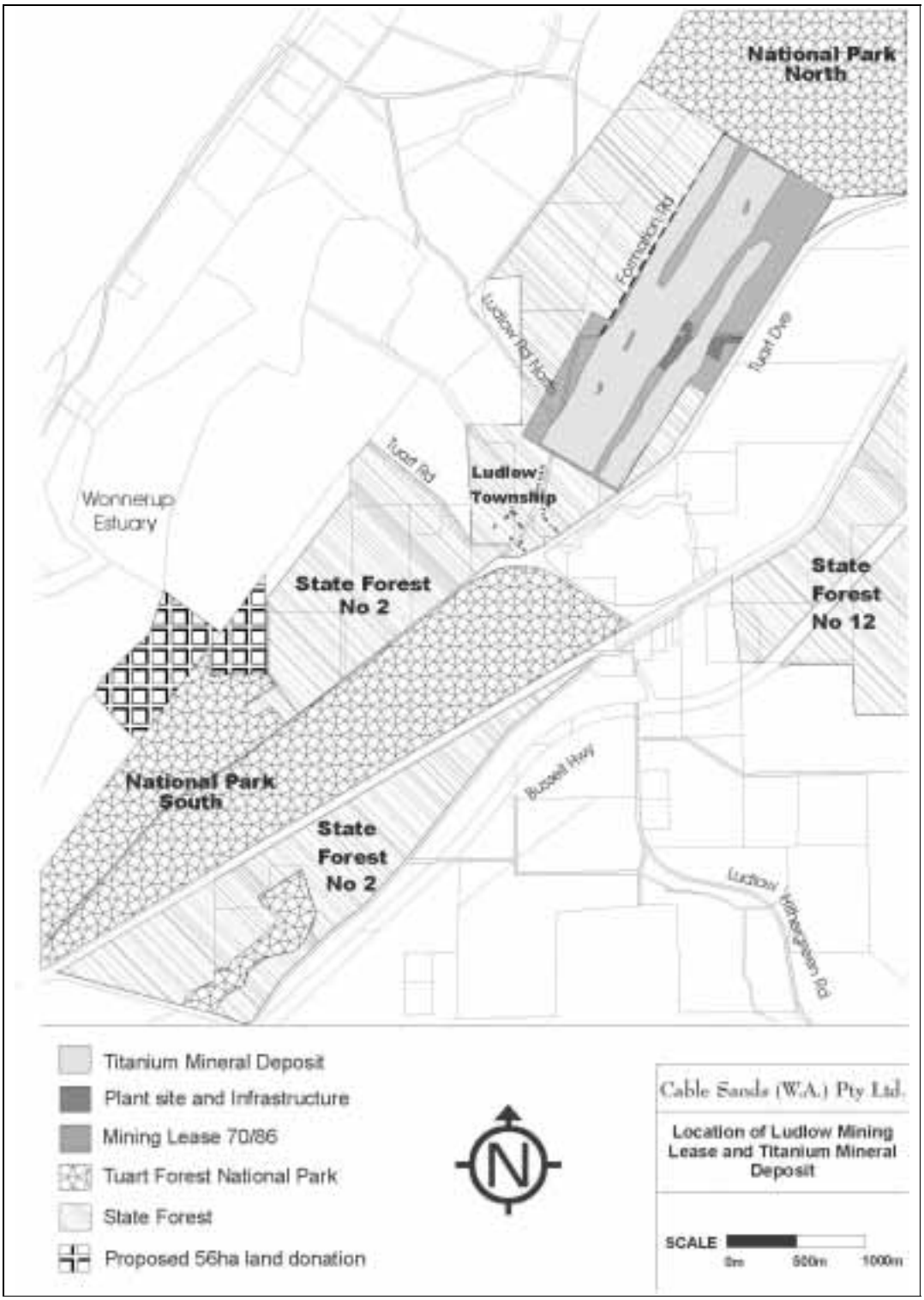

Figure 2: Local location and layout of the proposal (Cable Sands 2002)

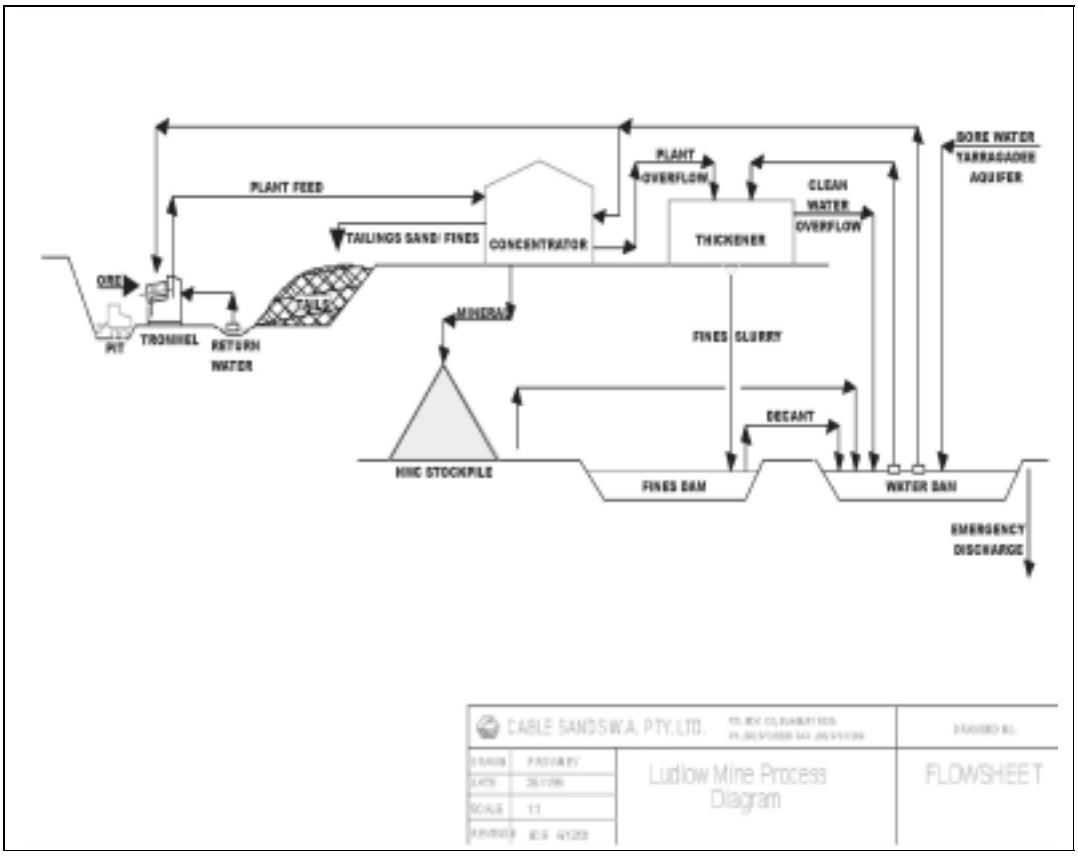

Figure 3: Mineral processing flow diagram (Cable Sands 2002)

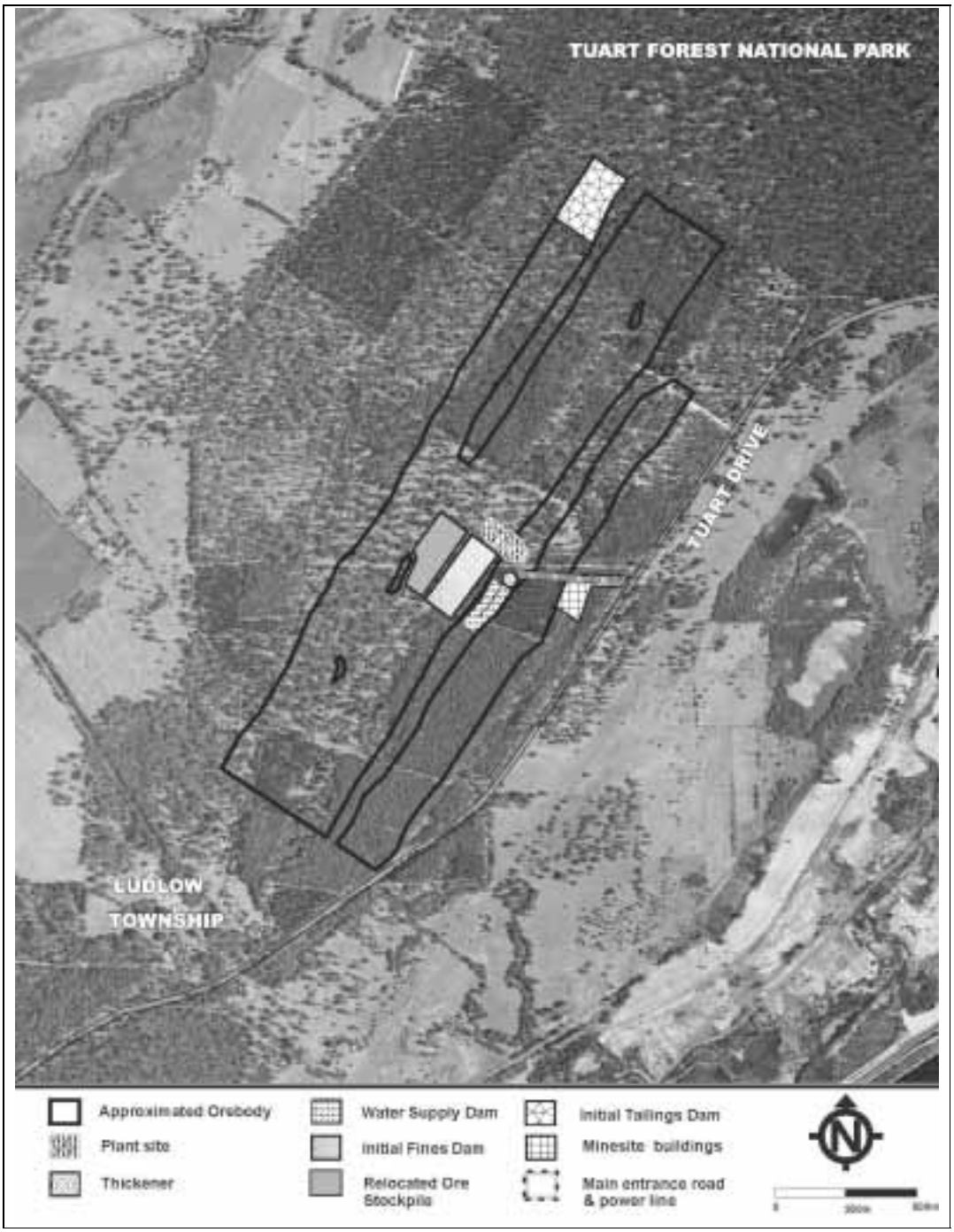

Figure 4: Revised layout of the proposal

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

It is the EPA's opinion that the following environmental factors relevant to the proposal require detailed evaluation in this report:

(a) Tuart conservation;

(b) Rehabilitation; and

(c) Fauna.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors generated from the ERMP document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment are contained in Sections 3.1 - 3.3. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

3.1 Tuart conservation

Description

Tuart

Tuart (*Eucalyptus gomphocephala*) is endemic to the Swan Coastal Plain, growing near the coast in a 400 km band from Jurien Bay on the Plain's north to the Sabina River east of Busselton. The recent *Status report: Tuart Conservation and Protection* (Tuart Response Group 2002) concluded that as a species, Tuart appears to be well represented in parks and reserves but its conservation status is less clear when considered relative to (i) its presently described six structural ecosystems and (ii) the composition of the flora associated with Tuart. The formation of the Tuart Response Group was largely in reaction to an increased decline and chronic insect infestation of Tuart in the Yalgorup area over recent years.

What is commonly referred to as the "Tuart forest" in the Ludlow area is formally categorized as a "tall woodland: Tuart" ecosystem. This is due to the formal

distinction between 'forest' and 'woodland' types, based on the proportion of the area covered by tree canopy. However, for the purpose of this report the common description of the area as "tall Tuart forest" will generally be used.

Background of conservation and mining in Ludlow area

The Ludlow Tuart Forest (which comprises the State Forest and National Park) has been the subject of a number of reports on the recommendations and implementation of the "Conservations Through Reserves" process initiated in the 1970's. There were four reports from 1974 to 1992 dealing with the Ludlow Tuart Forest, which lies within the System 1 area (CTRC 1974, EPA 1976, DCE 1980, EPA 1993).

With regard to conservation, the Ludlow Tuart Forest has always been considered of great value. Since the initial recommendations in 1974 the view has been that the forest area should be managed as a National Park. This lead to the gazetting of the National Park in 1987. However, within the Ludlow Tuart Forest, State Forest No. 2 has been treated as a distinct area. This area has little native understorey and was planted with exotic pine trees around 1915. This area is referred to as the "pine plantation". For this area the overall plan has been to replace pines with Tuart as the plantation areas were harvested, with the eventual goal of incorporation into the National Park.

With regard to mining, there has been a presumption against mining in the areas that are now part of the National Park, but an acknowledgement that mining in the pine plantation (the current proposal area) was a possibility. In line with the early recommendations of the Conservation Through Reserves Committee, a number of mining tenement applications were refused for areas that now fall within the National Park. However, mining in the "pine plantation" area was considered a possibility, subject to assessment of environmental impacts. A mining lease (ML 70/86) has been granted on this area. From 1974 to 1985 the position on how best to assess the impacts of mining evolved. Initially it was felt that a trial mining pilot study was needed prior to full-scale mining. After reviewing a trial mine proposal in 1985 the EPA concluded that the trial would not adequately demonstrate the long-term impacts of mining and that it would be better to research these impacts off-site and defer assessment of any mining to when a full-scale mining proposal came forward.

