MINERAL SANDS MINING

AND

RUBBISH TIP RELOCATION

AT

YARLOOP

CABLE SANDS (WA) PTY LTD

APRIL 2000

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 PURPOSE OF THIS ENVIRONMENTAL REVIEW DOCUMENT

This environmental review document describes a proposal to mine, manage and rehabilitate areas of Reserve 31900 about 2km south east of Yarloop.

A brief description of the proposal was referred to the Environmental Protection Authority (EPA) under Section 38 of the Environmental Protection Act, 1986. This was forwarded to the EPA in January 2000.

Following discussions with the EPA and Department of Environmental Protection (DEP), this environmental review document has been prepared to provide detailed information about the key environmental issues associated with the proposed mining operation.

Based on information in this document and other existing information, the EPA will determine the level of assessment for the proposal. Options available to the EPA include

- Advice that the project is unlikely to be environmentally acceptable (PUEA);
- formal assessment at Consultative Environmental Review (CER), Public Environmental Review (PER) or Environmental Review and Management Programme (ERMP) level; and
- assessment at Environmental Protection Statement (EPS) level

The decision on level of assessment can be appealed by members of the public.

Following determination that the EPA will assess the proposal, the EPA prepares a bulletin reporting on and making recommendations about the proposal. This bulletin considers all information and submissions available for the proposal. The release of the EPA bulletin initiates a two week appeal period against the report and recommendations.

Providing appeals determination does not prevent the proposal proceeding, the Minister will consult with decision making authorities (DMAs) and may issue a statement outlining conditions under which the proposal may proceed.

1.2 PROPONENT

The proponent is Cable Sands (WA) Pty Ltd, the oldest mineral sands mining company in Western Australia. Cable Sands commenced mining in 1956 at Koombana Bay, Bunbury and has continued through a series of mineral deposits at Busselton, Capel, Waroona, Wonnerup and Minninup. Currently operating minesites are located at Benger, Yarloop and Jangardup.

Cable Sands has considerable experience in the mining of mineral sands in south-western WA and has demonstrated a commitment to sound environmental management over a long period. Cable Sands was the first mineral sands company in the world to develop an Environmental Management System (EMS) certified to ISO 14001 (see Section 3.1). Cable Sands has extensive experience managing issues relating to vegetation, dust, noise, radiation, groundwater and transport.

1.3 PREVIOUS MINING PROPOSALS AT YARLOOP

Two previous mining proposals have dealt with Reserve 31900. In 1996 a CER was prepared titled "Yarloop Titanium Minerals Mine"(Cable Sands, 1996). Assessment of this proposal under the Environmental Protection Act, 1986 allowed for operations to proceed on cleared land at Yarloop but for proposed mining in Reserve 31900 not to proceed. EPA Bulletin 838 relates to the assessment of this proposal (EPA, 1996). Mining on the cleared land commenced in 1997 and is currently scheduled to continue until 2001.

In 1998 a PER was prepared relating to mining and rehabilitation of Reserve 31900 (Cable Sands, 1998). In addition to the proposed mining area, this proposal addressed issues of management of non-mined areas of Reserve 31900, of adjoining reserves and securing of an area of freehold land for inclusion in the conservation estate. EPA Bulletin 944 (EPA, 1999) recommended that the project could be managed in a manner that did not compromise EPA objectives. Approval for the project was not given, based on determination of appeals against the EPA Bulletin.

1.4 COMMUNITY CONSULTATION

The requirement for community consultation has been recognised by Cable Sands. Interest in the mining proposals at Yarloop has been expressed by the local community as well as by groups and individuals with an interest in the conservation values of vegetation in the area.

All appellants against EPA Bulletin 944 from the PER assessment have been advised that a new proposal has been prepared. Neighbouring residents have also been contacted. A media release has been prepared for the local media to coincide with the release of this document. All employees have also been advised of the new proposal.

Cable Sands organised a site inspection of Reserve 31900 on March 7th, 2000. Appellants to EPA Bulletin 944 were invited to attend as well as members of the EPA, DEP, WRC and the Shire of Harvey. Other local residents were also in attendance. The site inspection involved a brief description of the proposal and a walk along the eastern boundary of the proposed mining area.

The site inspection resulted in a constructive discussion of relevant environmental issues. Issues raised during discussions on site included:- the clearing of any native vegetation; groundwater abstraction impacts on neighbouring users; rubbish relocation and potential for groundwater contamination; and adequacy of the fauna surveys undertaken. The issues raised were consistent with those raised through the PER approval. All of the relevant environmental factors are addressed appropriately in this document.

As part of the ongoing community consultation at the existing Yarloop mine, Cable Sands is due to hold an open day in April or May 2000, encouraging members of the public to visit the site. Discussion of issues relating to mining in Reserve 31900 will be included as part of this process.

2. DESCRIPTION OF THE PROPOSAL

Reserve 31900 is located south east of Yarloop (Fig 1). The reserve is currently vested with the Shire of Harvey for the purpose of rubbish disposal and sand extraction.

2.1 OBJECTIVES OF THE PROPOSAL

The primary objectives of the proposal to mine are to:

- extract 114,000 tonnes of heavy mineral concentrate (HMC)
- minimise the area of native vegetation cleared whilst retaining a viable operation
- rehabilitate the mined area to native vegetation
- protect native vegetation on the eastern side of Reserve 31900 from existing and future threatening processes
- decommission the Yarloop rubbish tip
- rehabilitate the relocated rubbish area and adjoining degraded areas
- improve management of the reserve and adjoining reserves
- provide freehold land with conservation value to the conservation estate

Figure 2 shows designated areas within Reserve 31900. The proposed mining will be restricted to an orebody covering 5.5 ha, corresponding to Areas 3 and 4 in Figure 2. Additional ore to the east of this will not be mined, so that the native vegetation there will remain intact. The 5.5 ha mining area includes approximately 2.8ha that has been disturbed by the rubbish tip and sand extraction activities (area 3). The remaining 2.7 ha is native vegetation immediately east of this (area 4) and has varying degrees of impact from the rubbish tip.

The requirement to clear the area of native vegetation (Area 4) has been determined by the following key operating restrictions: -

- there is a minimum width (approximately 75m at basement) below which there are operational and safety implications for mining.
- The width along the southern boundary of Reserve 31900 allows for the proposed mining to merge with the mining on adjacent private property, facilitating a better landform restoration for both.
- Clearing of the 2.7ha of native vegetation will allow for the topsoil and plant material to be used to rehabilitate the entire mining area, the majority of which is currently badly degraded.

Cable Sands has reviewed options of minimising clearing in Reserve 31900. These have included increasing environmental benefits provided with the project and a range of modifications to the orebody outline. What is presented in this new proposal is a scenario that allows for mining of an economic orebody whilst retaining the majority of native vegetation that was previously proposed to be cleared.

The option of mining Area 3 without Area 4 has been considered and rejected based on:- the reduction in mineral would not justify the capital outlay for relocating the wet plant; the additional costs involved with moving unmineralised ground are prohibitive; and, the outcome of mining would not include the significant environmental benefits offerred in this proposal. Specifically, the reduction in topsoil would result in the tip area and adjoining degraded areas not being rehabilitated and the landform of the mined area not being appropriately compatible with adjoining unmined areas.

Table 1 provides a description of the various areas within Reserve 31900 and summarises proposed management.

