W. A. WILD LIFE AUTHORITY

ENEABBA INSPECTION. THURSDAY, SEPTEMBER 25, 1975.

Areas Under Construction:

	Name	Vesting	Date	Status	Purpose	Area (ha)
31030	-	W.A.W.L.A.	15.10.71	C	Cons.F.& F.	4946
27886	Rocky Springs	"	25.8.72	C	"	1245
10235	(Vacant Crown Land - recommended to be reserved in report prepared by W.D.Scott).					2000

Mineral claims and coal mining leases covering the area of the reserves were granted prior to the reserves being gazetted.

At previous meetings of the W.A.W.L.A. and Reserves Committee, it was decided to retain the reserves and to have them rehabilitated

The W.A.W.L.A. has been asked to consider, and make recommendations on, an Environmental Management Programme submitted by Allied Eneabba Pty. Ltd., and relating to mining in 31030. This programme is accompanied by a Statement of Environmental Impact of Heavy Mineral Sand Mining at Eneabba and Jurien Bay, prepared for 5 participating companies by W. D. Scott.

A copy of the Allied Eneabba Environmental Management Programme is attached.

Any W.A.W.L.A. recommendations may, at a later date, also relate to 27886 (Ilmenite Pty. Ltd.) on 10235 (Western Titanium).

Brief description of the area and the mining proposal.

Geology:

The reserves fall within the topographic unit referred to as the Slopeland - consisting of erosional debris from the lateritic plateau and wind deposited sand. The plateau escarpment probably represents a relict coastline of the late Tertiary. To the West the Slopeland adjoins the more recent coastal plain sedements (Bassendean Sand). The heavy minerals have probably been derived from the gneissic precambrian shield rocks, and have been sorted and deposited by wave action.

The area to be mined in 31030 consists of deep yellow sands with a sand + lateritic gravel upper horizon in a gently undulating dune sequence. Immediately East of the mine area is a lateritic slope rising up to the escarpment, containing small pockets of deeper sand.

Hydrology:

The area is drained by a series of Westward flowing streams, mainly draining into Lake Indoon, at about the Bassendean Sand - Spearwood dune system junction. A number of subterranean aquifers

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are presemt at depth, and Allied Eneabba is presently exploiting water at about 500 m depth.

Flora:

The vegetation is predominantly a heath-tree heath complex, and part of the Northern Sandplain flora. This flora, adapted to low nutrient conditions and poor water availability is extremely diverse and variable, changing markedly both from East to West and from North to South. These heaths are reknown for their spectactular and diverse wildflowers. The flora is extensively exploited for honey production (The Beekeepers Reserve lies to the West of Eneabba, near the Coast.).

A list of plant species for the whole sandmining area has been prepared by consultants to W.D. Scott (Cala & Blackwell). It appears that no survey has been specifically made of these reserves. Several unusual species occur in the general area and *Calytrix superba* is known only from near Eneabba.

Mining on 31030 will be largely restricted to swale areas supporting low-heath, but will encroach in places on dune crests which support a heath with emergent *Xylomelum angustifolium* (Woody Pear), *Nuytsia floribunda* (Christmas Tree) and occasional *Eucalyptus todtiana* (Prickly Bark). The lateritic slopes support a heath with tall *Xanthorrhoea* sp. and occasional *Eucalyptus wandoo*.

Fauna:

The Museum is in the process of compiling data from a survey in the Mt. Leseur - Cockleshell Gully area - which includes areas similar to that found in these reserves. The list for the whole survey area includes approx. 25 species of reptiles, 78 species of birds and 14 species of mammals (including an unusual Sminthopsis).

Mining:

The zone of mineralization is from about 0.2 m to about 6 m below the surface. Mining is by an open pit method whereby, following removal of about 15 cm of topsoil, all the soil in the mineralized zone is collected in an elevating scraper and carried to the primary concentration plant. Treatment involves a wet gravity separation using water and some floculants. Initial tailings will be pumped into tailings dams to settle and consolidate and some water will be recycled. After about 6 months of operations, new tailings will be diverted to a section of the pit to begin backfilling. The mining - filling will then be an essentially continuous operation involving excavation of new areas and filling in of old pits. As each old pit is refilled the surface can be recontoured and rehabitated.

The mining activity involves complete disturbance of a certain area of vegetation, including that for the tailings dams, service roads, railway line, treatment plant, offices, gravel pits, etc. Additional lesser disturbances result from movement of survey vehicles, construction of power lines, disposal of treatment effluent, hydrologic changes associated with the tailings disposal and general human activities.

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Other Land Use:

Much of the land surrounding the reserves is farm land, though as yet only a small proportion has actually been cleared. The soils are generally of low fertility - necessitating heavy applications of fertilizers for farming.