In accordance with the above, when a proposal for mining in Mining Lease 70/86 was put forward in 1987, the EPA decided that it required formal assessment at the level of an Environmental Review and Management Programme (ERMP). However, that assessment was not progressed very far and was eventually deactivated in 1989. In 2001, Cable Sands (WA) Pty Ltd referred a new mining proposal (the current proposal) to the EPA and again an ERMP assessment was initiated to assess the proposal on its merits, taking into account the long-term conservation objectives for the area.

Cable Sands' proposal

The proposal involves the clearing of 147 ha of vegetation within a section of State Forest No.2, which lies within a greater area often referred to as the Ludlow Tuart Forest. The vegetation of this area is a tall Tuart forest that has been significantly modified by past activities including tree felling, grazing, and planting of pine trees.

Nevertheless, it is still considered as a valuable Tuart forest area due to the number of large Tuart trees within it and its potential to be restored to a more natural Tuart forest ecosystem. The long-term plans for this area, after the removal of pines and re-establishment of Tuart, is for inclusion in the Tuart Forest National Park.

Approximately 1700 Tuart trees would be removed in the mining area. This is approximately 55% of the Tuarts on the mining lease. The tall Tuart woodland ecosystem of the project area is well represented in relation to its original extent, with approximated 66% remaining and 46% in conservation reserves. The 147 ha area affected by mining represents approximately 7% of the current extent of the tall Tuart woodland. However, the tall Tuart woodland ecosystem covers only a relatively small area, 2 088 ha in total.

The area has 14 vegetation complexes. These largely reflect different levels of historical disturbance. The majority of the area is a mixed woodland of Tuarts and Pines with a midstorey of Peppermints and a weedy understorey dominated by Arum Lilies.

A key component of this proposal is to rehabilitate the entire mining lease area with Tuart and native understorey species, with the long-term aim of creating a Tuart ecosystem suitable for inclusion into the adjacent National Park. In addition, a number of environmental offsets have been put forward to mitigate the impacts that mining will have on the Tuart forest in the short and medium terms.

Submissions

The main points raised through public submissions were that:

- the proponent has over emphasized the 'degraded' nature of the proposed mining area and that, in fact, the area is of comparable quality to the surrounding areas of forest in the National Park;
- the planting of pines had not degraded the forest, rather it had been the best available method at the time for managing the vigour of peppermints in the post-European environment;
- Tuart is under a number of threats and this coupled with uncertainty about rehabilitation outcomes poses unacceptable risk to the Tuart forest;
- there have not been any trials that demonstrate effective regeneration of a Tuart ecosystem on mined soils;
- approval of mining in this area would be contrary to past recommendations of the Conservation Through Reserves Committee;
- mining would be incompatible with the planned long-term land use of inclusion into the Tuart Forest National Park
- the financial benefits from the project in the form of lease payments and mining royalties should be used solely for the management and improvement of the Ludlow Tuart Forest;
- the 56 hectares proposed for by Cable Sands is very marginal Tuart land. and would likely be a liability rather than an asset;

- mining cannot be justified by providing funds to government for essential management of the Ludlow Tuart Forest, which government should fund in any case;

There were also submissions in support of the proposal, raising similar subjects as outlined above, but espousing contrary views.

In its submission on the ERMP document the Department of Conservation and Land Management (DCLM) stated that its clear preference was that mining should not occur in this area. The main points made in reaching this conclusion were that:

- the proposal presented an unacceptable risk to an area that was intended to be a future National Park, in that there was uncertainty about the rehabilitation outcomes compared to relative certainty of reconstructing a sustainable tall Tuart forest on existing un-mined soils;
- the area was not terminally degraded, given that reconstruction of a sustainable tall Tuart forest on the current soils would be relatively easy with existing proven technology;
- the areal extent of the tall Tuart woodland ecosystem is extremely small, with only 2088 ha remaining in total;
- the provision of 56 ha of land to add to the Tuart Forest National Park as an offset for mining was not considered adequate and could be a liability; and
- other potential land offsets needed to be investigated by the proponent.

The Conservation Commission, in which State Forest No. 2 is vested, was also opposed to mining in the pine plantation area of State Forest No. 2 at Ludlow. The basic ground for this stance was a belief that sand mining would jeopardise good prospects to revegetate former pine plantation back to a high standard of Tuart/native species cover. The Commission came to this conclusion based on much the same arguments as the DCLM.

Assessment

The area considered for assessment of this factor is the Ludlow Tuart Forest, that is the Tuart forest within the Tuart Forest National Park and State Forest No. 2.

The EPA's environmental objective for this factor is to maintain biological diversity where that represents the different plants, animals and micro organisms, the genes they contain and the ecosystems they form, at the levels of genetic diversity, species diversity, and ecosystem diversity.

In assessing this factor there is a hierarchy of issues that need to be considered that can be summarised by the following three questions. Would the loss of Tuarts through mining jeopardise the conservation of Tuart generally or the tall Tuart forest vegetation type in particular? What is the likely outcome of the proposed rehabilitation and would it be acceptable in relation to long-term Tuart conservation? And given the predicted impacts, do the proposed offset measures result in a net benefit for Tuart conservation in the long-term? These questions are addressed in turn below.

It should be noted that since the submission of the ERMP document, the proponent has carried out additional studies, committed to making further additions to the conservation estate, and given additional undertakings to address comments made by the Department of Conservation and Land Management and others in relation to rehabilitation outcomes and the adequacy of commitments. The key points of these changes are discussed in the body of this report. Further detail is set out in the proponent's response to submissions (Appendix 5). During this time the Department of Conservation and Land Management has provided expert review of additional work and been involved in the EPA's approach for this factor.

The clearing of 147 ha of State Forest No. 2 would not jeopardise the conservation of Tuart in the area, provided there is rehabilitation of the area consistent with the long-term land use. The loss of the 1700 trees would not significantly affect the conservation of the Tuart species. While there has been some disagreement over the condition of the forest in the mining area, this is not particularly relevant to long-term Tuart conservation. The EPA has accepted that the area has excellent potential for restoration of tall Tuart forest worthy of inclusion into the National Park system. It is this potential, rather than the current state, that is most important in assessing the impacts of mining. Taking this potential into account, it is also noted that tall Tuart forest is well represented both in comparison to its original extent, and within secure conservation reserves. Also, the Ludlow Tuart Forest does not seem to be under any particular threat at this time, other than the perceived threat of mining, that would make this area of critical importance. However, the total area of the "tall Tuart woodland" ecosystem is relatively small and so any permanent loss of 147 ha would be of serious concern and hence it is necessary to demonstrate that rehabilitation would have a high chance of success.

Based on the assessment presented in Section 3.2 "Rehabilitation", the likely conservation outcome would be acceptable in relation to the long-term conservation of Tuart in the Ludlow area. The EPA has taken a precautionary approach to the arguments raised in regard to the long-term outcomes of rehabilitation following mining. These arguments relate to the changes in soil structure as a result of mining and the impacts that would have on the future development of Tuart forest in the mined soils. This is discussed in some detail in the following section of this report. Based on its assessment, the EPA has accepted that the rehabilitated mined area (141 ha of the mining lease) will support a Tuart forest, but that the vigour and productivity of this ecosystem may be reduced from that possible if the soils were not mined. For the remainder of the mining lease (of which only 6 ha will be cleared) the soil structure is not altered and so rehabilitation is expected to enhance the condition of the existing Tuart forest. This conservative rehabilitation outcome would still result in an area that would be valuable as an addition to the National Park, and so is consistent with the long-term plans for the area. However, the assumed loss in capacity of the mined soils, implies there is a long-term impact that proposed offsets should address.

Environmental offsets become a valid consideration once all other mitigation measures are exhausted. In this case, the proponent has put forward a proposal that reduces the impacts as far as is possible if mining is to proceed. The proposed area of disturbance is largely confined to the orebody and the early rehabilitation of

undisturbed areas of the mining lease will mitigate some of the impact of clearing during mining. The long-term plans for the area will be followed, with the restoration of Tuart forest on the mined areas. The proponent has also set out an intensive soil reconstruction strategy designed to reconstruct a similar soil structure in the mined area.

In assessing the adequacy of the proposed offsets, the EPA considers the long-term impacts to be most relevant. In this case the long-term impact of mining, based on the EPA's precautionary approach, is that there may be some reduction in capacity of the mined soils to support Tuart forest. Hence, in calculating the values lost through mining and gained through offsets, a simple formula based on the Tuart potential of soil areas has been used as a long-term gauge. That is, given the degraded nature of the understorey now and provided the offsets can deliver an equivalent area of soils with good Tuart potential that will be managed for the conservation of Tuart, then there would be no net long-term loss to Tuart conservation as a result of this proposal. Based on the land offsets currently committed to by the proponent (the Wonnerup linkage shown on Figure 2 and the Stratham land shown on Figure 5 totaling 91 ha) and the size of the funds to be provided by the proponent ($830 000 in total), the EPA expects that this is achievable. These funds are in addition to the funds the proponent will spend on direct rehabilitation of the mining lease.

In addition, the EPA considers that the best use of the funds would be to acquire additional areas of Tuart soils for long-term incorporation into the conservation estate. The EPA notes that "tall Tuart woodland ecosystem" is a relatively small ecosystem type and so increasing the area in secure conservation is a sensible long-term strategy. The EPA has consulted appropriate experts in DCLM and reached the following conclusion. Given that development pressures in the area are expected to increase, securing additional land now will be more cost-effective in the long-term and allow better planning. As this is a long-term strategy, immediate rehabilitation of the land may not be so important as maximising the area and the capacity of the land to support Tuart. Hence in acquiring additional land the EPA recommends the following criteria be adopted in determining the best land purchase options:

1. Tuart soil with strategic location (that is, soils that have in the past supported Tuart forest in areas that can be linked to existing conservation reserves for effective management)
2. As for criterion 1 above, and with Tuart trees
3. As for criteria 1 and 2 above, and with native understorey

Obviously, all other things being equal, the best outcome would be to obtain land that fulfills all three criteria. However, depending on the price, extent, and availability of land, the most efficient use of funds may be to secure larger areas that fulfill one or two of the criteria, rather than smaller areas that satisfy all three.

The EPA therefore recommends that the following offsets committed to by the proponent be taken up:

1. contribution of the 56 ha Wonnerup linkage with rehabilitation to the value of $150 000; and

2. contribution of the 35 ha of Stratham land, which has a mixture of both old and regrowth Tuart, and is adjacent to Minninup Block of the Tuart Forest National Park.

Furthermore, the EPA considers that the remaining offered funds be combined ($830 000 in total) and used for additional Tuart conservation measures in the following priority order.

1. Acquisition of additional land for long-term conservation of Tuart
2. Rehabilitation of acquired lands (principally regeneration as a first step, leading to the establishment of Tuart trees)
3. Other Tuart conservation measures (such as additional research and development of management plans, etc.)

It is recommended that this be done through a Specific Purpose Account in the Conservation and Land Management Fund that will be set up to manage the funds provided by the proponent. The broad purpose of this fund will be to enhance the conservation of Tuart in the Ludlow area. The Minister for the Environment and Heritage will determine the priorities for expenditure from the fund based on the advice of the Department of Conservation and Land Management and the Ludlow Working Group. This is set out in Procedure 4, Appendix 4.

Should these recommendations be adopted, the EPA considers that there will be a neutral to positive outcome for Tuart conservation in the long-term, in that the mining area will be rehabilitated, additional areas will be managed for Tuart conservation, and other Tuart conservation measures will receive additional funds.

Summary

Having particular regard to the:

(a) potential future conservation value of the rehabilitated mining area;

(b) likely rehabilitation outcomes following mining;

(c) adequacy of proposed offsets with regard to provision of additional lands for Tuart conservation; and

(d) other contributions to Tuart management and conservation,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that a Specific Purpose Account is established to distribute funds for Tuart conservation initiatives in the Ludlow area in accordance with the priorities set out in this report.

Figure 5: Location of Stratham land adjacent to Minninup Block of Tuart Forest National Park (Cable Sands response to submissions).

3.2 Rehabilitation

Description

The proposal involves the clearing of 147 ha of vegetation within a section of State Forest No.2 and then rehabilitation of the area to a Tuart forest ecosystem at the completion of mining. There would be progressive rehabilitation as mining proceeds along the mine path. As the ore is mined, tailings would be returned to the mine pit to restore the landform, which would then be revegetated. Rehabilitation of the 147 ha and the remainder of the mining lease (216 ha in total) is critical to the proposal, since the long-term plans for this area are to incorporate it into the Tuart Forest National Park once compatible values have been restored. The proponent's rehabilitation objective is to re-establish native vegetation with a density and richness consistent with adjoining areas of the National Park.

Key to establishing a sustainable Tuart forest ecosystem is the reconstruction of soil profiles that are suitable for the growth of Tuart trees. In particular the remade land must be capable of providing trees with sufficient water and not impede root growth.

Preliminary mining schedules have been developed to minimise the area of disturbance and plan for early and progressive rehabilitation. Replacement of tailings will restore landforms to within ± 25 cm of the original contours.

Submissions

The main points raised through public submissions were that:

- there is considerable uncertainty as to the likely success of re-establishing a sustainable Tuart forest following sand mining at Ludlow and that long term demonstration trials were necessary;
- rehabilitation would not be able to restore the existing age structure within the forest;
- long-term commitment to some rehabilitation measures, such as weed management and monitoring, was lacking;
- completion criteria for the understorey component of a Tuart forest ecosystem had not been developed and there are varying views on what was the original state of the forest before European disturbance;
- some rehabilitation actions such as weed and fire management would need to be undertaken as part of wider management plan for the whole Ludlow Tuart Forest if they are to be successful;
- strategies for topsoil management were not finalised and did not seem to be in accord with best practice;
- orchid replacement was not satisfactorily addressed; and
- there will need to be monitoring of Tuart borers and disease within the rehabilitated areas.