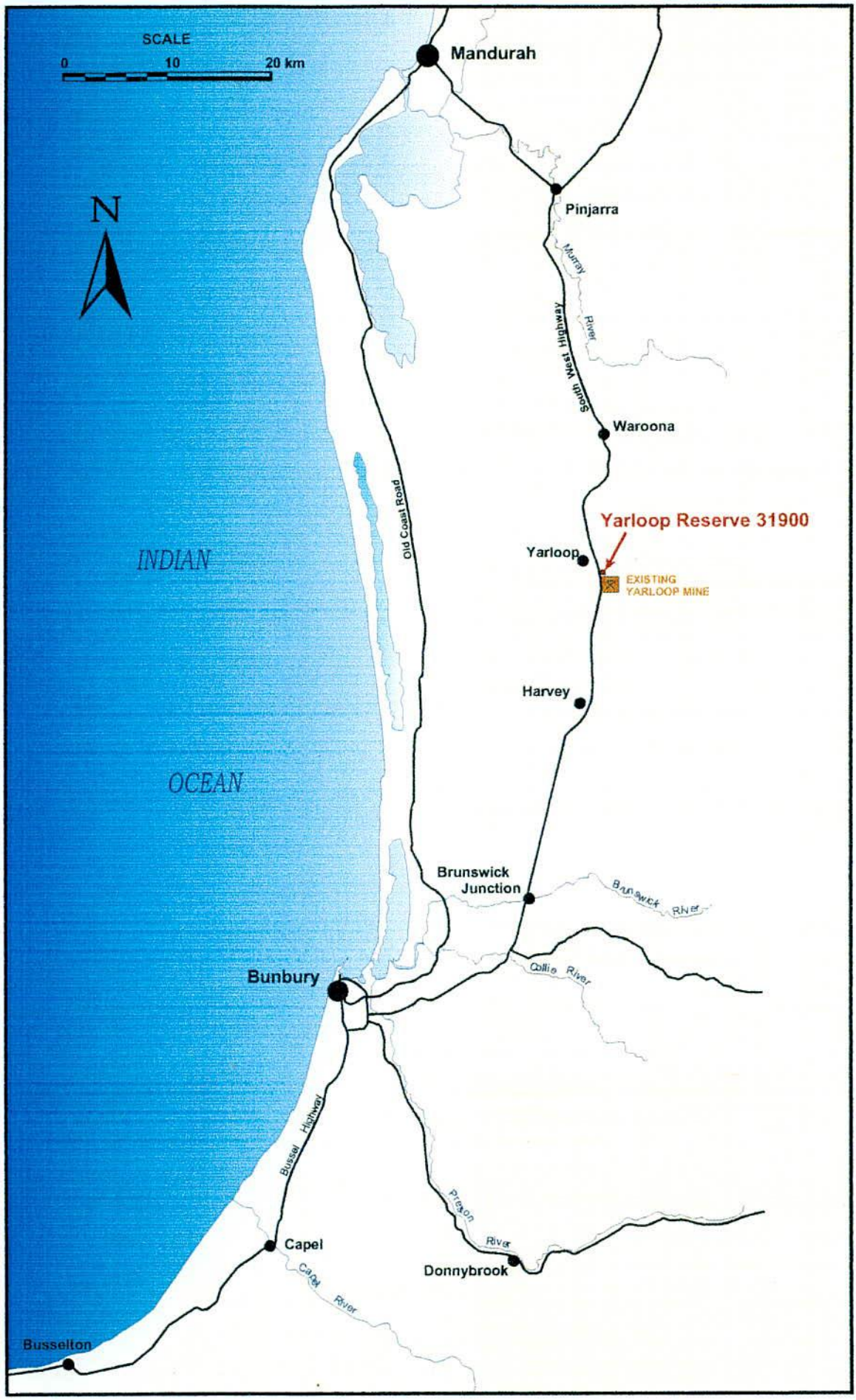


Figure 1 Location of Yarloop Reserve 31900

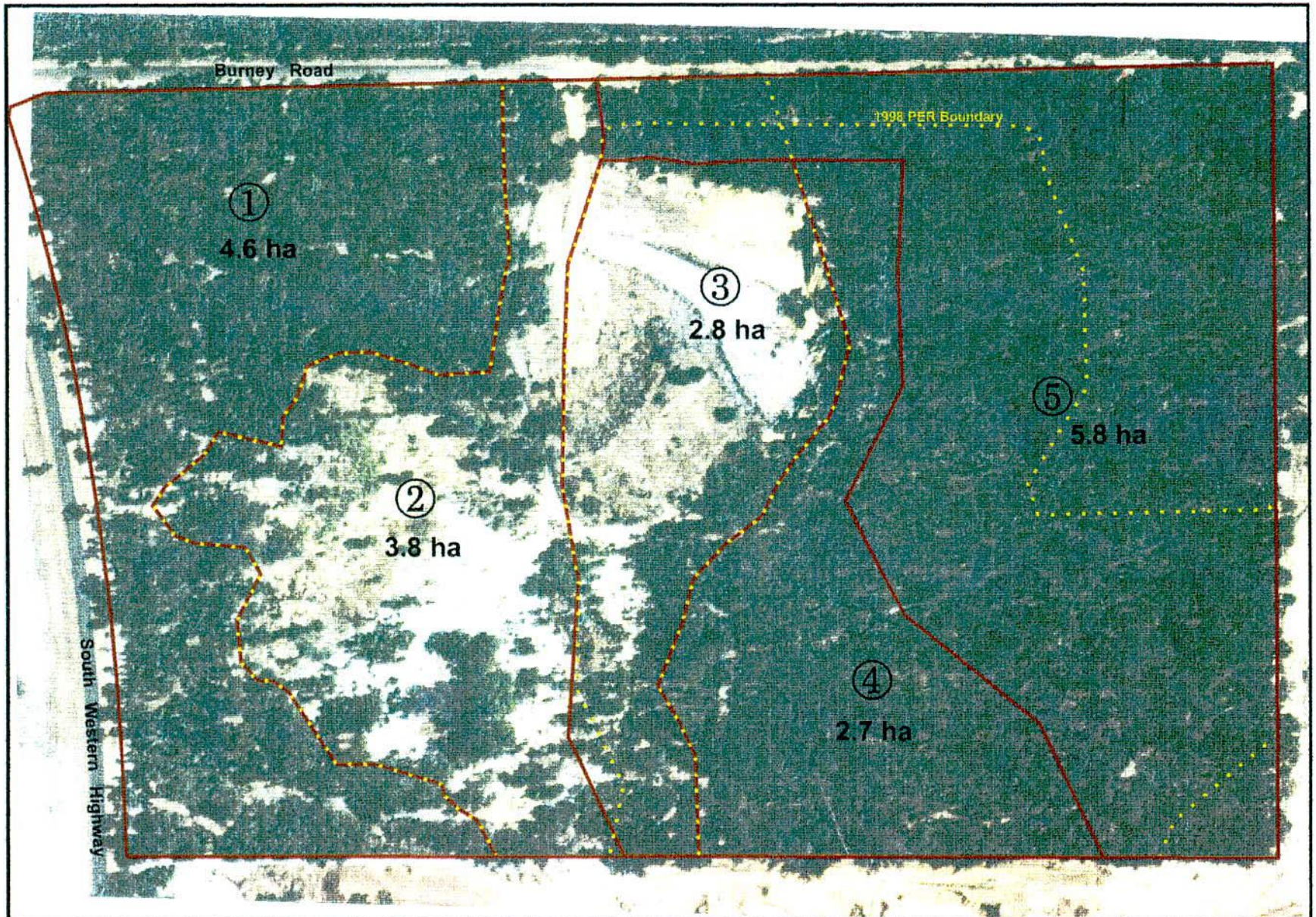


Figure 2 Areas within Reserve 31900
(see Table 1 for description of area)

Table 1 : Summary of Management of Areas within Reserve 31900

	AREA (ha)	CURRENT SITUATION	MANAGEMENT AND OUTCOME
Whole reserve	19.7	Mixture of: - * Native vegetation with varying degrees of disturbance; * Degraded area used for sand extraction; * Rubbish tip.	Clearing and rehabilitation of orebody area Protection and management of identified conservation values Boundary fencing to reduce unauthorised access Fencing and rubbish removal from parts of adjoining Reserve 31901 Fencing and understorey development of parts of adjoining Loc 816 Retention and tidy up of buffer and fauna corridor on northern boundary **Outcome:** Improvement in long term viability as conservation reserve
Area 1	4.6	Forrestfield Vegetation (continuum of Type 3b and Type 20b floristic communities) in variable condition. Areas of significant weed infestation. Currently used for illegal dumping Numerous tracks through area	No mining in this area Fencing to reduce access from South West Highway Weed control Tidy up of windblown litter and dumped rubbish **Outcome:** Improved situation with reduction in threatening processes
Area 2	3.8	Area degraded by sand extraction and the rubbish tip Limited native vegetation. Extensive weed areas Extensive areas of bare sand	No mining in this area Rubbish to be relocated into prepared section and covered with clay capping. Landform re-established at approximately pre-disturbance levels. Shallow rooted native species will be established on relocated rubbish area to stabilise the soil and complement conservation values of other reserve areas **Outcome:** Improved situation with reduction in threatening processes
Area 3	2.8	Area degraded by sand extraction and the rubbish tip area. Limited native vegetation. Extensive weed areas Extensive bare areas	This area will be mined. Landform will be re-established. **Outcome:** Improved situation with reduction in threatening processes High quality rehabilitation complementing conservation values of Area 5
Area 4	2.7	Native vegetation Forrestfield Complex (continuum of Type 3b and 20b floristic communities). Quality variable, improving to the east. Windblown rubbish, especially in the western parts	This area will be mined. Landform will be re-established. **Outcome:** High quality rehabilitation complementing conservation values of Area 5
Area 5	5.8	Core conservation area Good quality native vegetation Forrestfield complex (Continuum of Type 3b and 20b floristic communities) Windblown litter in northern area	No mining in this area Improved security by reduction of threatening processes Removal of litter along northern boundary **Outcome:** Viable conservation area in the long term with appropriate management

2.2 MINING AND PRIMARY SEPARATION OPERATIONS

The orebody area (Areas 3 and 4 in Fig 2) will be dry mined using similar equipment and techniques to those currently in use at the Yarloop mine. The steps in this process of extraction of heavy mineral sands are described briefly below.