The natural gas pipeline runs through both 31030 and 10235. A strip of land about 8 m wide has been disturbed in the process of laying the pipeline.

The Coastal Highway runs through both reserves and 10235 and represents a significant disturbance to the reserves. Associated with the road are a number of sand and gravel pits.

An underground PMG cable runs approx. parallel to the road, about 10 m to the East.

At least one coal mining lease covers parts of the reserves. This coal is a source of montan wax. There are no indications of intention to mine at present.

Environmental Management Proposal.

The company (Allied Eneabba) has submitted two alternative proposals for rehabilitating the reserve area:

1. To restore to native vegetation (WAIT-AID)

2. To restore to farmland (Muresk College).

In view of the previous decisions of the W.A.W.L.A., the view of the Conservation through Reserves Committee that these reserves constitute an important part of the conservation reserve system, and the fact that alienation of any part of the reserve will detract from the conservation value of the remainder (through invasion of exotics, degeneration of heath vegetation through fertilization etc.), Proposal 1 seems the more acceptable.

The Environmental Management Proposal does not provide any details on techniques for rehabilitation to native vegetation. The proposal involves:

1. Survey of flora - vegetation map, species list search for rare species, study of soil profiles and root profiles (WAIT AID).

   (Allied Eneabba have also proposed establishment of nursery facilities for rare and difficult to propogate species).

2. Restoration of soil surface - removal of vegetation and top 15 cm of soil with scraper, storage of topsoil (and vegetation), and return of top soil after mining (about 6 months storage), as suggested by Blackwell & Cala. This will be carried out by the Company using existing equipment.

3. Rehabilitation of native vegetation. Dr. B. Lamont (WAIT AID) has proposed a series of regeneration experiments using various fertilizer treatments etc. No specific techniques have been described.

   Blackwell & Cala has made general comments about the importance of seed storage in the soil, and thus the importance of the topsoil in relation to any rehabilitation

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programme. Again no specific techniques have been described.

It seems that the two consulting firms have not yet drawn on the extensive experience and expertise available in Eastern Australia. In particular, several studies of rehabilitation of native vegetation in S.E. Queensland and N. N.S.W. have been completed. These studies relate to rehabilitation of similar (but more fragile) areas of high dune/heath complex.

From results of these studies, and general heath studies in S. Australia, it seems that environmental factors of most ecological importance are:

1. Soil nutrient status

2. Soil water availability.

Any rehabilitation technique which eventually returns these to pre-mining levels has a good chance of providing regeneration of the original native species.

Another important result of Stradbroke Island rehabilitation is that there is little seed stored in the soil - and the important source of seed for recolonization is surrounding native vegetation. Lignotubers corms, etc. are generally in the upper 15 cm of soil, but there is a tendency for them to compost when stockpiled. Top soil should be removed from one area and immediately spread in an adjacent similar area.

Two strategies have been devised for rehabilitation of fragile coastal dunes in Qld.- N.S.W:

1. Involving fertilizing and replanting with cereal grasses to stabilize the dunes, allowing native species to recolonize.

2. Involving covering the sand surface with brushmatting (harvested from an area about to be mined), using no fertilizers, and allowing species to recolonize naturally.

The first strategy has been used extensively and with some degree of success. It may not be directly applicable to the Eneabba situation as it involves use of fertilizer, which may not leach as readily in these soils. The second strategy has been suggested but never tried.

It seems then that the consultants' proposals for rehabilitation bare little relation to programmes and experiences elsewhere.

Standards and monitoring:

No standards for rehabilitation have yet been laid down. If bonds are to be demanded from the mining companies it is reasonable to outline standards before the mining programme begins. However, it is not practical to set standards in terms of number of plants regenerating or percentage of vegetation cover. The best approach would be to insist on the use of certain techniques for rehabilitation (e.g. best available technology).

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Responsibility for monitoring of rehabilitation apparently lies with the Department of Mines, which granted the mining tenements. This is an unsatisfactory situation as Mines Department personnel would have no expertise. The Conservation through Reserves Committee has recommended that the W.A.W.L.A. be given financial assistance to provide for monitoring and management studies in the reserves.

Costs:

Responsibility for the regeneration rests with the mining companies. Some cost estimates have been prepared:

Rehabilitation to Agricultural land	$ 50 - 70 per ha.
Rehabilitation to Native vegetation	$500 - 1000 per ha.

In view of the lack of any definite rehabilitation proposal (for Native Vegetation) these estimates must be considered guesses only. The two strategies proposed above could be more realistically costed at rates much lower than these.

Other Constraints on Mining Companies:

limiting area of disturbance
- roads, + off road travel (+ speed limits), gravel pits & sand pits

shooting

fire control

rubbish, sewerage disposal

wildflower picking

notification of changes of plan.

A. HOPKINS
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September 23, 1975.