The Department of Conservation and Land Management noted that the fundamental component to enable reconstruction of a sustainable Tall Tuart forest was the native soils, and that these would be altered by mining. Reconstruction on existing soils would be relatively easy with existing, proven technology, however, on reconstructed soils the capacity for the return of a sustainable tall Tuart woodland ecosystem is undemonstrated and carries a significant risk. To provide a reasonable chance of success at growing Tuart the proponent needs to demonstrate an understanding of plant water relations, critical soil parameters, and develop operational practices that allow the functional replication of existing soil analogues. Key issues in regard to the post-mining soils are the capacity of the reconstituted profile to:

- allow root penetration and
- provide sufficient water for the trees.

The Department also considered that

- Option 1 for topsoil management (replacement of topsoil on top of reconstructed land, after weed eradication measures) was the only acceptable option;
- it was important to ensure sufficient debris would be available to achieve sufficient ash-bed density for regeneration of Tuart; and
- specification of rehabilitation targets should be flexible, as the vegetation structure and composition in the potential control plots has been greatly modified since European settlement.

Assessment

The area considered for assessment of this factor is Mining Lease 70/86 within State Forest No. 2.

The EPA's environmental objectives for this factor are to ensure that:

- mine planning, decommissioning and rehabilitation are carried out in a planned sequential manner consistent with best practice; and
- ecosystem function is maintained following mine closure.

Given the long-term conservation plan for State Forest No. 2, rehabilitation of the mining area to a functional Tuart forest ecosystem is critical to the proposal. It is therefore important to ensure that the proposed rehabilitation is consistent with best-practice, taking into account knowledge of regeneration methods developed by the DCLM and its predecessors, and experiences of previous mining projects. More important, however, is the expected rehabilitation outcomes. In order for this proposal to be considered acceptable, the expected outcomes must be sufficiently successful so as not to compromise the long-term conservation plans for State Forest No. 2 and there must be sufficient confidence in these predicted outcomes. Also, for this proposal, the expected rehabilitation outcomes are an important consideration in determining the adequacy of proposed environmental offsets (refer to Section 3.1).

Soil structure

As was noted in submissions, the capacity of the remade soils to support Tuart trees is a key issue in determining the expected rehabilitation outcome for the site. Since the

release of the ERMP, the proponent has conducted additional studies to investigate this issue and has updated its soil profile reconstruction strategy.

It is now clear that it is relatively easy to reconstruct soils that will not impede the growth of Tuart roots. Studies of Tuart root systems on similar mined soils have shown that, provided the post-mining soils do not have thick layers of clayey materials (fines), there is no impediment to the growth of Tuart roots through the soils, which have generally low soil strength. Mining at other sites has successfully demonstrated that tailings can be deposited without creating clay layers.

The capacity of reconstructed soils to provide water to Tuart trees is still subject to some debate. The proponent's analysis of its studies has convinced it that the Tuarts are largely reliant upon the capillary zone above the superficial water table. Mining will affect less than 1% of the capillary zone. However, the DCLM's analysis of the same information, is that Tuart growth is limited by the stored soil moisture above the capillary zone. Given that it would take a number of seasons to make significant progress to resolving this issue, attention has been redirected towards examining the changes in Plant Available Water Content (PAWC) of existing and mined soils and how these changes would affect water use by Tuarts.

The mining process alters the PAWC of soils by separating the fine material from the coarser sands and so replacing the existing mix of fines/sands with an artificial one determined by how the various streams of material are deposited and combined. A simple explanation is that the overall PAWC is usually reduced in remade soils by the fact that the fines are not as homogenously mixed and uniformly distributed through the soil profile. Measurements of previously mined soils suggest by using similar techniques to that used in the past the PAWC of the remade soils would be 4.2% (by volume) compared with 6.3% for existing soils.

Based on these results the proponent has revised its soil reconstruction strategy in order to improve the blending of fines through the soil profile and therefore reduce the differences between the natural and reconstructed soils (refer to Figure 6). This strategy involves optimising the amount of fines combined with tailings discharge, depositing the remaining fines onto the tailings/fines material, and a number of stages of mechanical mixing to blend the fines as deeply as possible into the tailings/fines material. Using this strategy, which is a combination of proven techniques previously used at different mine sites, the proponent expects to get a PAWC of 6.0% for the top 2.5 m of soil and 4.5% for deeper soil. The average depth of mining is 4 m. Hence even with an intensive soil reconstruction strategy there will be some reduction in the PAWC of the reconstructed soils. Once again there is some follow-on uncertainty as to the extent that this change would affect the uptake of water by Tuart over the seasons. Water uptake could be affected in some proportion to the change in PAWC, or the uptake may only be affected for short periods during summer that would not significantly limit the growth of Tuart.

Given that the establishment phase is likely to be the most critical to the successful regeneration of Tuart, the efforts to improve the PAWC of the top 2.5 m of remade soils are likely to be beneficial.

Taking into account the discussion above, and in particular, noting that there is still some disagreement on the analysis of some studies and their implication for Tuart growth, the EPA takes a precautionary approach to the expected rehabilitation outcomes. That is, the EPA will accept the assumption that Tuart growth in the area is limited by water availability, that the stored soil moisture is the primary source of water to the Tuart, and that the reduction of PAWC in the lower 1.5 m (average) of reconstructed soil will have some discernable effect on Tuart growth. Hence, the EPA assumes that the rehabilitated mined area (141 ha of reconstructed soils) will be capable of supporting a Tuart forest, but that the vigour and productivity of this ecosystem may be reduced from that possible if the soils were not mined. Given this precautionary view of the expected rehabilitation outcomes, the provision of additional offsets becomes important. This was discussed in Section 3.1, where the EPA considered the values lost through mining and those gained through offsets in coming to its conclusion that there would be a neutral to positive outcome for Tuart conservation in the long-term.

Other aspects of rehabilitation

Through the development of its rehabilitation strategies outlined in the ERMP and its response to submissions the proponent has demonstrated a best-practice approach to rehabilitation. The proponent has thoroughly investigated rehabilitation methods that could be useful in this area and has set out a fairly detailed description of methods it will employ. This includes the use of ash beds for the regeneration of Tuart, a method that has been developed over the years by DCLM and proven to be effective. Draft completion criteria have been presented that will require further refinement during the development of the Mining and Rehabilitation Management Plan (Commitment 13). In particular, there will need to be further discussion between the Conservation Commission (or its advisory agency DCLM) on what should constitute the understorey of the Tuart forest ecosystem that is to be created in State Forest No. 2. That is, will the goal be to restore understorey similar to that which now exists in the adjacent National Park, or should it be based upon interpretation of what the understorey was like before European settlement? The recent work published by the Wildflower Society of Western Australia (Wildflower Society 2002) provides some additional information for this discussion. The proponent has also clarified the long-term nature of its commitment to the rehabilitation of the mining lease in its response to submissions.

The proponent has therefore demonstrated to the EPA's satisfaction that it has the understanding and the resources to be able to rehabilitate the area to a standard that will ultimately allow its inclusion within the National Park. The proponent has also demonstrated a willingness to listen to the community members in formulating its rehabilitation plans.

However, noting the importance of the implementation of the soil reconstruction strategy to the final rehabilitation outcome, the EPA recommends that there be frequent review of this operation in order to optimise the rehabilitation outcome. The proponent should develop a Soil Profile Reconstruction Plan that will detail procedures to be used for fines/sand deposition and mixing; keep a thorough record of how the procedures are implemented for each section of the mine; carry out early and progressive monitoring of reconstructed soil profiles; and use the results of

monitoring to continually review and improve procedures (Condition 7, Appendix 4). The emphasis on early and progressive monitoring is in recognition of the fact that little can be done to improve the reconstructed soils once they are deposited.

Summary

Having particular regard to the:

(a) rehabilitation methods set out in the ERMP;

(b) proponent's commitment to prepare and implement a Mining and Rehabilitation Management Plan;

(c) likely rehabilitation outcomes, based upon studies of soil profiles and Tuart water use; and

(d) the importance of soils reconstruction to rehabilitation outcomes,

it is the EPA's opinion the proposal is capable of being managed to meet the EPA's objectives for this factor provided the proponent is required to prepare and implement a Soil Profile Reconstruction Plan and the proponent's commitments are made legally enforceable.

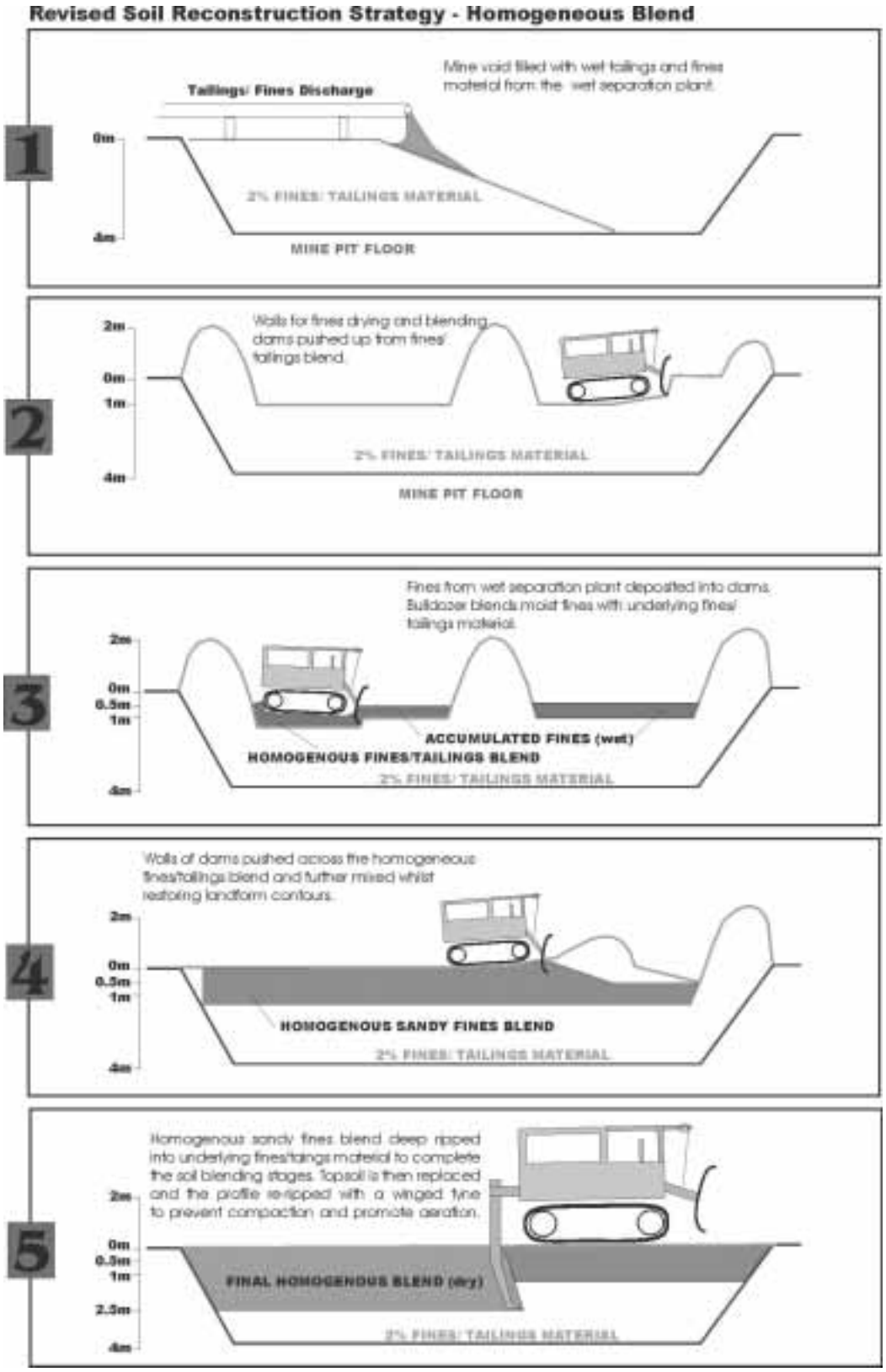

Figure 6 Revised soil profile reconstruction strategy

3.3 Fauna

Description

The primary impacts on fauna will be due to loss of habitat associated with clearing of the Tuart forest and the displacement of fauna from the mining lease by the proximity of mining operations. The mining area also forms part of a vegetation and habitat linkage between the northern and southern sections of the Tuart Forest National Park.

The mining area provides similar habitat to the surrounding areas of National Park and State Forest. Based on surveys of the site and assessments of the habitat the area could support 23 mammal species, 85 bird species, 25 reptile species, and 9 amphibian species. These include a number of threatened or priority species.

> Mammals Chuditch, Brush-tailed Phascogale, Quenda, Western Ring-tailed Possum, Brush Wallaby, and a bat species (*Falsistrellus mackenziei*)
>
> Birds Square-Tailed Kite, Peregrine Falcon, Carnaby's Black Cockatoo, Baudin's Black Cockatoo, Barking Owl, Masked Owl, and a number of migratory birds.

Among the Tuart trees on the mining lease are approximately 50 trees of greater significance as habitat. These are important for possums, may be used by breeding waterbirds (such as the Australian Sheldrake), and may support the Masked Owl. The proponent has generally restricted disturbance to the area of the orebody and so will retain approximately 50% of these trees (Figure 7).

Submissions

The main points raised through public submissions were that:

- removal of mature and senescent Tuart forest would result in impacts on fauna;
- plans to deal with the issue of displaced fauna during mining were needed;
- clearing would reduce the habitat of threatened or priority species;
- mining would increase the fragmentation of the north and south sections of the Tuart Forest National Park;
- nesting boxes should be provided; and
- if mining were approved, fragmentation effects could be reduced by actively enhancing the value and functionality of the conservation corridor, both within the tenement area, and the adjoining National Park.