1. Following seed collection, areas will be cleared of vegetation for mining. Clearing of vegetation will be restricted to the mining area and appropriate use made of any timber harvested. Some vegetation will be used for block translocation. Section 3.5 provides more detail of preparation prior to topsoil stripping.
2. Topsoil will be stripped, where practicable, in two stages using scrapers. The top 0-15 cm will be removed first along with the understorey vegetation and stored separately. The next 15cm will also be removed for separate storage. Care will be taken to ensure that topsoil from the reserve is stored separately from topsoil from adjacent farmland areas to prevent weed infestation. The storage of topsoil will be kept to a practical minimum and used as required in the rehabilitation of mined areas to re-establish vegetation. Topsoil will be managed to avoid the spread of weeds.
3. Overburden, where it is of sufficient depth to be handled independently of the ore, is removed by earthmoving equipment, eg front end loaders, bulldozers and scrapers. The overburden will be used in the construction of slime dams, stockpiled for later replacement or will be used to fill areas already mined.
4. The ore is mined using similar earthmoving equipment and fed into a rotary trommel with 50 mm and 4.5 mm screens to separate large rocks, roots and gravel. The fine fraction is then pumped as a slurry to the Primary Separation Plant (located outside the reserve) where HMC is separated by conventional wet gravity methods. HMC will be dewatered and stockpiled at the mine site prior to being trucked to the Cable Sand's Secondary Separation Plant at North Shore, Bunbury. The tailings separated in the Primary Separation plant are returned to the mined areas.
5. Clay is removed using a thickener tank and the clean water is recycled as far as practicable. The resultant thickened clayey slurry is allowed to dry in one of a number of slimes dams constructed for this purpose on cleared land outside the reserve.
6. The mined area is recontoured to blend in with the existing landscape using the dried clay, overburden and tailing sand, including a top layer of 2m of overburden. Topsoil is then replaced and vegetation re-established to a standard suitable for the reserve.

Mining Schedule

Mine site construction will commence as soon as possible after appropriate approvals are received to allow mining. Mining will be integrated with the current operations at Yarloop and will continue in the reserve for approximately 11 months at current production rates. The mining will commence in the northern end of the reserve and progress southwards.

Backfilling of mined areas will commence before all mining has been completed so that some areas will be filled prior to mining finishing. Mined areas will be recontoured and rehabilitation established over the subsequent growing seasons.

2.3 THIS PROPOSAL IN RELATION TO PREVIOUS PROPOSALS

Table 2 summarises the relationship between the PER proposal (Cable Sands 1998; EPA, 1999) and the new proposal. The new proposal is clearly different from the PER proposal under the Environmental Protection Act, 1986 which defines a proposal as ".. project, plan, programme, policy, operation, undertaking or development or change in land use or amendment of any of the foregoing".

The major difference is a significant reduction in the area of native vegetation proposed to be cleared. This allows for the protection of a core conservation area on the eastern side of Reserve 31900. There is also additional management of adjoining reserve areas. These differences are detailed below.

The 1998 PER proposal involved clearing of 6.1 ha of native vegetation. The current proposal involves clearing of 2.7 ha of native vegetation, a reduction of 3.4 ha or more than half of the area originally proposed for clearance. The area that now will not be cleared is good quality Forrestfield Complex vegetation.

The retention of the additional native vegetation allows for the designation of a core conservation area of 5.8ha on the eastern side of Reserve 31900. This area will be managed, in conjunction with adjoining areas, to preserve the conservation values identified. This management will include:

- fencing to prevent unauthorised access
- removal of weeds and rubbish
- fencing and understorey development in the adjacent area of Location 826
- retention of a vegetated corridor along Burney Rd to connect with the western side of the reserve
- high standard rehabilitation of the mined area immediately west of the core conservation area.

The criteria for vegetation composition in the degraded areas will be less restrictive than was proposed in the PER. This is a direct consequence of the significant reduction in the area to be cleared. With limited resources of topsoil and plant material, the focus of rehabilitation will be on establishing comparable species composition in the mined area. In the remaining areas, vegetation diversity will be reduced and will focus on a smaller range of local species that are most likely to survive in this area. However, this will still be a considerable improvement on the bare and weed infested areas that currently dominate much of the reserve.

Vegetated areas of Reserve 31900 will have windblown rubbish removed. Vegetated areas along the section of Reserve 31901 facing Burney Rd will have windblown rubbish and car bodies removed and disposed of appropriately.

Table 2: Comparison of 1998 PER proposal and Current proposal

Characteristic	1998 PER Proposal (as modified through assessment process)	Current Proposal
1. MINING		
Orebody (tonnes HMC)	178,000	114,000
Life of Project (years)	1.4	0.9
Area of native vegetation cleared	6.1 ha Forrestfield Complex (continuum of Type 3b and 20b Floristic Communities)	2.7ha Forrestfield Complex (continuum of Type 3b and 20b Floristic Communities)
Typical Mining Rate (tonnes HMC pa)	126,000	126,000
Water supply	Borefield, Waterous Formation Creek and SWIC	Borefield, Waterous Formation Creek and SWIC
2. ENVIRONMENTAL BENEFITS		
Land swap	Donation of Bunnings land (including improved management). This land contains 9.1ha of Forrestfield Complex vegetation (Type 20b Floristic Community).	Commitment remains
Rubbish tip	Decommissioned including stabilisation with native species	Commitment remains
Degraded areas in Res. 31900	Rehabilitated to good quality native vegetation	Stabilised and native species established. Reduction in area to be cleared reduces the amount of topsoil and vegetative material available for improving degraded areas.
Res. 31900 boundaries	Fenced to prevent unauthorised access and illegal dumping	Commitment remains
Res. 31900 boundaries	Fauna corridor retained along northern boundary	Commitment remains
Windblown litter	Not addressed	Vegetated areas of Res. 31900 will have rubbish removed
Adjoining reserves (23307 and 31901)	Fenced to restrict unauthorised access	Commitment remains
Reserve 31901 rubbish	Not addressed	Reserve 31901 will have litter and car bodies removed from southern area
Location 816 (Cable Sands land east of Res. 31900)	Overstorey retained, fenced and understorey regrowth encouraged to act as buffer for Res. 31900	Commitment remains
Core conservation area	Not addressed	Core conservation area (Area 5 from Fig 2) designated for long term management of conservation values by CALM if vesting is transferred from Shire of Harvey
Area of clearing	6.1 ha (or 31.0% of Reserve 31900)	2.7 ha (or 13.7% of Reserve 31900)
Native vegetation retained	6.8 ha (53% of native veg, 35% of reserve)	10.4 ha (80% of native veg, 53 % of reserve)

3. ENVIRONMENTAL FACTORS

The relevant environmental factors discussed below have been identified through the previous assessments, through discussions with the DEP and through the appeals received against EPA Bulletin 944. Where appropriate, reference is made to previous documents where these issues are discussed in more detail.

3.1 ENVIRONMENTAL MANAGEMENT

Cable Sands has demonstrated a commitment to sound environmental management over a long period. The company has successfully rehabilitated more than ten mine sites since commencing operations.

Cable Sand's Environmental Management System has been modified to meet the requirements of ISO 14001. Certification to that standard was confirmed in July 1997 making Cable Sands the first titanium minerals company in the world and the first Australian mining company to have mining operations certified to that standard. Certification remains current for all Cable Sands operations.

Cable Sands Pty Ltd has developed an environmental management and monitoring program which addresses relevant environmental issues for the Yarloop Mine. This program will be updated to cover all aspects of mining in Reserve 31900.

The environmental management and monitoring program includes details of management measures for:

dust and noise control;
clearing and rehabilitation
weeds and vermin control; and
rehabilitation and decommissioning.

Commitments

Cable Sands will update the Yarloop Environmental Management and Monitoring Programme (EMMP) to include environmental aspects of Reserve 31900.

Cable Sands will report environmental performance to relevant government departments on an annual basis

3.2 VEGETATION

3.2.1 EXISTING ENVIRONMENT

The vegetation of Reserve 31900 has been assessed on a number of occasions in recent years (eg Gibson et. al., 1994; Keighery, 1995; Environmental Survey and Management, 1996 and Mattiske Consulting, 1997). This work has highlighted the conservation values of vegetation in the area.

The vegetation in the reserves at Yarloop (Reserves 31900, 31901, 23307, 16681 and 3672) has been mapped as Forrestfield Vegetation complex (Heddle et al, 1980). This complex is primarily located on the eastern side of the Swan Coastal Plain and it is thought that between 92 – 98% of the original distribution has been cleared.

Gibson et al (1994) identified two floristic community types in the Yarloop reserves: - Type 3b (jarrah – marri woodlands on sandy clay soils) and Type 20b (eastern Banksia attenuata and/or jarrah woodlands). These were mapped by Keighery (1995), using aerial photography.

Survey work undertaken by Mattiske Consulting (1997) found a continuum of Type 3b and 20b floristic community types present in Reserve 31900. Dominant species, used to describe the floristic community types, occur across the Reserve 31900 and it was difficult to separate the different types on species presence/absence or species density.

The gradual change in floristic components reflects the gradual change in soil from east to west.

The areas of native vegetation in the Yarloop reserves are summarised in Table 3. The total area of native vegetation is approximately 76 ha. Fig 3 indicates locations of the various reserves.

None of the reserves are currently managed for protection of the identified conservation values. Reserves 23307 and 31901are likely to be vested with the NPNCA in the near future. Reserve 3672 is managed by CALM. Location 5322 is freehold land that is proposed for donation to the conservation estate by Water Corporation (Welker Environmental Consultancy, 1999). Reserve 31900 has been recommended for inclusion in the conservation estate but requires substantial work to remove threatening processes.

Given the current situation, the total area that can reasonably be expected to be managed for conservation in the future is 36.9 ha (Reserves 3672, 23307 and 31901 and Location 5322). The best case scenario for the conservation estate without mining would be inclusion of the vegetated areas of Reserve 31900 (threatening processes still present) to give an area of 50ha.

Table 3 Summary of Vegetated land at Yarloop

Location	Total area (ha)	Vegetated area (ha)	Comments
Reserves			
31900	19.7	12.8	Rubbish tip and degraded area in centre of reserve. Vegetation quality variable with some heavily disturbed. Vegetation in good condition to east of disturbed area
31901	19.1	16.1	Vegetation in good condition except for Sand pit, access road and gravel area
23307	13.0	12.5	Vegetation in good condition. 0.5 ha cleared in 1996 for parking bay
16681	21.4	11.5	Strip down centre of reserve is currently used as a rifle range. Remainder in good condition
3672	3.4	3.4	Vegetation in good condition
Sub total	**76.6**	**56.3**	
Private Property			
816	72.3	15	Vegetation facing Johnstone Rd and South West Highway in good condition. Some evidence of stock use. Variety of landuse for remaining 57.3 ha. 9.1 ha block to be purchased for conservation
5322	4.9	4.9	Vegetation in good condition. Land to be donated to the conservation estate as part of the Harvey Dam project
Sub total	**77.2**	**19.9**	
Total	**153.8**	**76.2**	

As part of the investigations into the vegetation in Reserve 31900, quantitative plot sampling was undertaken. Results of this work are presented in "Yarloop Reserve 31900 – Programme for Mining and Rehabilitation (Environmental Survey and Management, in prep).

Established tree densities of 320-450 stems/ha were measured with jarrah the dominant species. There is a high proportion of understorey species less than 50cm in height predominantly herbaceous perennials, prostrate or non-woody sub-shrubs and sedges. Medium to tall shrub species do not form a significant proportion of the vegetation.

The reserve has a relatively diverse flora, with approximately 110-120 species recorded.

No rare or priority listed species have been recorded in the reserve.

3.2.2 PROPOSED MANAGEMENT

The mining proposal recognises the conservation values of the 2.7 ha of vegetation to be cleared and compensates for this by improving the long term security of vegetation at Yarloop and by increasing the area of land to be managed for conservation. Specifically, the mining proposal will result in: -

- Establishment of a core conservation area in Reserve 31900 which protects 5.8 ha of the best vegetation in the reserve
- donation to the conservation estate of 9.1 ha of land (Loc 826) with native vegetation in good condition
- decommissioning of the rubbish tip area and establishment of native vegetation over the relocated rubbish site within Reserve 31900 thereby reducing the impact of this area on high conservation value native vegetation
- removal of invasive weeds from Reserve 31900
- rehabilitation of other degraded areas in reserve 31900 (ie sand extraction areas)
- fencing of Reserve 31900 boundaries to prevent unauthorised access impacting on vegetation
- clean-up of windblown and illegally dumped rubbish throughout Reserve 31900
- rehabilitation of mined areas of Reserve 31900
- fencing of Reserves 31901 and 23307 to prevent unauthorised access
- fencing and understorey establishment on Location 816 to the east of Reserve 31900 which will act as a buffer to the core conservation area

The donation of an area of Location 826 to the conservation estate is likely to be the first land at Yarloop available to be managed for conservation purposes. In addition to the reserves likely to change vesting (23307 and 31901) and donation of Location 5322, Location 826 will result in an area of 46.8 ha of land reasonably likely to be managed as part of the conservation estate. This is a significant increase on the 36.9 ha likely at present.

Rehabilitation after mining will result in approximately 5.5ha of high standard native vegetation and a further 3.8ha to native vegetation with reduced species diversity (Section 3.5 provides rehabilitation details). The improvement in overall condition of Reserve 31900 will increase the chances of future management to protect the conservation values identified. If this were the case the total area likely to be managed for conservation would increase from 46.8ha to 62.7ha (cf 50ha best case or 36.9 likely) if mining were not to proceed.

The end result of mining and rehabilitation will be Reserve 31900 in a suitable condition for management of identified conservation values; improved condition and management of Reserves 23307 and 31901; increased area of native vegetation in the conservation estate and an overall increase in the area of native vegetation.