Assessment

The area considered for assessment of this factor is Mining Lease 70/86 and the adjacent areas of State Forest and National Park.

The EPA's environmental objectives for this factor are to:

(a) maintain the abundance, species diversity and geographical distribution of native fauna; and

(b) protect Specially Protected (Threatened) Fauna, consistent with the provisions of the *Wildlife Conservation Act 1950*.

In relation to threatened and priority fauna, none of the species likely to occur on the site are critically dependent on the habitat of the mining area. The mining area is adjacent to relatively large areas of similar habitat. Mining will result in the displacement and loss of some individuals, and so translocation programmes for particular species (e.g. Brush-tailed possum) are proposed to reduce these impacts.

Overall, the proponent has taken fauna into account in developing its proposal and management measures. In order to reduce the impact on fauna, the proponent:

- has forgone mining the northeast section which has higher vegetation and habitat values (Figure 7);
- has minimised the area of clearing needed through detailed mine planning and sequencing of operations;
- would retain approximately 50% of the more important habitat tees;
- would encourage re-colonisation by installing nesting boxes; and
- would implement translocation programmes for particular species.

The operational aspects of these measures would be included in the proponent's Fauna Management Plan (Commitment 9, Appendix 4). This plan will set out clearing controls, workforce awareness, translocation programmes, habitat reconstruction, and monitoring programmes.

With regard to the increased fragmentation effects on the adjacent National Park and State Forest, this is not expected to cause any significant isolation of populations and the effects can be reduced by early rehabilitation. It should be noted that fauna currently copes with fragmentation impacts across the Mining Lease. However, the proposal would increase the fragmentation effect for the period of mining and regeneration. Early rehabilitation of remaining corridors in un-mined areas will to some extent counter the temporary loss of habitat in the mined areas. In addition, the short mine life, limited disturbance, and the existence of remaining corridors is not expected to cause genetic isolation of populations within the two sections of the National Park.

In the long-term, the rehabilitation of the entire mining lease, including improved native understorey, will enhance the habitat and linkage values of the area. The proponent has undertaken to rehabilitate all areas in the mining lease and to restore a sustainable Tuart forest. The provision and rehabilitation of land linking the section of State Forest and National park to the Wonnerup Estuary should also assist fauna in moving between these areas.

In conclusion, the EPA considers that the short-term impacts on fauna are manageable and that in the longer term, the existing habitat and linkage values of the area would

be restored and enhanced by rehabilitation and the securing of other areas to add to the Tuart forest estate.

Summary

Having particular regard to:

(a) current habitat conditions on the mining lease;

(b) the limited extent of clearing;

(c) the fact that similar habitat is found in the adjacent National Park;

(d) mining will not result in the complete isolation of fauna populations;

(e) measures proposed for the Fauna Management Plan; and

(f) long-term enhancement of habitat and linkage through rehabilitation,

it is the EPA's opinion the proposal is capable of being managed to meet the EPA's objectives for this factor provided the proponent's commitments are made legally enforceable.

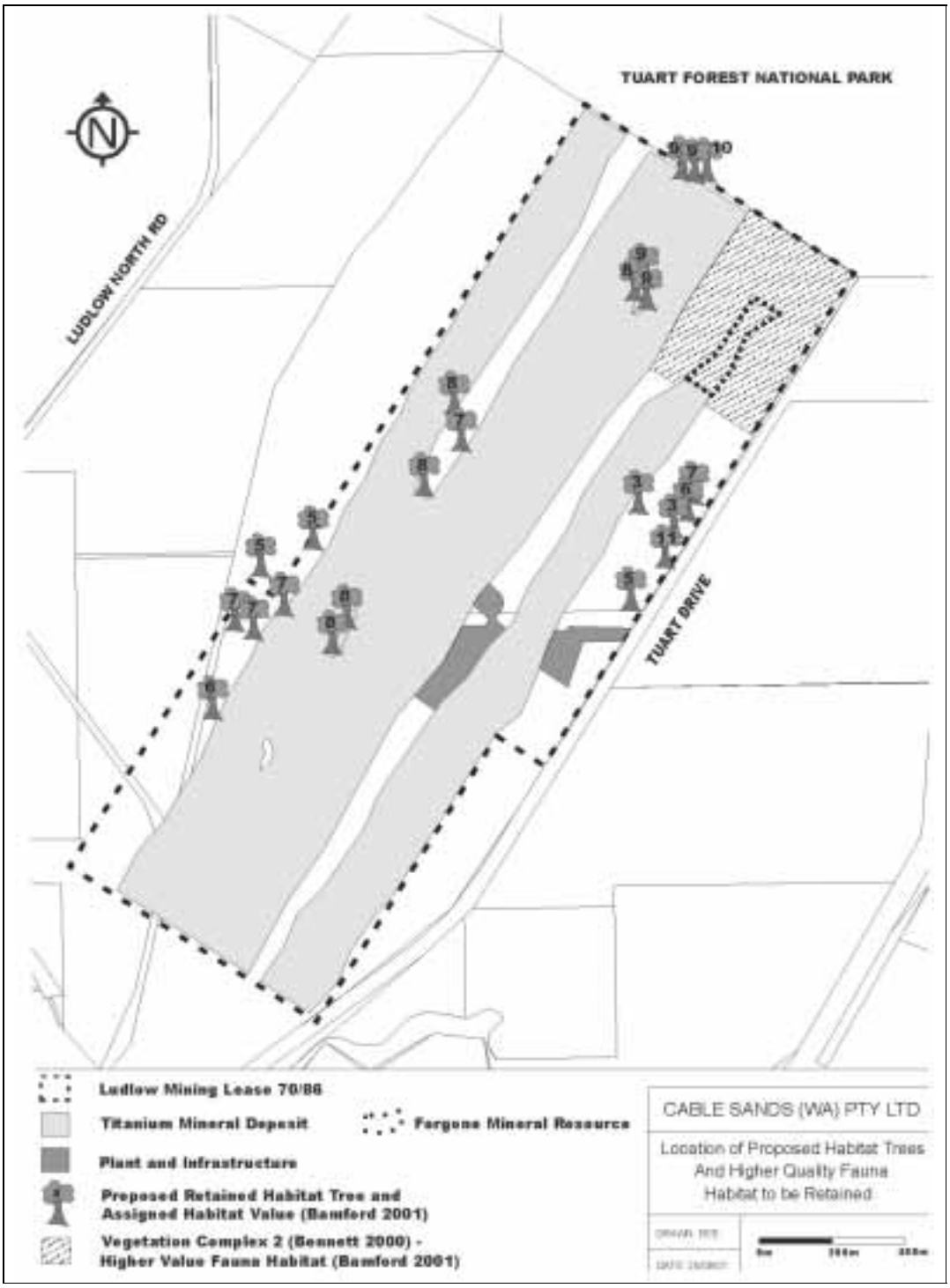

Figure 7: Mine plan in relation to habitat values (Cable Sands 2002)

4. Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set out in the ERMP and subsequently modified, as shown in Appendix 4, should be made enforceable.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Cable Sands (WA) Pty Ltd to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfill the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) that the proponent prepare and implement a Soil Profile Reconstruction Plan to ensure that soils profile reconstruction methods are optimised; and

(c) guidelines for the Specific Purpose Account that will distribute the funds provided for Tuart conservation initiatives in the Ludlow area.

5. Conclusions

The EPA has considered the proposal by Cable Sands (WA) Pty Ltd to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury.

Cable Sands (WA) Pty Ltd has worked hard with the community and government to develop an environmentally acceptable proposal in a region which has high significance for conservation. The proposal is located in a section of the Ludlow Tuart Forest which is planned to be added to the Tuart Forest National Park after the restoration of its original forest values. Early in the development process, Cable Sands established the Ludlow Working Party, which is comprised of a number of community groups and government agencies with interests in the Ludlow Tuart Forest. The work of this party resulted in early identification of the environmental issues and has allowed for well informed debate on the remaining issues of concern, thus assisting the EPA in its assessment. The EPA appreciates the efforts of the community in participating in the working party and commends their efforts and the initiative of Cable Sands in establishing it.

The potential for long-term impacts on the conservation value of the area has been the most important consideration for the EPA in assessing this proposal. In particular, the issues of whether the likely rehabilitation outcome is consistent with the long-term conservation plans for the area and how this outcome might affect the conservation of Tuart in the Ludlow area have been closely examined.

In the long-term, there would be a neutral-to-positive outcome for Tuart conservation as a result of the proposal. In the Ludlow area, Tuart is well represented in relation to its pre-European extent and in conservation reserves. While the assumed rehabilitation outcome would result in some change to the current conservation potential of the land, this would be compensated for by a number of offset measures. These include the provision of additional areas of land for Tuart conservation and funds for Tuart conservation initiatives in the Ludlow area. The EPA has set out the priorities it believes should be applied in distributing the funds and recommends that a Specific Purpose Account be set up in the Conservation and Land Management Fund to do this.

After adopting a precautionary approach, the EPA has concluded that an acceptable rehabilitation outcome can be achieved. Cable Sands has demonstrated an understanding of the issues involved in regenerating a Tuart forest and has set out appropriate rehabilitation measures. The EPA considers that a sustainable Tuart forest can be returned to the mined area, but that there may be some reduction in vegetation productivity and vigour as a result of changes to the soil structure. Rehabilitation of the remainder of the mining lease is not expected to be difficult, and would enhance the conservation value of the area.

Fauna of the State Forest and the National Park is not likely to be significantly affected by the proposal. The impacts on fauna are likely to be short-lived, due to the short mine life and the early rehabilitation of un-mined areas within the mining lease.

The EPA has therefore concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

6. Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the development of a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

State/Local Government agencies

Conservation Commission of Western Australia

Department of Conservation and Land Management

Department of Indigenous Affairs

Department of Mineral and Petroleum Resources

Forest Products Commission

Heritage Council of Western Australia

Shire of Busselton

Shire of Capel

Water and Rivers Commission

Non-government organizations

Bunbury Naturalists Club Inc.

Busselton-Dunsborough Environment Centre

Cape Naturaliste Tourism Association

Capel Land Conservation District Committee

Conservation Council of Western Australia

Denmark Environment Centre

Friends of the Tuart Forest

Geographe Catchment Council

Institute of Foresters, WA Division

Leeuwin Conservation Group (Inc.)

Margaret River Regional Environment Centre (Inc.)

South West Environment Centre Inc.

Tuart Response Group

Wildflower Society of Western Australia (Inc.)

Individuals

A D Armitage

Alison Cassanet

Andrea Savic

Andrew G Thomson

Barry Willcox

Bernie Masters, MP

Brendan Kelly

Brendon .L. Martin

C Bent

CA Knudson

Charles Roche

Cheryl Campbell

Cheryl Sampson

Christine Emerson

Christine Scott

Clarrie Isaacs

D L Goodlad

Darren Pace

David Pond

Dr Christine Sharp MLC

H Parkay

Helen Redman

Holli Parker

J Jones
Jane Morrow
Jim Muir
John McBain
John Tate
John Vukovich
Judy Trembath
K H Scott
K Zanotti & E Clayton
Keryn Marley
Les Mitting
Lesley Jackes
Mabel Bell
Martin Pritchard
Michael Cassanet
Mr Kimberley A Hawkins
Ms Diane Marshall
Ms Ellen Clayton
Ms Tanya Marwood
Nan Connell
Noreen Hocking
Paul Redman
Peter Murphy
Pride Bierman
R.N. Glencross
Roger Underwood
Rupert Jones
Sally Wylie
T Cullen
Vance Scott
Vanessa White
W Franssen
Wendy Alpen

Appendix 2

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Cable Sands 2002, *Ludlow Titanium Minerals Mine, Environmental Review & Management Programme*. (vols 1 & 2) Prepared by Cable Sands (W.A.) Pty Ltd, January 2002.

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DCE 1980, *Status of Recommendations by the Environmental Protection Authority for Conservation Reserves in Western Australia, Systems 1,2,3,4,5,8,9,10,11,12*, Department of Conservation & Environment, Western Australia, Bulletin No 85, June 1980.

EPA 1976, *Conservation Reserves for Western Australia, as Recommended by the Environmental Protection Authority 1976, Systems 1, 2, 3, 5*. Perth 1976.

EPA 1993, *Red Book, Status Report (1993) on the implementation of Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority (1976-1984)*, Environmental Protection Authority, Report 15, February 1993.

Wildflower Society 2002, *Tuart (Eucalyptus gomphocephala) and Tuart Communities*. A Perth Branch Wildflower Society of Western Australia (Inc.) Publication, June 2002.

TRG 2002, *Status Report: Tuart Conservation and Protection*, Prepared by the Tuart Response Group, August 2002.