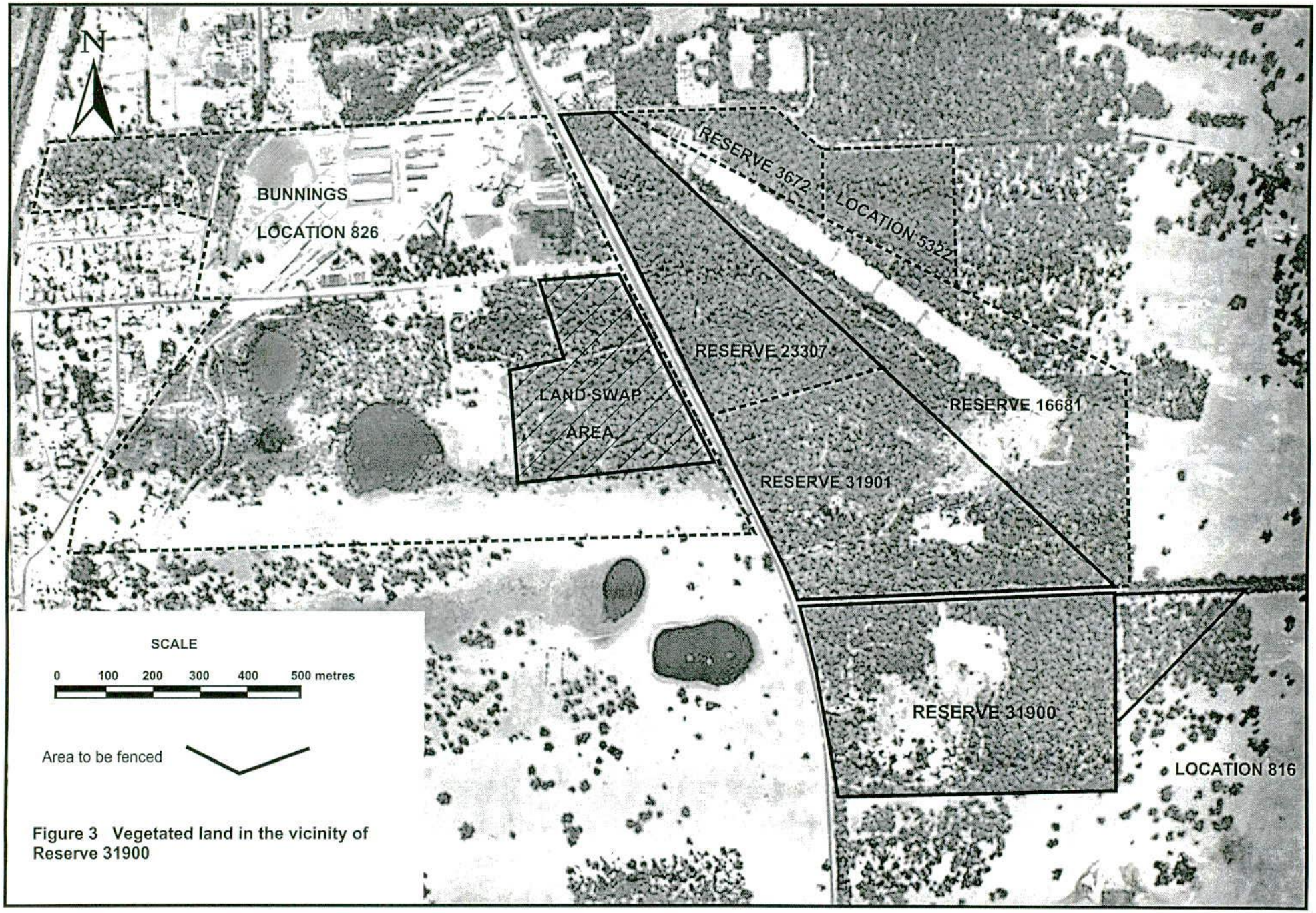


Figure 3 Vegetated land in the vicinity of Reserve 31900

Commitment

Cable Sands will acquire the 9.1ha part of Location 826 indicated in Figure 3 for incorporation in the conservation estate.

Cable Sands will fence areas of 23307 and 31901 to reduce unauthorised access.

Cable Sands will retain and fence the overstorey of Location 816 and facilitate growth of understorey species.

Cable Sands will maintain vegetation clearing to a practical minimum.

Cable Sands will preserve as much seed and plant material as possible.

Cable Sands will retain a strip of native vegetation along the northern boundary of Reserve 31900

3.3 BIODIVERSITY

3.3.1 EXISTING ENVIRONMENT

Biodiversity values in the area surrounding the proposed mining operation are largely confined to the group of reserves and adjoining property north of the current mining operation.

Current management of these reserves and private property has the potential to reduce biodiversity in the area in the long term. Threatening processes continue despite recognition of the conservation values of these areas.

Components of the biodiversity factor are discussed in other sections (vegetation 3.2 and fauna 3.9.4)

3.3.2 PROPOSED MANAGEMENT

Cable Sands proposal involves the clearing of 2.7ha of native vegetation. No rare or priority listed species are present in the area to be disturbed. No species in the area to be cleared is expected to be lost from the group of reserves at Yarloop. There will be a short-term loss in biodiversity in the cleared area but an increase in area managed for conservation and subsequent increase in protection of biodiversity.

The provision of the freehold land to the conservation estate and the improved management of Reserve 31900 and other reserves protects biodiversity values of the Yarloop area. The removal of threatening processes assists in this protection. Rehabilitation of a larger area than will be cleared by mining also provides for an increased area under native vegetation. The long term impact of mining is therefore likely to be no loss of biodiversity values.

3.4 RUBBISH TIP

3.4.1 EXISTING ENVIRONMENT

Reserve 31900 is currently vested with the Shire of Harvey as a rubbish tip and for sand extraction. The shire operated a tip on the reserve from the early 1970s until mid 1999. The closure of the tip was caused by the government direction away from unmanned and inappropriately located disposal sites. The Shire of Harvey took the decision to close the site rather than incur the additional costs and obligations associated with upgrading the tip to meet DEP licence conditions.

Rubbish disposal in Reserve 31900 occurred over an area of approximately 2.5 ha in the northern part of the reserve. Much of the rubbish has been burnt and/or buried during the period of active management. Some areas of rubbish still exist at the surface in this area and windblown rubbish extends over much of the reserve.

3.4.2 PROPOSED MANAGEMENT

Cable Sands is currently finalising a document "Management Plan for the Decommissioning of the Yarloop Rubbish Tip" in consultation with DEP, Shire of Harvey and Water and Rivers Commission (WRC). This plan outlines the management for rubbish material, its relocation to a clay based area to the south west and capping of the rubbish with clay. The relocation plan from this document is attached (Fig 4). Relocation should take less than one month.

Steps in the relocation process are given below:

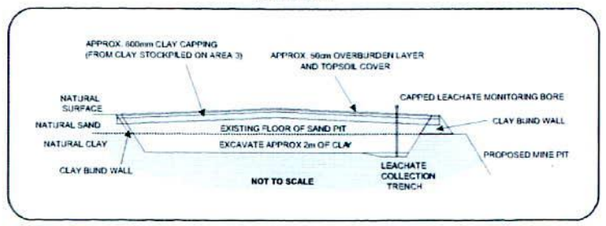
- remove and stockpile all material above the clay layer (sand, debris etc) on Area 2 in Fig 2
- excavate approximately 2m of clay from base of Area 2 where rubbish will be located and stockpile this clay to the south in Area 3 of Fig 2
- construct small clay bund around the excavated area to limit groundwater flow into the pit area
- relocate rubbish from Area 1 in Fig 2 (except Class III and IV wastes) into excavated pit and compact. Class III and IV wastes identified during the removal process will be transferred to a suitably licensed landfill facility
- cover compacted rubbish with a minimum of 300mm of stockpiled clay from Area 2 with 2m overlap over clay bund. This clay will be contoured to shed water away from the pit area
- cover clay with minimum 50cm overburden or other material so that pit shape blends with surrounding landscape
- cover with weed free topsoil from within the reserve as far as practical
- establish suitable native vegetation to blend with remainder of the reserve

Commitments

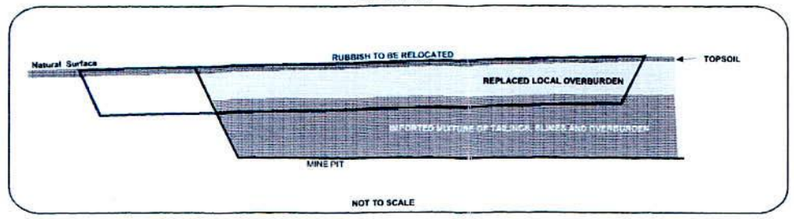
Cable Sands will prepare a management plan for decommissioning of the Yarloop rubbish tip.