Appendix 3

Summary of identification of relevant environmental factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
BIOPHYSICAL			
Flora and vegetation	The proposal involves the clearing of 147 ha of vegetation within a section of State Forest No.2. The vegetation of this area is a tall Tuart forest/woodland that has been significantly modified by past activities including tree felling, grazing, and planting of pine trees. Nevertheless, it is still considered a valuable area of Tuart forest due to the number of large Tuart trees within it, and its potential to be restored to a more natural Tuart forest ecosystem. The mining area does not contain any declared rare or priority flora. The area has 14 vegetation complexes. These largely reflect different levels of historical disturbance. The majority of the area is a mixed woodland of Tuarts and Pines with a midstorey of Peppermints and an understorey dominated by Arum Lilies.	**Public** In terms of Tuart, the area is far from degraded. On the majority of the mining lease there is a very adequate stocking of largely 80 to 100 year old Tuart trees. The density and structure of Tuart over much of the mining area is a good as the best of the Tuart forest. Of particular concern is the proposal to destroy large numbers of senescent and mature Tuart trees. These trees could form an integral part of the ecological restoration of the site. Cable Sands has not adequately surveyed fungal biodiversity within the area. To describe the area as having limited biodiversity is inaccurate. The area is part of an ecologically significant biosphere, that contains a significant fungal population, and is near the Vasse-Wonnerup wetlands and McCarleys Swamp. The proposal should not be allowed to proceed without supporting statistical information that enables a clear determination to be made on how the proposal meets the EPA's *Position Statement No. 2 Environmental Protection of Native Vegetation in Western Australia*. In particular, it would appear that this proposal would seriously impact on the remaining extent of vegetation complexes that are critically under represented in the conservation estate and relative to their original extent. It would also be contrary to the EPA's advice regarding the "threshold level" of 30% of the pre-clearing extent of vegetation types. **Ecological Systems Branch, EPA Service Unit** To properly establish the significance of the mining area a proper comparison with the surrounding areas is needed. The ERMP focuses on the degraded nature of the vegetation in the study area. The vegetation in the study area should be compared that of the Tuart Forest Reserve. This comparison should include a comparison of vegetation condition using	Note that a large number of submissions specific to Tuart are discussed elsewhere under "Tuart Conservation". Fungal surveys have been conducted since the release of the ERMP. No rare species were found. The proposal is unlikely to affect diversity of higher fungi at a local or regional scale. Recolonisation of the area is expected to be rapid, given the close proximity to unmined areas and the continued presence of mammal vectors. According to the recent *Status Report: Tuart Conservation and Protection*, approximately 66% of the pre-1750 area of "tall woodland: Tuart" ecosystem type remains and 46% is in conservation reserves. In this sense, the proposal is consistent with the EPA's position statement. However, this type covers a relatively small area (2 088 ha) and so the project's impact on Tuart conservation requires further consideration. It is noted that no declared rare of priority species would be affected by the proposal. With regard to vegetation condition, debate over the existing values of the area is not as important as the potential future values of the site (which is discussed under "Rehabilitation"). However, additional studies comparing the vegetation condition of the project area with that of the National Park have tended to support the original assertion that the vegetation of the mining area is generally more degraded, with the exception of Vegetation Community 1 in the northeast section of the mining lease. This area has vegetation in better condition and has the most diverse range of fauna. This community has been excluded from the mining area. The entire mining lease will be rehabilitated. The likely outcomes of rehabilitation and its adequacy in restoring environmental values to the area are discussed under "Rehabilitation". **Considered to be a relevant environmental factor and is**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		an appropriate condition scale.	**discussed under the factors of "Tuart Conservation" and "Rehabilitation".**
Fauna	The primary impacts on fauna will be due to loss of habitat associated with clearing of the Tuart forest and the displacement of fauna from the mining lease by the proximity of mining operations. The mining area provides similar habitat to the surrounding areas of National Park and State Forest. Based on surveys of the site and assessments of the habitat the area could support 23 mammal species, 85 bird species, 25 reptile species, and 9 amphibian species. These include a number of threatened or priority species. Mammals Chuditch, Brush-tailed Phascogate, Quenda, Western Ring-tailed Possum, Brush Wallaby, and a bat species (*Falsistrllus mackenziei*) Birds Square Tailed Kite, Peregrine Falcon, Carnaby's Black-Cockatoo, Baudin's Black Cockatoo, Barking Owl, Masked Owl, and a number of migratory birds. There is the possibility that the endangered Short-Billed Black Cockatoo is breeding, or attempting to breed, in the north of the mining area and the adjacent National Park. Among the Tuart trees on the mining lease are approximately 50 trees of greater significance as habitat. These are important for possums, may be used by breeding waterbirds (such as the Australian Sheldrake), and may support the Masked Owl.	**Public** The removal of mature and senescent Tuart forest would result in an unacceptable loss of habitat and have an unacceptable impact on fauna. Not only will mining impact on the tall Tuarts, but it will also destroy, and further reduce, the associated ecosystems and the habitat of the endangered Carnaby's Black Cockatoo. The effect of noise and light on the fauna of the Wonnerup wetlands and McCarley Swamp has not been considered. The local Fauna Group report that this area of Tall Tuart is a breeding area for local native ducks. There is no fauna recovery plan put in place by Cable Sands to deal with fauna losses arising from displacement into neighbouring territories and to provide some chance of reintroduction after mining. Clearing, and the noise and light of mining operations will unacceptably affect fauna such as the Quenda, Wambenger, and Chuditch. These are nocturnal animals that have been spotted in the mine-site. Displacement of these animals into nearby habitat will stress the local populations of these species. Should mining proceed it would have a further significant fragmenting effect on the fauna habitat corridor left in the forest, which is already under pressure due to its elongated nature. **DCLM** Prior to the proposed mining operations, the proponent needs to develop a detailed plan to deal with the issue of displaced fauna. Mining operations will occur over a 5-year period, hence the issue and management of displaced fauna will be on going for the same period. The proponent needs to monitor for the presence of nest sites of Baudin's Black Cockatoo. If a nest site is found then it is	**Considered to be a relevant environmental factor.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		to be reported to the Department for appropriate action. It is recommended that the proponent monitors and manages fox predation during the mine establishment phase to reduce the impact of predation on fauna. **Ecological Systems Branch, EPA Service Unit** The scoring method for assessing the habitat significance of Tuart trees was somewhat restricted and so limits its value as a tool for selecting what trees to retain. More information is needed on the potential impact of 31 bird species of conservation significance on the Swan Coastal Plain that are likely to occur in the project area. The significance of the lease area for bat species has not been assessed. All of the bat species in the area probably use the Tuart trees as roosting sites and most are likely to use them as breeding sites.	
Subterranean Fauna	Based upon a review of potential habitats, there is unlikely to be any subterranean fauna present. The Tamala limestone underlying the orebody does not have karst structures and is unlikely to support subterranean fauna. In addition, mining does not extend into this formation, nor is dewatering of it necessary.	**Public** Given the lack of knowledge of subterranean fauna in the area of the proposed mine-site, it is difficult to establish what impact the proposed mine might have. Further study of this matter is required.	Based upon the lack of suitable habitat or project induced impacts, there is little likelihood of any significant impact to subterranean fauna. The Proponent has committed to carry out sampling of groundwater bores to further survey for subterranean fauna (Commitment 12) **Factor does not require further EPA evaluation.**
Surface water	Runoff from mining area could affect water quality through the discharge of sediment or the escape of hydrocarbon spills. The Vasse-Wonnerup Estuary is approximately 1.8 km northwest of the proposed mining area and the Ludlow River that flows to the estuary is 100 m to the south.	**Public** Until more is know about the flocculant 'Optimer 9965' it, and materials like it, should not be used in ecologically sensitive areas. Flocculant overflow from settling ponds during inundations may have an adverse effect on the quality of surface water, with some recent studies indicating that flocculants do not biodegrade and are moderately toxic. The proponent has not stated how it will prevent any contaminated water from reaching Wonnerup estuary (a wetland of international importance), given that surface water flows from the mining lease to the estuary. 3 000 tonnes of salt is to be introduced to the site through the use of process water. However, the ERMP contains no	Under most conditions no water will be discharged form the site. Any decant water or collected stormwater will be recycled through the water supply dam. Any overflow from this dam would be infrequent and would not contain high sediment levels. Tailings and fines dams will be constructed with adequate freeboard to prevent overtopping. Fine dams will also have the facility to pump excess water into the water supply dam if necessary. Flocculant is only toxic in its free form and free flocculant is not expected to leave the site in any significant concentration. Almost all of the flocculant used will be bound to fines particles and remain with the soils until broken down by bacteria.

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		explanations to assess dispersal of the salt load.	broken down by bacteria. The process water is of similar salt content to the surface aquifers. It will therefore not result in any increased salt levels. The proponent has committed to implementing a Water Resources Management Plan that would control discharge water quality, install appropriate hydrocarbon storage, and monitor discharges and the receiving environment. (Commitment 15) **Factor does not require further EPA evaluation.**
Groundwater (quantity and quality)	1.5 GL/annum of process water would be extracted from the Yarragadee aquifer. This is a deep regional aquifer. Abstraction at this scale could affect the regional groundwater system and reduce water supply to other beneficial uses, including ecosystem maintenance. Deposition of water-laden tailings and fines would cause local mounding of the water table. This could have adverse impacts on nearby vegetation including vegetation within the Nation al Park.	**Public** Pumping large amounts of water (1.5 GL of water each year) may have the effect of lowering the watertable within the surrounding forest area. It seems evident that a drop in the watertable would adversely affect the remaining Tuart forest, degrade the Wonnerup wetlands, McCarleys Swamp, and disadvantage nearby farmers. Cables Sand should prepare a Dewatering Management Plan in consultation with the Water and Rivers Commission as a condition of the EPA assessment of the ERMP. The ERMP fails to describe how the 4.4 million litres of water per day would be used or disposed of, as possible recharge of the groundwater system has the potential to impact severely on the native vegetation. It is essential that Cable Sands consider scenarios involving hydrogeological change. There is an emerging body of evidence that suggests that hydrogeological change may be a major contributing factor to the deaths of Tuart trees in the Yalgorup National Park. Based on the Yalgorup example, it is possible that a wedge of saline groundwater could permeate through to the root zone of the eventual rehabilitation area. **Conservation Commission** If mining were to be approved, the Conservation Commission would like to see a more cautious approach taken in the maintenance of water balance for the Tuart	After further discussion with the WRC it has been clarified that there is sufficient capacity from the Yarragadee aquifer to meet the requirements of this proposal. Abstraction from the Yarragadee aquifer is unlikely to affect local vegetation or wetlands. It is a deep aquifer that is separated from the shallow aquifers (which support vegetation and wetlands) by impermeable aquacludes. The extent of local groundwater mounding due to tailings has been studied further since the release of the ERMP. Based on this and the concerns raised by the Conservation Commission, changes have been made to the management of fines dams. A series of shallower temporary fines dams will be constructed and the initial dam will be sited away from the boundary of the National Park. An interception sump will be constructed on the northern boundary of the mine to recover mounded groundwater. Based on these new designs the temporary ground water mounds will not extend into the National Park. (Response 81) The hydrological conditions at Yalgorup are dissimilar to those at Ludlow. An intrusion of saline groundwater is not considered possible. (Response 82) The proponent has committed to implementing a Water Resources Management Plan that would install appropriate hydrocarbon storage, and include monitoring of groundwater levels. (Commitment 15) **Factor does not require further EPA evaluation.**

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		forest itself at the interface between adjoining National Park and mining operations. The Conservation Commission advocates that this be addressed at 9.7.2 and 8.7.3 of the ERMP – including a halt to mining if tree stress monitoring in the National Park detects any emerging problem apparently caused by mining/processing operations. There should also be a cautious approach to the siting of initial fines and tailings dams, currently proposed close to the mine interface with Tuart forest in the adjoining National Park. If significant water leakage problems occur in this area, it might also jeopardise the water balance and affect the forest. **WRC** The Water and Rivers Commission commends the proposed reuse of any water that may be pumped from the mining area as part of dewatering activities. (Water and Rivers Commission) The proposed source of water for mineral processing is the deep, Yarragadee aquifer. The proposed rate of extraction is 1.5 GL/annum. The report suggests that this quantity of groundwater is available, however this is not true. In recent time this aquifer has become fully allocated.	
POLLUTION			
Dust	Clearing and excavation of the mine pit could generate dust. The southern end of the mining area is adjacent to the Ludlow township.	No submission received.	Past experience suggest that this type of mining in this region is not likely to significantly increase dust levels. Standard mining practices would be employed to reduce the generation of dust from mining activities. These would be incorporated into the Environmental Management and Monitoring Programme (Commitment 1). **Factor does not require further EPA evaluation.**
Radiation	The mineral sand ore contains a small component (monazite) that is radioactive (less than 0.1% of the ore). This component is concentrated within the heavy mineral fraction of the ore by the processing operations. Once off-site processing at Bunbury is complete, some of the monazite is returned to the mine pit at Ludlow.	**Public** Blending radioactive monazite and xenotime tailings back into unstable mine-site infill is an irresponsible practice. Water will flow through the infill and may leach radioactive contaminants into the nearby wetlands. A 15% monazite component in some tailings streams on site	Apart from volumetric concentration during processing, the mining operation would not affect the radioactive properties of the soils in the mining area. Processing will concentrate the radioactive components in the material being handled. This activity is subject to State legislation that protects the public and company employees.