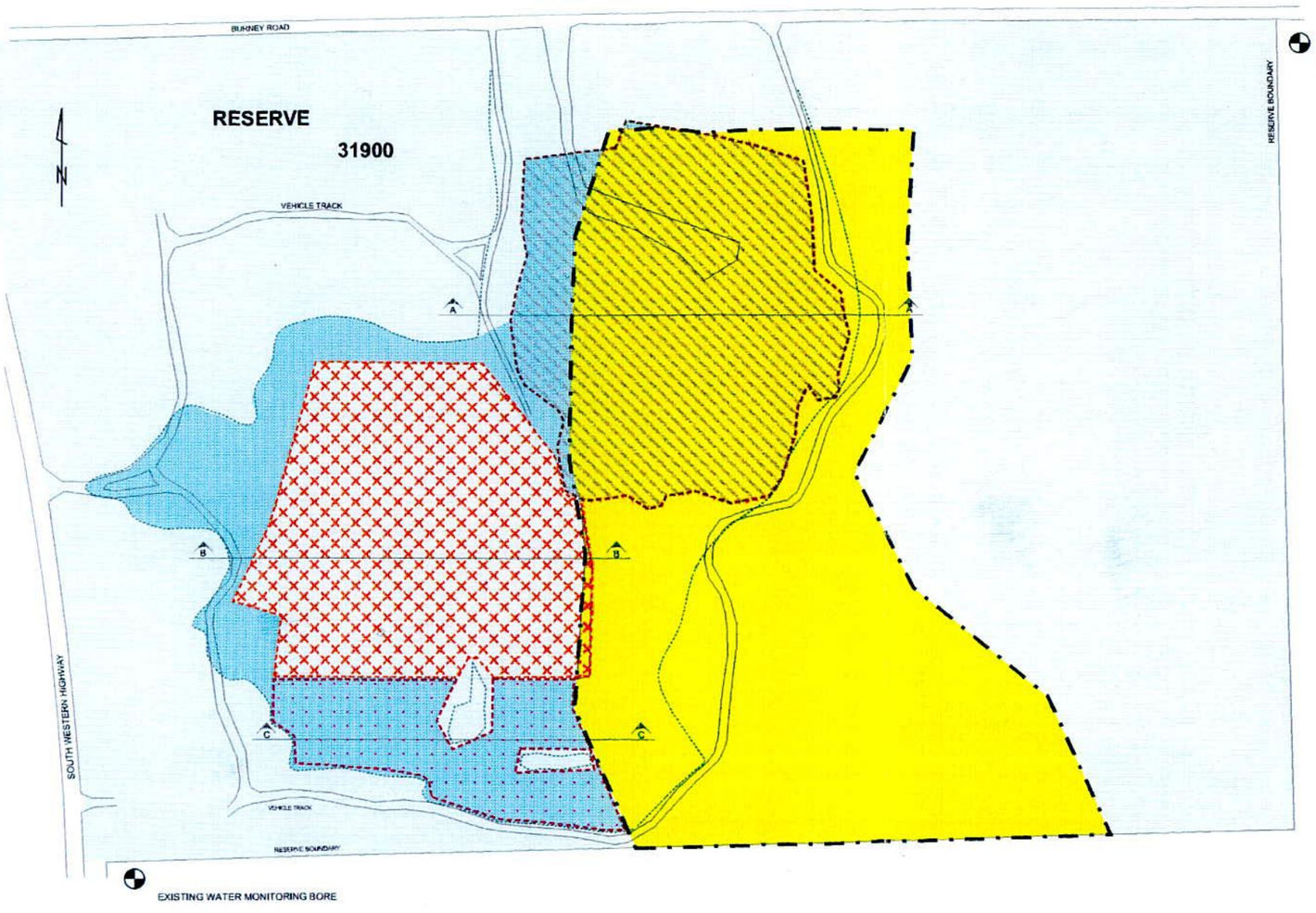
Cable Sands will implement the management plan for decommissioning of the Yarloop rubbish tip.

SECTION BB



SECTION AA





EXISTING WATER MONITORING BORE

Rehabilitation Area A: Revegetation of mined area, with slimes at a depth of 2m

Rehabilitation Area B: Revegetation with species suitable for shallow soil over clay

Rehabilitation Area C: Backfill and revegetation

Rehabilitation Area D: Weed control and supplementary management
(eg. Ripping and seeding of tracks where necessary)

Existing rubbish dump. See Section AA

Proposed site for relocated rubbish. See Section BB

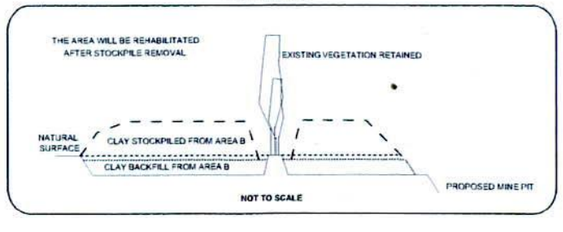
Temporary storage area for material removed from relocated rubbish area. See Section CC

Extent of proposed mining

Extent of existing excavation and vegetation clearance

Roads and tracks

SECTION CC



RUBBISH RELOCATION:

Remove & stockpile all material above the clay layer (sand, debris etc) in the proposed area

Excavate approximately 2m of clay from the base of this area where rubbish will be located, and stockpile to the south of this area.

Construct small clay bund around the excavated area to limit groundwater flow into the new rubbish storage area.

Relocate rubbish (except Class 3 & 4) into excavated pit, and compact.

Cover compacted rubbish with approximately 600mm of stockpiled clay with 2m overlap over clay bund. This clay will be contoured to shed water away from the pit area.

Cover clay with a minimum of 300mm of overburden or other material so that the pit shape blends with surrounding landscape.

Cover with weed free topsoil from within the reserve as far as practical.

Establish suitable native vegetation to blend with remainder of the reserve.

0m 50m 100m
SCALE

Figure 4 Decommissioning Plan for the Rubbish Tip

3.5 REHABILITATION

3.5.1 PROPOSED MANAGEMENT

Rehabilitation objectives for mining in Reserve 31900 include: -

- restoration of mined areas to post mining landform, profiles and topography consistent with the surrounding terrain
- restoration of the relocated rubbish area with a landform that will achieve appropriate drainage and landscape integration
- development of stable non-eroding landform surfaces in all areas using local native vegetation as groundcover
- revegetation of mined areas that will focus on re-instating existing vegetation assemblages
- use a wide range of techniques to re-establish as broad a range of species as possible
- remedial works in vegetated areas to enhance conservation values where weeds and previous landuse has compromised these values

Rehabilitation success is strongly influenced by clearing and materials management prior to mining. The 2.7 ha of native vegetation to be cleared provides important resources that will be managed to maximise rehabilitation outcomes.

Seed will be harvested from the area to be mined prior to clearing. This will be supplemented by collection from adjacent vegetated areas, under permit. Seed will be handled and stored appropriately. Viability and germination testing will be undertaken on seed samples to determine which species require special treatment. Treatment prescriptions include scarification, soaking, heating and application of smoke or smoke water.

Following removal of commercial timber, the remaining timber will be removed or retained as fauna habitat.

Block translocation will be employed for approximately 20% of the area. This technique involves using a front-end loader to remove 40cm deep blocks of intact soil and vegetation. The blocks are then stored in a suitable location until they can be returned to the mined area. The technique maximises regeneration from substrate roots, bulbs and corms as well as from seed retained on the block surface or in block vegetation.

As far as practical, brush harvesting will be undertaken to act as a mulch and supplementary seed source on rehabilitated areas.

Topsoil will be stripped in two stages. The first from 0-15cm will include shrub and sedge material that has been left with the topsoil to facilitate regeneration. The second stage will remove a further 15cm. Topsoil will be stored in a suitable dry location.

Following mining, the sub-soil will be reconstructed using a combination of tailings, overburden and fines. Fines are clays and silts that will be dried in dams that are currently used for this function within the existing operation. Approximately 2m of free-draining overburden will be used to cover the subsoil before the topsoil is replaced.

Following re-establishment of the landform, vegetation and soil contained within translocated blocks will be repositioned on the surface. In other areas, topsoil will be respread in two stages corresponding to the two stages for stripping. Each application will be spread as evenly as possible. Compaction by machinery will be assessed and, where appropriate, deep ripping will occur.

Significant regeneration is expected from seed retained in the topsoil. This will be supplemented by broadcasting of seed mixes. These mixes will be applied during late autumn to early winter on freshly ripped and contoured topsoil. Component seed will have had appropriate pre-treatment just prior to preparation of the mix. Initial seeding will be at approximately 4-5 kg/ha with supplementary seeding at 1-2 kg/ha as required.

Stockpiled brush will be placed on the topsoil to act as a mulch and supplementary seed source.

Infill planting of seedlings propagated from seed, cuttings or root division will then occur at densities approximately twice pre-mining levels (approximately 750 seedlings/ha overstorey and 3000 seedlings/ha understorey).

Monitoring of rehabilitation success will determine the requirements for supplementary seeding or planting. Detailed monitoring methodologies and completion criteria will be determined in consultation with CALM and DEP.

Commitment

Cable Sands will prepare a Programme for Mining and Rehabilitation relating to Reserve 31900 in consultation with CALM and DEP. The programme will include the requirement to re-instate the final landform, consistent with the surrounding terrain, within 12 months of completion of mining of the orebody.

Cable Sands will implement the approved Programme for Mining and Rehabilitation.

3.6 HYDROLOGY

3.6.1 EXISTING ENVIRONMENT

Hydrological issues at Yarloop relate to three key areas: - abstraction of water from the Brockman Rd borefield; surface water adjacent to the mine site; and groundwater at the minesite. A management plan and operating strategy has been prepared to address these areas (Cable Sands, 2000).