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	Due to the separation and selective placement of radioactive components of the ore, post-mining landscapes usually have lower gamma radiation levels.	is totally unacceptable. Ionising radiation from the monazite has the potential to contaminate the groundwater, the surface water, and the employees on site. Monazite rich tailings have elevated levels of radioactivity, and Cable Sands does not intend to remove radioactive contaminants from the proposed mine-site. As a result, the site would remain a radioactive hazard for an extended period after decommissioning. It is clearly not acceptable to allow radioactive dust to drift into the forests, Wonnerup wetlands, and McCarleys Swamp.	Any material that is returned to the site would only replace the same, or similar, material as already exists in the pre-mining soils. This material is unaltered by processing and would not leach into surrounding waters. Return of this material would be assessed by the DMPR and would need to demonstrate surface radiation levels equal, or lower, than pre-mining levels. **Factor does not require further EPA evaluation.**
Solid waste	Tailings from the processing plants will be returned to the mine pit to recreate as nearly as possible the pre-mining soil profile. Processing of mineral sands is primarily a physical separation process and does not involve the use of chemicals. A non-toxic flocculant is used for settling of the fines material.	No submissions received.	The proposal does not generate any waste, in that it does not significantly alter the chemical composition of the existing soils. The potential for the flocculant to be considered as a pollutant is discussed under the factor of surface water. **Factor does not require further EPA evaluation.**
Noise (including transport)	Noise will be generated from the processing plant, earthmoving equipment, and the screening trommel. The mine will normally operate 24 hours a day, 7 days a week. There are approximately 27 residences within 2 km distance from the mining area, including those in the Ludlow township adjacent to the area. An additional 15-20 truck movements per day will occur along the transport route. Most of the route is along roads currently used for heavy haulage. Tuart Drive was once part of the Bussell Highway and carried heavy vehicles. Noise modelling indicates that regulatory noise limits can be met.	No submission received.	Noise modelling indicates that the proposal would meet the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. **Factor does not require further EPA evaluation.**
SOCIAL SURROUNDINGS			
Community consultation	There is considerable interest in the proposal due to its: • impact on Tuart trees and Tuart conservation; • proximity to the Tuart Forest National Park • location within an icon forest along a tourist drive. The Ludlow Working Party has been established to consult	**Public** The Institute of Foresters of Australia, the professional body representing the forestry profession and containing within its ranks some of the most in depth understanding of Tuart forest management in WA, should have been consulted in preparation of the ERMP.	The EPA commends the proponent for the proactive approach that it has taken to community consultation in developing this proposal. The establishment of the Ludlow Working Party has allowed key issues to be raised early in the development and assessment of this proposal. This has resulted in well-informed debate and submissions on the proposal, which in

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	with representative groups throughout the development of the proposal.	Community consultation has not resulted in any modification of Cable Sands' intent to mine the area. The Ludlow Working Party process has been a good model and the efforts of Cable Sands in this area are to be commended, although the general consensus is that this area should not be mined. The proponent should be required to extend the community consultation process to cater for the growing community interest in Tuart conservation. The way that Cable Sands has undertaken this project, informing all interested parties and addressing concerns, has been impressive and gives confidence that they will undertake the restoration satisfactorily.	informed debate and submissions on the proposal, which in turn has assisted the EPA in its assessment of the proposal. A number of modifications to the proposal have occurred as a result of the consultation and submission process. While some groups may have been overlooked in the formation of the Ludlow Working Party, these groups have been able to make their concerns known through the public review process. **Factor does not require further EPA evaluation.**
Aboriginal culture and heritage	Excavation of the mine has the possibility of disturbing artefacts or burial sites. Archaeological and ethnographic surveys have been conducted over the mining area. No significant artefact sites were found. However, there is the potential for burial sites to occur given the high proportion of previously recorded burial sites in the Ludlow area.	**Public** Given the high proportion of Aboriginal burial sites in surrounding areas, it is vital that anthropological surveys cover more than the "20% of the ML (that) was effectively surveyed" **DIA** Copies of the reports from archaeological surveys and ethnographic surveys should be provided to the Department of Indigenous Affairs. Any sites that are to be disturbed would require a Section 18 permit under the *Aboriginal Heritage Act 1972*. Due to the potential for sub-surface material such as skeletal remains to be uncovered during work, a Section 16 permit should be obtained for monitoring and possible management of such material if located.	No Aboriginal heritage matters have been identified that cannot be properly dealt with under the *Aboriginal Heritage Act 1972*. The sites have been adequately surveyed to the satisfaction of Aboriginal representatives. Copies of the survey reports have been provided to the Department of Indigenous Affairs. Formal procedures will be developed in the form of a Contingency Plan for the event of unearthing Aboriginal artefacts or archaeological material (including burial sites). (Commitment 19) **Factor does not require further EPA evaluation.**
European heritage	A review of European heritage has identified two sites that would be affected by the mine pit. Both of these sites are small sections of old transport routes (a tramway and a stagecoach pass) of which little physical evidence remains.	**Public** The remnant Tuart forest that would be removed as a result of this proposal holds significant conservation value in terms of habitat, genetic diversity, and heritage value. A number of heritage sites would need to be protected or replaced if the mine was developed. These include: the old stage coach road, the remains of the formation track for the horse drawn timber tram, and a tree stump that has marks of	Rehabilitation of the mine site would be able to restore the values of the heritage sites. These sites are of interest mainly for their location rather than any material artefacts. After mining these routes will be reinstated. Prior to mining the sites would be surveyed to produce a locality plan, in consultation with the Shire of Capel. Any remaining infrastructure would be removed and stored as the Shire decides. On completion of mining, the dirt tracks

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		horse drawn timber tram, and a tree stump that has marks of past logging techniques. **Heritage Council of WA** Prior to any disturbance of heritage sites, the following actions should be taken: • Prepare a surveyed photographic and notated inventory of the sites, accurately locating any infrastructure and remnants. • Develop a strategy to ensure that the archaeological integrity is maintained, or at the very least accurately recorded. • Records and catalogue any items of infrastructure removed, for future reinstatement. The Council does not agree with the proposal to relocate such material. It is recommended that a report on European heritage within the mining lease be prepared by a suitably qualified consultant and a copy provided to the Heritage Council.	defining the location of both sites will be reinstated. (Commitments 21, 22, & 23) Given the low significance of the sites and the impacts upon them, a Heritage report and Interpretation Plan does not appear necessary and is unlikely to achieve any better outcome than the preparation of a locality plan. The tree stump mentioned in submissions will not be disturbed. **Factor does not require further EPA evaluation.**
Public health and safety — radiation and transport	Transport of heavy mineral concentrate would be undertaken in batch runs along roads suitable for heavy haulage. An average of 15-20 truckloads per day would be moved along the transport route. Some tailings containing concentrated levels of monazite would be transported from the off-site processing plant to the mine site along the same transport route.	**Public** Product transport on a main tourist route will be dangerous.	The transport of product and tailings on public roads would not result in any appreciable increase in risk to the public. The transport route is along designated heavy haulage routes (including Tuart Drive). The transport of tailings containing radioactive material will be conducted in accordance with State regulations (*WA Radiation Safety (Transport of Radioactive Substances) Regulations 199*) and a Radiation Management Plan. This includes such measures as covered trucks, driver training, and emergency instructions in the case of a spill. **Factor does not require further EPA evaluation.**
Visual amenity	Clearing and infrastructure near to a tourist route (Ludlow Drive) will affect amenity along a section of the route. Clearing for the mine pit (including the removal of tall Tuart trees) will occur nearby to Tuart Drive for approximately 2.7km of the route. The mine pit is on average 150 m from the road. A processing plant would be constructed approximately	**Public** This area of forest provides an entry to Busselton that is recognised as a key character attribute of the area. The mining operation would have an unacceptable impact on the character of the forest and the region. Ludlow North Road is a significant tourist route and it is imperative that a comprehensive screen be installed (by way	While the mine will be noticeable, it would not significantly reduce the amenity of the area, in particular, as viewed while driving along Tuart Drive. The mine is set back sufficiently from the road for screening to be effective. A screening belt of native trees along the road was established in 2001 and along with the existing vegetation, would be sufficiently developed before mining to prevent any obtrusive visual impact.

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	300m from the road.	of bunding and vegetation) to retain as much visual amenity as possible. It is unlikely the Cable Sands would be able to effectively screen the mine-site from view by developing a vegetative shelter belt. The short mine life and the impacts of dewatering and dust would make this difficult. This proposal would jeopardise other plans for the development of tourism at the Ludlow Township.	prevent any obtrusive visual impact. **Factor does not require further EPA evaluation.**
OTHER			
Tuart Conservation	The proposal involves the clearing of 147 ha of vegetation within a section of State Forest No.2, which lies with a greater area often referred to as the Ludlow Tuart Forest. The vegetation of this area is a tall Tuart forest that has been significantly modified by past activities including tree felling, grazing, and planting of pine trees. Nevertheless, it is still considered as a valuable Tuart forest area due to number of large Tuart trees within it and its potential to be restored to a more natural Tuart forest ecosystem. The long-term plans for this area, after the removal of pines and reestablishment of Tuart, is for inclusion in the Tuart Forest National Park. Approximately 1700 Tuart (E*ucalyptus gomphocephala*) trees would be removed in the mining area. This is approximately 55% of the Tuarts on the mining lease. The 147 ha area affected by mining represents approximately 7% of the current extent of the tall Tuart woodland ecosystem.	**Public** Tuart forest is unique to Western Australia and is under many threats – past and future clearing on private lands, insufficient areas in conservation areas, and widespread tree deaths from not well understood causes. Coupled with the uncertainties in the ability to rehabilitate the forest ecosystem, the loss of Tuart forest creates a great environmental risk. On the other hand, the value of the benefits from the various offset proposals are debatable. The proposal should be rejected by the application of the precautionary principle, due to inadequate knowledge regarding Tuart conservation and the inability to demonstrate effective regeneration of a Tuart ecosystem on mined soil. No decisions should be considered until the outcome of the State Government's "Tuart Response Group" is formulated. If mining does proceed, it should only be on the basis that it provides significant, sustainable, long-term benefits to the entire Ludlow Tuart ecosystem. The development is supported because it offers substantial long-term gain to the quality of the Tuart forest in the region, based on the following reasons. • The site is a very degraded section of the Ludlow Tuart Forest as a whole. • The Mining Company has the resources and expertise to rehabilitate the site well. • There appears to be no understorey seed store under the	**Considered to be a relevant environmental factor.**

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		pines. • The area has some old Tuarts but in no way is it an old growth forest. • If neglected the existing weeds will respond to the extra light, proliferate and then spread to the National Park on either side. • To date there has been no attempt anywhere to restore a Tuart forest and this is maybe the only opportunity for this to be undertaken at this site. • CALM has neither the money nor the resources to rehabilitate the area after the removal of the pines. • There are other gains with the proposed project, such as the of 56 ha of wetland to the park, the ongoing management of the site after mining, the weed control and the royalties CALM will receive. The intent of vesting and management of the Ludlow Tuart forest should determine its land use, and at no stage has either intent or management recommended mining. The conservation significance and intent is further supported by a series of reports and recommendations over the intervening years (by the Environmental Protection Authority and its Conservation Through Reserves Committee). Any approval would need to identify why past reports and recommendations are in error. The Tuart forest is not an extensive forest and a healthy Tuart forest should not be considered for mining. It is estimated that there is only about 2 500 hectares of Tall Tuart forest on crown land left in Western Australia (WA). This is far less than in reserves nominated under the WA Regional Forest Agreement for tree species such as Tingle. In addition, Tuart trees in Yalgorup National Park and the Lake Clifton area have been dying over the last years for reasons that are not completely understood. There have been also been problems in Tuart regeneration and it is now recognized that management intervention is necessary. Tall Tuart forest is not adequately secured within the conservation reserve system. The total area of Tuart species	

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		occurring within the IUCN reserve Category of 7 384 hectares, or 6.5% of the estimated pre-European distribution, does not meet the reserve minimum of 10% established by the National Reserve Programme Mining would require the destruction of over 1700 mature Tuart trees, many of which are some hundreds of years old. Even if rehabilitation were possible, the result would be a plantation of trees of the same age that would take many hundreds of years to develop a natural biodiversity. Long-term rehabilitation and management of the Tuart forest will be best served by the Tuart Conservation Strategy being developed by the CALM and the Forest Products Commission under the guidance of the Environment Minister. The Ludlow Tuart Forest has suffered from many years of neglect by Government Agencies. It is considered that should this proposal go ahead, the financial benefits from the project in the form of lease payments and mining royalties be used *solely* for the management and improvement of the Ludlow Tuart Forest. It is not guaranteed that the $750 000 proposed to be given to CALM for the lease of the land would be spent on improving Tuart forest. Rather than degrading the Tuart forest, the pines in the Tuart forest were part of a strategy to reduce the dominance of a peppermint understorey and aid regeneration of Tuart. When the pines are removed the Tuart forest in the mining area will be in good condition. **DCLM** The Department has reviewed the Ludlow Mineral Sands Mining Proposal ERMP and has come to the conclusion that there can be no guarantee that rehabilitation will satisfactorily replace the natural capability of the site and there must therefore be an element of risk associated with the development of the mine. The proponent will probably be able to restore elements of native vegetation cover, fauna habitat and a satisfactory landform on the mine site. However, while it is recognised that the proponent has gone	

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		to great lengths to identify, investigate and reduce the risks that mining operations pose to successful Tuart forest regeneration, the ERMP cannot give an assurance that the natural capability of the site can be replaced and hence allow replication of the existing natural values. The proposal therefore creates a risk that the site and future forest will be at best a degraded Tuart forest. As there is no convincing precedent for the restoration of a similar mined Tuart forest, DCLM is not able to quantify this risk. In view of the icon status of this forest and the focal location of the ore body, DCLM suggests that this risk to the future national park should not be accepted. It is recognised that a comprehensive assessment of the proposal would include the totality of benefits and not just possible environmental impacts in the Ludlow Tuart forest. In considering these benefits the Department would discount any suggestion that this area of the Ludlow forest is terminally degraded and mining is the preferred way to improve any aspect of the Ludlow Tuart forest. Mining constitutes a threat to a significant area of the Tall Tuart Woodland Ecosystem. Although represented at 46 % in IUCN reserve categories I to IV, the areal extent of this unique ecosystem is extremely small, with only 2087 ha remaining in total. Tuart ecosystems are exposed to a range of threatening processes the hierarchy of which is not known. Tuart trees are undergoing very visible signs of decline in the Yalgorup area between Mandurah and Bunbury, but this is not evident at Ludlow. The primary reason(s) for the recent increased decline and chronic insect infestation in Tuart is not clear, as there are a number of contributing and inter-related factors involved. Potential influences include the ongoing decline in winter rainfall, soil and hydrological factors near wetlands, insect borers, salinity and nutrient supply, altered fire regimes, competition with understorey species, and roadworks. Clearing disturbance from mining cannot be ruled out as a possible contributing threat to decline in the Tall Tuart Woodland ecosystem, as there is some evidence to suggest	

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		that clearing alters the environment and exposes adjacent trees to more sun, more wind, and a greater edge effect, than in the natural condition in which trees have developed. **Conservation Commission** The Conservation Commission is opposed to mining in the pine plantation area of State Forest No. 2 at Ludlow. The basic ground for this stance is a belief that sand mining would jeopardise good prospects to revegetate former pine plantation back to a high standard of Tuart / native species cover. A revegetation goal involving Tuart has long- existed for this site, and apparently was the reason for existing Tuart trees being retained when the pine plantation was established. Although it appears that in the past the former Forests Department had considerable difficulty in working the Ludlow Tuart Forest and in achieving good Tuart regeneration, the DCLM is confident that revegetation of areas of the National Park currently under Tuart (but with degraded lower storeys) is achievable in a practical sense. Similarly, the DCLM has confidence that a high standard of revegetation is achievable in the adjoining State forest, post pine harvesting, so long as the soil profile is not substantially disturbed. However, mineral sand mining as proposed, will substantially disturb the soil, and the proponent's ERMP has failed to convincingly demonstrate that a satisfactory outcome is achievable under these conditions. This is therefore considered not to be a cautious approach, for if satisfactory revegetation proves to be not possible after mining – it will also have eliminated the possible alternative, that of conducting revegetation without substantial soil disturbance, which has better prospects for success. Should a decision be made that allows mining to proceed, it needs to be based on demonstration trials showing that a high standard of revegetation can be achieved.	
Tuart Forest National Park	The mining area is on the east edge and north half of State Forest No.2, which itself lies between the northern and southern parts of the Tuart Forest National Park. As such it forms part of a vegetation and habitat linkage between the northern and southern sections of the National Park.	**Public** The excavation of the land for mining is not compatible with the planned long-term land use of inclusion into the Tuart Forest National Park.	The conservation value of the mining area and its long-term land use relate to the wider issue of "Tuart conservation" and hence are discussed under that factor. Impacts on the connection between the two section of the National Park, and its implications for fauna in particular, are

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	northern and southern sections of the National Park. Combined, the National Park and the State Forest form what is known as the Ludlow Tuart Forest. Since the 1970s it the long-term conservation object for the State Forest area has been to eventually include it within a conservation system once the pine trees had been removed and Tuart re-established.	**DCLM** Until the area to the west, currently being rehabilitated by CALM, develops into a more substantial vegetation cover, mining would result in there not being an effective conservation connection between the two sections of the National Park. If mining is approved, there are two options to minimise the impact of fragmentation. Firstly, mining of the site could be delayed until an effective conservation corridor is in place outside the tenement area. Secondly, there is the prospect of actively enhancing the value and functionality of the conservation corridor, both within the tenement area, and the adjoining National Park.	National Park, and its implications for fauna in particular, are dealt with under the factor of "Fauna". **Considered to be a relevant environmental factor and is discussed under the factors of "Tuart Conservation" and "Fauna".**
Environmental Offsets	From the start it has been accepted that even in the best-case scenario, there will be some short-term reduction in the environmental values and function of this area of State Forest No. 2. As a result the proponent has put forward a number land management proposals to be taken into account as environmental offsets when assessing short and long term impacts of mining. These proposals have been modified in response to submissions and now include: • assistance towards the preparation of a Tuart Forest National Park Management Plan; • provision and partial rehabilitation of a 56 ha linkage to the Wonnerup Estuary; • provision of Tuart woodland adjacent to the Minninup Block of the Tuart Forest National Park; • rehabilitation of unmined portions of the mining lease (69 ha); and • the remainder of $750 000 (after additional land purchases and rehabilitation).	**Public** The 56 hectares proposed for by Cable Sands is very marginal Tuart land. The donated site is comprised of 2/3rd cleared horticultural land, the remainder has some 14 hectares of previously regenerated Tuart. The previously regenerated Tuart is of poor quality. Without the necessary funds the donated land will be a liability rather than an asset. The proponent must prove the success and value of claimed benefits (environmental off-sets) prior to proposal proceeding. The claimed Social and Environmental benefits are: • Contribution to knowledge • Expansion of the Tuart National Park • Financial returns for Tuart management • Restoration of a heavily degraded ecosystem, and • Increased community awareness Mining of State Forest cannot be justified on the grounds of providing funds to CALM. Government funds should be made available to carry out essential management of the Ludlow Tuart Forest. Funding of active management is more important than the lack of a formal management plan **DCLM**	The consideration of environmental offsets is an important part of the EPA's consideration of long-term impacts on Tuart conservation. **Considered to be a relevant environmental factor and is discussed under the factor of "Tuart Conservation"**

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		The provision of 56 hectares of land to add to the Tuart Forest National Park as an offset for mining is not considered adequate. A key criterion in assessing land addition offsets is that the offset should be the best available land that can benefit Tuart forest conservation. In this case the offset would include 52 hectares that is largely pasture that would require rehabilitation by CALM in order to realise its ecological values for Tuart conservation. As such, it presents a cost to the State. It is recommended that the proponent investigate other potential land offsets to improve the net outcome for Tuart conservation. The following are presented in priority order. • High quality Tuart forest, close to or adjoining the Ludlow Tuart forest • High quality Tuart forest, remote from the Ludlow Tuart Forest • Good condition (remnant vegetation), close to or adjoining the Ludlow Tuart forest • 56 hectare property, fully rehabilitated by the proponent **Conservation Commission** Post mining revegetation – the Commission supports concerns outlined by the estate manager, the DCLM, in its submission. It believes that a high standard of revegetation in the former pine plantation has a better chance of success without mining. of partly revegetated land – while the block has a strategic location and biodiversity potential, delivery of its full potential will involve the estate manager in considerable effort. There is likely to be other land available, that could better deliver benefits to Tuart ecosystem conservation, and the proponent needs to consider this further. of $80,000 for pre-management plan investigations – this is a satisfactory offer capable of producing worthwhile results.	
Mine planning, decommissioning and rehabilitation	Replacement of tailings will restore landforms to within ± 25 cm of the original contours.	**Public** Rehabilitation of the mined area must be undertaken in the	**"Rehabilitation" is considered to be a relevant**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
rehabilitation	Preliminary mining schedules have been developed to minimise the area of disturbance and plan for early and progressive rehabilitation. The accepted long-term land use for the mining area is for inclusion within the Tuart Forest National Park. The rehabilitation objective is to re-establish native vegetation with a density and richness consistent with adjoining areas of the National Park. Key to establishing a sustainable Tuart forest ecosystem is the reconstruction of soil profiles that are suitable for the growth of Tuart trees. In particular the remade land must be capable of providing trees with sufficient water and not impede root growth.	context of a management plan for the whole of the Tall Tuart Woodland if it is to be effective (for example, in managing weeds). Cable Sands entire rehabilitation assessment is based on the unsubstantiated confident assertions that rehabilitation will be successful. Specific problems in their rehabilitation methods include. • Hundreds of years of management will be required to develop appropriate age classes within the forest. • Further information is required to assess topsoil management options. • Minimum 2-year weed eradication program is inadequate. • Failure to address concerns relating to the Tuart borer and Tuart decline as experienced at Lake Clifton. • The possibility that Tuart decline may be caused by a yet unknown fungal association or predation. • Lack of integration of fire regimes with the DCLM managed lands. • Lack of monitoring and assessment, particularly in relation to disease and predation. • Lack of detail with regard to revegetation and sustainability outcomes. Especially in regard to understorey composition and distribution and 15 month and 10 year intervals. There is considerable uncertainty as to the likely success of re-establishing a sustainable Tuart forest following sand mining at Ludlow. There are many examples of failed Tuart plantings on mined areas on soil types similar to that at Ludlow. Claims of success relate to completely different soil types. Given the uncertainties, demonstration of successful recreation of sustainable Tuart forest on cleared land is necessary. This would take several decades to demonstrate. “Rehabilitation to world standards of the entire mining lease area.” is patently not possible as the rehabilitation of old-growth natural ecosystems is far too complex to be feasible.	**environmental factor.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		It has also been noted elsewhere that Cable Sand's ability to rehabilitate simple pasture is notably deficient and that it is in breach of its statutory obligations at the Jangardup Mine. The lack of demonstrated success in the re-establishment of a Tuart ecosystem in disturbed soils is a critical deficiency in the proposal. This is in spite of the Conservation through Reserves Committee recommendation in 1974 that trial plots be established to "…demonstrate that Tuart can be satisfactorily re-established." For the return of a Tuart ecosystem, regeneration of the understorey which would be most problematic aspect, and this will require the appropriate treatment and return of topsoil. The mining process should require the stockpiling of topsoil and its appropriate treatment so as to eliminate weeds and to return those fertility and physical characteristics (such as clay and organic matter contents) that are needed for the successful establishment of understorey species. Although paucity of understorey within the mining lease will not provide the diversity or quantity required to adequately rehabilitate the proposed 216ha, realistic timeframes for collecting additional local provenance seed must be set so as to not compromise parent stock. Orchid replacement is not addressed. Given that orchids exist in symbiotic relationship with soil fungi, the proposed topsoil management is unlikely to re-establish orchids. The completion criteria for sustainability of understorey (Criteria 4.1.2) is not adequate. The 50% value after 10 years is not sufficient diversity. Descriptive and extensive success criteria for both the species of flora and the community vegetation structure should be set on the proposal. Then use performance against these success criteria indicators, to determine the length of time the proponent remains responsible for the rehabilitated areas. Arum lilies, while an eyesore, are not a major obstacle to Tuart regeneration and mining is not the only way to remove	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		them. In addition to the weed species Arum Lily, there are a number of other localised weed species of concern that would require different weed management strategies. **DCLM** The thrust of the Department's submission is that the fundamental component to enable reconstruction of a sustainable Tall Tuart forest, the native soils, currently exist in the area proposed for mining. Reconstruction on existing soils would be relatively easy with existing proven technology. Reconstruction capacity for the return of a sustainable Tall Tuart woodland ecosystem on post mining soils is undemonstrated and carries a significant risk. To provide a reasonable chance of success at growing Tuart the proponent needs to demonstrate an understanding of plant water relations, critical soil parameters, and develop operational practices that allow the replication of or improves on successful remade soil analogues. Key issues in regard to the post mining soils are the capacity of the reconstituted profile to: (a) allow root penetration and (b) provide sufficient water for the trees. In addition to the crucial soil profile issues, the following points were made about rehabilitation should mining proceed. • Hygiene standards and practices within the proponent's nursery need to be accredited. • Option 1for topsoil management is the only option that provides for the maintenance of soil organic matter • Need to develop target soil nutrient specifications for post mining reconstructed soils, which are to be monitored. • Investigate the wider use of fertiliser across the site should it be necessary to restore a satisfactory nutrient status for understorey.	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		• Investigate the application and suitability of inoculated seed to improve regeneration and accelerate the return of beneficial soil fungi to the site post mining. • Ensure sufficient debris to develop adequate ash-bed density for regeneration of Tuart. • Tuart borer populations should be monitored. • A cautious and conservative approach should be taken to establishing a suitable fire regime for protection and regeneration. • Specifications of rehabilitation targets should be flexible and not become solely focussed on the control plots, as the vegetation structure and composition in the control plots has been greatly modified since European settlement. **DMPR** The proponent should provide a diagrammatic representation and description of the post mining profile. This diagram should show the precise location, depth from surface, and proposed post-ripping soil structure. Ripping should occur after topsoil replacement to ensure that compaction associated with topsoil replacement is also negated. **Ecological Systems Branch, EPA Service Unit** Given that there is confusion as to the true nature of the vegetation of the Tuart Forest Reserve it is essential that the ERMP clearly identifies what they define as a 'Tuart Forest ecosystem' and locate and describe fully, with respect to species type and density, a comparable 'area/s in the Tuart Forest National Park'. Most recent studies into the floristics of the Tuart Forest Reserve (draft report by Keighery and Keighery, unpublished) have found that the Tuart Forest Reserve's past flora and vegetation was similar to the relatively intact areas of the Reserve remaining today.	

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

RECOMMENDED CONDITIONS AND PROCEDURES

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

LUDLOW TITANIUM MINERALS MINE, 34 KM SOUTH OF BUNBURY, SHIRE OF CAPEL

Proposal:	The mining of mineral sands and rehabilitation of mining lease 70/86 in State Forest No. 2, as documented in Schedule 1 of this Statement.
Proponent:	Cable Sands (W.A.) Pty. Ltd.
Proponent Address:	Koombana Drive, North Shore, BUNBURY WA 6203
Assessment Number:	1385

Report of the Environmental Protection Authority: Bulletin 1098

The proposal referred to above may be implemented subject to the following conditions and procedures:

Procedural conditions

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in Schedule 1 of this Statement subject to the conditions of this Statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in Schedule 1 of this Statement in any way that the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in Schedule 1 of this Statement in any way that the Minister for the Environment and Heritage determines on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments documented in Schedule 2 of this Statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of fulfillment of the conditions in this Statement.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment and Heritage under Section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment and Heritage has exercised the Minister's power under Section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this Statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this Statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponent shall provide evidence to the Minister for the Environment and Heritage within five years of the date of this Statement that the proposal has been substantially commenced or the approval granted in this Statement shall lapse and be void.

Note: The Minister for the Environment and Heritage will determine any dispute as to whether the proposal has been substantially commenced.

4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this Statement to the Minister for the Environment and Heritage, prior to the expiration of the five-year period referred to in Condition 4-1.

The application shall demonstrate that:

- the environmental factors of the proposal have not changed significantly;
- new, significant, environmental issues have not arisen; and
- all relevant government authorities have been consulted.

Note: The Minister for the Environment and Heritage may consider the grant of an extension of time limit of approval not exceeding five years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program in consultation with, and submit compliance reports to, the Department of Environmental Protection which address:

the implementation of the proposal as defined in Schedule 1 of this Statement;

evidence of compliance with the conditions and commitments; and

the performance of the environmental management plans and programs.