Borefield

As for the existing mine, water requirements for mining in Reserve 31900 will be met from a number of sources. The primary source, in terms of volume, will be from the Brockman Rd borefield. As part of mine development for the Yarloop mine, five production bores were installed along Brockman Rd, 4km west of the minesite, in 1996 (see Fig. 5). This area is outside proclaimed groundwater areas and does not require bore licences. Abstraction of water from these bores commenced in mid 1997. Following concerns expressed to the company, relating to impacts of abstraction on groundwater levels and quality, a series of discussions and meetings were held with residents WRC and DEP. Hydrological investigations proved inconclusive in determining the extent of any impact of mining on local residents. WRC subsequently issued a direction under the Rights in Water and Irrigation Act, 1914, limiting the amount of water that can be abstracted from the borefield. WRC investigations indicated that the bore abstraction was unlikely to be impacting water quality.

Current management of the borefield includes: -

- restricting the amount of water taken from the borefield by increasing abstraction from Waterous Formation Creek
- operating only four of the five bores (Bore #2-5) under normal conditions
- supplementing water requirements using irrigation water over summer
- monitoring of bore and piezometer water levels and quality on a monthly basis
- interpretation of results and reporting to WRC
- handling of complaints through the documented complaint resolution procedure

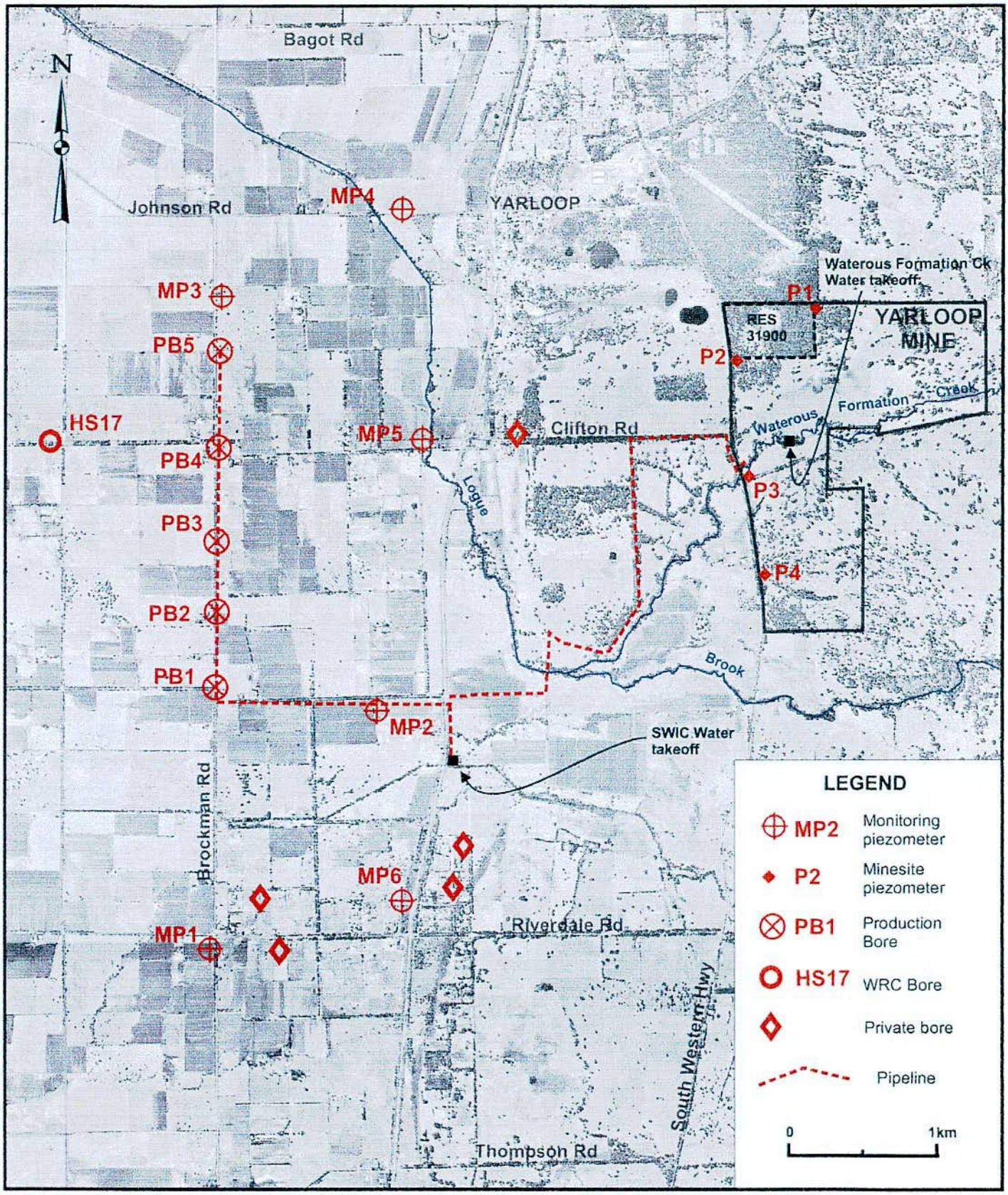


Figure 5 Water supply locations

Surface Water

There are no surface water features associated with Reserve 31900. Rainfall quickly infiltrates in to the sandy soils of the area.

Surface water in the vicinity of the operating minesite is dominated by Waterous Formation Creek, a tributary of Logue Brook. This creek flows in winter and spring and divides the current mining operation in two. Water quality in the creek is variable, reflecting seasonal conditions and clearing of vegetation in the catchment. Water monitoring upstream and downstream of the minesite has indicated comparable levels of suspended solids ie the mining operation does not significantly increase creek levels. Water quality is typically at its worst at the start of the flow period and improves over winter before tailing off in spring. Typical quality measurements are: pH 5.5-7.8; conductivity 230-800µS/cm and suspended solids up to 40mg/l.

Water falling on the mining area is retained in the mine water circuit. Occasional discharge of water from the mine is related to peak rainfall periods. For example, in 1999 water was discharged over 5 days in June and 11 days in October. This discharge is overflow from the water storage dam and has no significant impact on water quality or quantity of Waterous Formation Creek.

Fines dams are installed with emergency overflow weirs to allow for decanting of clear water where retention would compromise the integrity of the dam. These dams have been managed such that decanting is directed to the water storage dam and that no external decanting has been required. There is some leakage of clear water around the dam weirs but volumes are insignificant.

Minesite Groundwater

Groundwater levels and quality have been measured at minesite piezometers since 1997 (locations on Fig 4). Water levels around Reserve 31900 are greater than 4m below surface. Groundwater quality is variable

Mining at Yarloop intersects the surface water table. The conductivity of the aquifer is low and little water is produced by seepage into the mine pit. Monitoring of piezometers located adjacent to the minesite has indicated that mining has not caused a drop in water levels at distances close to the mining pit. Mining to the southern fenceline of Reserve 31900 has had no discernible impact on vegetation less than 10m away.

3.6.2 PROPOSED MANAGEMENT

Borefield

Development of the document "Groundwater Management Plan and Operating Strategy for Yarloop Mine Water Supply including the Brockman Rd borefield" (Cable Sands, 2000), in consultation with WRC, has effectively addressed the groundwater issues for Yarloop. This document was prepared in anticipation of approval of the PER proposal. It therefore addresses issues relating to mining in Reserve 31900.

The operating rules outlined in the management plan detail how water is sourced for the operations. Water from Waterous Formation Creek is used between June and November up to 300,000m^3 at no more than 50% of creek flow. When this source is insufficient for mining requirements, water is abstracted from the borefield, with a maximum of 600,000 m^3/yr. Any further water required will be sourced from South West Irrigation.

Other aspects of management detailed in the management plan include monitoring (at the borefield and around the minesite), complaint resolution procedures, water efficiency and borefield decommissioning.

Surface Water

The proposed mining operation will not impact on any surface water features. Water management of the mining will be as for the existing operation. There may be a requirement for some discharge from the site based on peak seasonal rainfall events. This discharge will be of overflow from the water storage dam into Waterous Formation Creek.

Minesite Groundwater

The depth of the mining will be below the water table. The low horizontal conductivity of the aquifer immediately adjacent to the southern boundary of reserve 31900 indicates that little water will seep into the pit. Mining of the orebody will take approximately 11 months at current production rates. The landform will be redeveloped within 12 months of completion of mining. This relatively short time for which the pit will be open, and the rapid restoration of the landform, will quickly re-establish the water level at levels similiar to pre-mining. Monitoring of groundwater levels adjacent to the reserve will continue to provide a mechanism for reviewing impacts of mining. These results will be interpreted and reported to WRC as per the groundwater management plan.