Note: Under Sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the Statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this Statement.

Usually, the Department of Environmental Protection prepares an audit table which can be utilised by the proponent, if required, to prepare an audit program to ensure that the proposal is implemented as required. The Chief Executive Officer is responsible for the preparation of written advice to the proponent, which is signed off by either the Minister or, under an endorsed condition clearance process, a delegate within the Environmental Protection Authority or the Department of Environmental Protection that the requirements have been met.

6 Soil Profile Reconstruction Plan

6-1 Prior to the commencement of mining, the proponent shall prepare a Soil Profile Reconstruction Plan to ensure that soil profile reconstruction methods are optimised in regard to re-creating soil profiles, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

Advisory agency (See procedure 3):

- Department of Conservation and Land Management

This plan shall include the following:

1. work procedures to be followed in remaking soils in the mined-out sections of the orebody;
2. a record-keeping mechanism for recording the details of how work is actually carried out;
3. a progressive monitoring programme for sampling of reconstructed soils (particularly, the distribution of fines and Plant Available Water Capacity) as discrete sections of the mine pit are completed; and
4. a review mechanism that modifies work procedures based on the results of monitored outcomes.

6-2 The proponent shall implement the Soil Profile Reconstruction Plan required by condition 6-1 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

6-3 Within six months following the conclusion of soil reconstruction, the proponent shall compile the results of monitoring to construct a Soil Profile Map of the (entire) mined area, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This map shall be submitted to the Department of Conservation and Land Management.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority", the Chief Executive Officer of the Department of Environmental Protection will obtain that advice for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies, as required, in order to provide its advice to the Chief Executive Officer of the Department of Environmental Protection.

3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environmental Protection.

4 **Management of provided funds** (note to commitment 6)

The funds provided under commitment 6 will be placed into a Specific Purpose Account in the Conservation and Land Management Fund.

The purpose of the account will be to distribute the funds in a way that optimises the long-term benefit to conservation of Tuart (*Eucalyptus gomphocephala*) forest in the Ludlow area, through the following strategies:

1. Acquisition of additional land for long-term conservation of Tuart
2. Rehabilitation of acquired lands (principally regeneration as a first step, leading to the establishment of Tuart trees)
3. Other Tuart conservation measures (such as additional research and development of management plans)

Priorities for expenditure will be determined by the Minister for Environment and Heritage on the advice of the Department of Conservation and Land Management, the Ludlow Working Party, and the proponent.

Notes

1 The Minister for the Environment and Heritage will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environmental Protection over the fulfilment of the requirements of the conditions.

2 The proponent is required to apply for a Works Approval Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

Schedule 1

The Proposal (Assessment No. 1385)

The proposal is to develop a mineral sands mine in a section of State Forest No.2, 34 km south of Bunbury. The mining area (refer to Figures 1 and 2) is located between the north and south parts of the Tuart Forest National Park. The mining phase is of short duration (4 years) and the proposal includes the rehabilitation of the entire mining lease (mined and un-mined areas) into a Tuart forest ecosystem suitable for future inclusion within the Tuart Forest National Park.

Key aspects of the proposal include:

- disturbance of 147 ha of State Forest No. 2 (including the loss of 1700 Tuart trees, being approximately 55% of the Tuarts on the mining lease);
- a 4-year mine life, during which 7 million tonnes of ore will be mined to produce 800 000 tonnes of heavy mineral concentrate;
- mining to a maximum depth of 6 metres, then wet processing of the ore (which is principally a physical separation process requiring few chemicals, refer to Figure 3) to produce concentrate that is transported to Bunbury for further processing;
- return of waste materials to excavated pits to recreate current landform and soil profile;
- revegetation of disturbed areas (147 hectares) and unmined parts of the mining lease (69 ha) through the creation of ash-beds, and then seeding and planting of Tuart forest flora.

The proposal also has a number of significant environmental offset measures related to the provision of land for conservation purposes, the rehabilitation of some of this land, and the provision of funds for Tuart conservation initiatives. These measures are an important component of the proposal and are set out in commitments 6, 7 and 8.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

ELEMENT	DESCRIPTION
Area of Disturbance	147 ha
Area of orebody	141 ha
Depth of orebody	Maximum 6 m
Size of orebody	Approximately 7,000,000 tonnes
Area of rehabilitation	Approximately 217 ha
Life of mine	Up to 4 years
Production	200,000 – 280,000 tonnes of Heavy Mineral Concentrate per year
Operating hours	24 hours, 7 days/ week
Deposit	Titanium Minerals
Mining method	Dry, using conventional earthmoving equipment.
	Progressive backfilling of mine pit

Stockpiles	
• Overburden	No overburden present
• Topsoil	2 metre maximum height
Stockpile area	Dependant on final topsoil strategies.
Processing Method	Wet separation
HMC	Approx. average 11%
Sand and fines	87.7%
Oversize	0.85%
Water dam	Up to 45 megalitres capacity
Water supply	Groundwater bore in Yarragadee formation
Process water	Maximum 1500 megalitres per year
Power source	Western power grid
Electrical energy	9000 Megawatt hours per year with 22kV supply.
Diesel fuel	Approximately 800 kilolitres per year

Figures

1. Regional location of the proposal
2. Local location and layout of the proposal
3. Location of Stratham land adjacent to Minninup Block of Tuart Forest National Park

Schedule 2

Environmental Management Commitments

January 2003

Ludlow Titanium Minerals Mine, 34 km south of Bunbury

(Assessment No. 1385)

Cable Sands (W.A.) Pty. Ltd.

Environmental Commitments

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
Environmental Management	To ensure environmental management is in accordance with EPA objectives and continually improves.	1	Prepare an Environmental Management and Monitoring Programme (EMMP) for the proposal. The EMMP will detail, among others, management for the following factors; • Vegetation and Flora • Fauna • Ground and surface water • Greenhouse Gas • Noise • Dust and particulates • Radiation	Prior to mining	DEP, CALM, DoIR	DEP,CALM approval of Plan
		2	Implement the EMMP to the satisfaction of relevant authorities.	During mine development and throughout mine life.	DEP, CALM, DoIR	Agency comment on annual report.
		3	Publicly report environmental performance on an annual basis through the preparation of an Annual Environmental Report to be distributed through the Ludlow Working Party.	Operation and decommissioning	DEP	Receipt of annual report.
Vegetation Conservation	Maintain the abundance and diversity of species, and geographic distribution and productivity of vegetation communities.	4	Maintain vegetation clearing to a practical minimum through mine planning initiatives.	Prior to mining	DEP, CALM	Mining and Rehabilitation Plan meets DEP, CALM requirements.
		5	Implement an ongoing weed eradication program within the ML.	Before and during mining and for the first 2yrs of the rehabilitation phase.	CALM	Advice with annual reports.

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
	Assist in the conservation and management of Tuart Forests outside of the project area.	6	Provide funding of $830,000, for Tuart conservation initiatives. (The $830,000 total is the sum of $750,000 previously allocated for land compensation and $80,000 previously identified as a contribution to assist the development of a Tuart Forest Management Plan). (Note: Procedure 4 sets out how these funds will be managed.)	12 months after the Statement of Environmental Approval.	CALM	Letter from the proponent
		7	Provide 56ha of land (Sussex Loc.62 and Lot 2, plan 3280) to the Conservation Commission. Implement rehabilitation of this land in part to the value of $150,000 using methods agreed by CALM.	Provision of land and rehabilitation of corridor within 18 months of receiving the Statement of Environmental Approval.	CALM, LWP, EPA	Letter from the proponent.
		8	Provide 35ha of land known as the "Stratham Land" to the Conservation Commission.	Provision of land within 12 months of receiving the Statement of Environmental Approval.	CALM, EPA	Letter from proponent.
Fauna Conservation	Maintain the abundance, diversity and geographical distribution of native terrestrial and subterranean fauna. Protect Specially Protected (Threatened Fauna), consistent with the provisions of the Wildlife Conservation Act 1950.	9.	Prepare a Fauna Management Plan (FMP) to address, among other issues, management of the following; • review of existing fauna • clearing protocol • employee awareness • capture and translocation program • habitat reconstruction • monitoring.	Prior to mining	CALM, DEP	CALM approval of Plan.

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
	Improve understanding of subterranean fauna.	10	Implement within the ML, a rabbit, fox and feral cat eradication program.	Before and during mining and for the first 2yrs of the rehabilitation phase	CALM	Advice with annual reports.
		11	Store habitat logs and stag trees for inclusion in the final rehabilitation.	Throughout mine life	DEP, CALM	Mining and Rehabilitation Plan meets DEP, CALM requirements
		12	Conduct a sampling program of groundwater piezometers within the ML for the occurrence of subterranean fauna.	Prior to mining	CALM	Advice with annual reports

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
Rehabilitation	Ensure that mine planning, decommissioning and rehabilitation are carried out in a planned sequential manner consistent with best practise. Ensure ecosystem function is maintained following mine closure. Avoid State liability.	13	Prepare a Mining and Rehabilitation Management Plan (MRP) for the entire ML area. The plan will include; • final landuse (s) • biophysical baseline data • topsoil management plan • pre and post mining contour plans • mining and tailings return schedules • weed management plans. • erosion control plans • fungi re-introduction and *Armallaria sp*. management. • fire management plans • infrastructure removal/ decommissioning • rehabilitation completion criteria • rehabilitation monitoring.	Prior to mining	CALM	CALM approval of Plan.
		14	Implement the MRP to the satisfaction of relevant authorities	During mine development and throughout mine life.	DEP, CALM	Advice with annual reports.

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
Water Quality Protection	Protect the quality of underlying groundwater so that surrounding users including native vegetation are not unduly effected. Ensure surface water quality is protected so that surrounding watercourses including the Ludlow River and Wonnerup Estuary are not unduly effected.	15	Prepare a Water Resources Management Plan (WRMP) to address, among other issues, management of the following; • review of the physical environment • minimising water abstraction by recycling/ reuse. • erosion control measures • control of discharge water/ turbidity • controlling quality of the water circuit • chemical and hydrocarbon storage • contingency measures for spills • monitoring.	Prior to mining	WRC, DEP	WRC approval of Plan.
		16	Implement WRMP to the satisfaction of relevant authorities.	During mine development and throughout mine life.	WRC, DEP	Advice with annual reports
Groundwater quantity	Ensure that the beneficial uses of groundwater can be maintained	17	Prepare an Operating Strategy for Groundwater Abstraction.	Prior to mining	WRC	WRC approval of Strategy.
		18	Implement Operating Strategy to the satisfaction of the relevant authority.	During mine development and throughout mine life.	WRC	Advice with annual reports.
Aboriginal Heritage	Ensure that the proposal complies with the requirements of the Aboriginal Heritage Act 1972; and Ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.	19	Prepare a Contingency Plan for the event of unearthing an Aboriginal artefact or archaeological material.	Prior to mining	DIA	DIA approval of Plan.
		20	Implement Contingency Plan as required.	If circumstances arise during mine development and throughout mine life.	DIA	Letter from DIA

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
European Heritage	Comply with statutory requirements in relation to areas of cultural or historical significance. Assist in the preservation and improvement of European sites of significance.	21	Consult with the Shire of Capel and local historians to define the location of heritage sites within the vicinity of the mining lease.	Prior to mining	Shire of Capel, local historians	Locality plan approved by Shire of Capel.
		22	Remove and store any remaining infrastructure of heritage significance to the satisfaction of the relevant authority	Prior to and during mining.	Shire of Capel	Letter from Shire of Capel.
		23	Re-instate the location of heritage sites on completion of mining to the satisfaction of the relevant authority.	Post-mining	Shire of Capel	Letter from Shire of Capel.
		24	Donate mine production bore and power supply infrastructure to CALM for upgrade of Ludlow Township services	Post-mining	CALM	Letter from Proponent
Noise	Protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards. Ensure that noise and vibration levels meet acceptable standards and that an adequate level of service, safety and public amenity is maintained. (Road transport).	25	Prepare a Noise Management Plan (NMP) to include and address among other issues, the following; • location of noise sensitive premises • baseline noise levels • predicted noise contours • noise control strategies • monitoring	Prior to mining	DEP	DEP approval of Plan.
		26	Implement NMP to the satisfaction of relevant authorities	During mine development and throughout mine life.	DEP	Advice with annual reports.
Visual Amenity	Visual amenity of the areas adjacent to the project should not be unduly affected by the proposal.	27	Establish shelter belts along the road verge of Tuart Drive and Ludlow North Rd utilising plant species approved by the appropriate authority, within the limits of impacts by FPC, CALM and the public.	Prior to mining	Shire of Capel	Letter from the Shire of Capel.

Environmental Factor	Objective (Why)	No.	Action (What, How, Where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
Conservation Reserves	Secure the protection of the Tuart Forest National Park for the long-term.	28	The Managing Director of Cable Sands (WA) Pty Ltd will sign a legally binding document that the Company will never pursue mining in the Tuart Forest National Park.	Within 2 months of the Statement of Environmental Approval being issued.	-	Letter from proponent.
Community Consultation/ Involvement	To ensure that interested community groups are kept informed of the project and that the proponent benefits from the experience and skills of these groups.	29	The proponent will continue to meet at least twice a year with the Ludlow Working Party (assuming members are interested). The WP will continue as a forum for sharing information on the project to the wider community and receiving feedback. Specifically the LWP will be involved in ; ▪ Environmental Management and Monitoring Programme. ▪ Mining and Rehabilitation Plan ▪ Water Resources Management Plan ▪ Fauna Management Plan ▪ Fate of 56ha Wonnerup linkage	Ongoing until completion of mining.	-	Progress outcomes of the LWP reported in the Annual Environmental Report.

Appendix 5

Summary of Submissions and
Proponent's Response to Submissions

The attached CD ROM contains a copy of the Summary of Submission and the Proponent's Response to Submissions.