Commitment

Cable Sands will implement the approved "Groundwater Management Plan and Operating Strategy for Yarloop Mine Water Supply including Brockman Rd borefield" (Cable Sands, 2000).

3.7 NOISE

3.7.1 EXISTING ENVIRONMENT

Noise issues relating to Reserve 31900 are similiar to those encountered for Cable Sands' existing mining operation just to the south. The primary difference is that the proposed operations are much further from noise sensitive premises. The use of earthmoving equipment and processing of mineral at the Yarloop mine contribute to the noise levels currently experienced in the area. Other non-mining noise generators include traffic using South West Highway, agricultural activities and environmental noise.

Noise levels at residences adjacent to the existing operation occasionally approach Noise Regulation limits. Cable Sands continue to address these issues with residents, and in consultation with DEP where appropriate.

3.7.2 PROPOSED MANAGEMENT

Cable Sands has prepared a Noise Management Plan for the existing Yarloop mining operation in consultation with DEP (Cable Sands, 1999). This plan details noise control measures undertaken by the company to minimise impacts on neighbours. Other areas discussed include noise monitoring, employee awareness, complaint resolution procedures and operating agreements.

Mining in Reserve 31900 is much further away (an additional 500m) from noise sensitive premises than the existing mining operation. Based on worst case operating levels measured at 150m from the current mining activities, noise levels have been calculated for the nearest residents to Reserve 31900. These results are presented in Table 4 below. Calculated levels indicate that noise levels at the nearest noise sensitive premises will be below relevant noise regulation levels.

		Typical worst case operating levels at 150m	Noise Regs (no influencing Factors)	Calculated levels Level at 650m =level at 150m -log(650/150)*20			
				650m Factor 3dB	750m Factor 3dB	1100m Factor 0dB	1250m factor 4dB
Daytime	La10	47	45	34	33	30	29
	La1	55	55	42	41	38	37
	Lamax	61	65	48	47	44	43
19-22	La10	42	40	29	28	25	24
	La1	46	50	33	32	29	28
	Lamax	58	55	45	44	41	40
22-7	La10	39	35	26	25	22	21
	La1	43	45	30	29	26	25
	Lamax	45	55	32	31	28	27

Table 4 Noise levels for Reserve 31900

Commitment

Cable Sands will implement the approved noise management plan for Yarloop.

3.8 ABORIGINAL CULTURE AND HERITAGE

3.8.1 EXISTING ENVIRONMENT

Archaeological and ethnographic surveys of Reserve 31900 have been undertaken by qualified professionals in consultation with representatives of the local aboriginal community.

No archaeological material was discovered. It was considered unlikely that any archaeological material would be present given the lack of useful resources in the area.

A search of the Aboriginal Affairs Department's archival system found no ethnographic sites for Reserve 31900. Aboriginal consultants participated in a work program clearance survey in August 1999. The report prepared as part of this work recommended that mining in Yarloop 31900 proceed (Taylor, 1999).

3.8.2 PROPOSED MANAGEMENT

The likelihood of aboriginal sites or material of interest to aboriginal people being unearthed is considered small. If such sites or material is unearthed, production will cease in the vicinity and the Aboriginal Affairs Department (AAD) and Department of Minerals and Energy (DME) will be consulted. In the event of skeletal remains being discovered the Police Department will be informed.

Commitment

Cable Sands will cease production in any area where aboriginal sites are discovered and consult with DME and AAD.

3.9 OTHER ENVIRONMENTAL FACTORS

3.9.1 DUST

Dust at Yarloop is managed using a range of techniques. These include use of water carts on haulage roads and disturbed areas, vegetating topsoil stockpiles, use of fines to bind loose surfaces and maintenance of vegetation screens along South West Highway.

Operations in Reserve 31900 are further away from neighbouring residents than existing operations and are thus less likely to impact these neighbours.

Commitment

Cable Sands will wet haulage roads with a water cart as required.

Cable Sands will vegetate stockpiles as far as practical to prevent dust emissions

Cable Sands will keep disturbed areas to a minimum

3.9.2 GREENHOUSE GASES

Cable Sand's mining operations are not a significant source of greenhouse gas emissions. Approximately 6.8kt/a are released or approximately 0.01% of Western Australia's total emissions. Cable Sands uses energy efficiency measures to reduce the amount of these gases emitted.

The mining proposal will result in a long term increase in the vegetated area of Reserve 31900, thus providing an increased carbon sink over the current situation.

3.9.3 RADIATION

Radiation levels at Yarloop are low and typical of those recorded for the Swan Coastal Plain. Based on previous experience at a number of different minesites, the likely post mining levels will be slightly less than existing levels.

3.9.4 FAUNA

A fauna survey of Reserve 31900 indicated that the fauna values of the reserve have been reduced because the reserve and its neighbours are an island of remnant vegetation with poor prospects for supporting diverse or rare fauna in the long term. (Martinick & Assoc, 1996). No rare or threatened or priority fauna were detected or indicated in the reserve. The temporary reduction in habitat associated with mining will be more than compensated by the long-term increase in vegetated area.

Commitment

Cable Sands will retain a strip of native vegetation along the northern boundary of Burney Rd to act as a fauna corridor between Reserve 31900 and 31901.

3.9.5 VISUAL AMENITY

Operations proposed for Reserve 31900 are screened from South West Highway by the vegetation screens established on Cable Sands property to the south west and by the existing vegetation on the western side of the reserve. This vegetation will largely remain unaffected by operations, with the exception being removal of screening weed species (eg Tagasaste). A

strip of vegetation along the northern side of Burney Road will help screen operations from the rare vehicles using this road.

Commitment

Cable Sands will implement enhance or maintain vegetation screens.

4. COMMITMENTS

Table 5: The table below outlines management commitments for the proposal. Where relevant, these commitments include those made for the existing operations.

	Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
1	Incorporate environmental aspects of Reserve 31900 into the Yarloop Environmental Management and Monitoring Plan (EMMP)	To ensure environmental management is in accordance with EPA objectives and continually improves	Incorporate into existing EMMP	Prior to construction and throughout mine life	DEP and DME	Submission of modified EMMP
2	Report environmental performance on an annual basis.	To inform Government on environmental performance of the proposal	Preparation of Annual Environmental report	Operation and decommissioning	DEP	Receipt of annual report
3	Locate infrastructure for mining and primary processing on cleared land outside Res 31900.	To minimise impact on vegetation in Reserve 31900.	Incorporate in Mine Planning	Prior to and during mining	DEP	Infrastructure not present on reserve
4	Acquire the 9.1ha part of Location 826 indicated in Figure 3 for incorporation in the conservation estate.	To increase security of Forrestfield Complex	By acquiring part of Location 826	During mining within Reserve 31900	DEP	Letter from proponent
5	Fence areas of Reserves 23307 and 31901 to restrict access to these areas.	To reduce threatening processes in these reserves	Adjoining reserves	During mining	CALM	Advice with annual reports
6	Retain and fence the area of overstorey on the Loc 816 immediately east of the reserve and facilitate growth of native understorey species.	To provide a buffer to conservation values of Reserves 31900 and 31901	Within fenced area of Loc 816	During mining	DEP	Advice with annual reports
7	Maintain vegetation clearing to a practical minimum.	To minimise impact on vegetation in Reserve 31900.	Within the reserve	During mining	CALM	Rehabilitation Plan meets CALM requirements
8	Preserve as much seed and plant material as practical for rehabilitation	To facilitate rehabilitation success	Within the reserve	Prior to mining	CALM	Rehabilitation Plan meets CALM requirements
9	Rehabilitate unmined degraded areas in Reserve 31900 west of the mining areas.	To consolidate values of Reserve 31900	Incorporate with Rehabilitation Plan	During mining	CALM	Rehabilitation Plan meets CALM requirements
10	Retain a strip of native vegetation along the northern boundary of Reserve 31900.	To provide a buffer and fauna corridor between Res 31900and 31901	Incorporate in Mine Planning	Prior to mining	CALM	Rehabilitation Plan meets CALM requirements
11	Implement the noise management plan	To ensure appropriate management of noise issues	For all Yarloop Mining including Reserve 31900	Prior to Mining	DEP	Advice with annual reports
12	Wet haulage roads with a water cart as required	To minimise dust emissions	Within and in the vicinity of the reserve	Throughout mine life	DEP	Advice with annual reports
13	Stockpiles will be vegetated as far as practicable to prevent dust emissions.	To minimise dust emissions	Within and in the vicinity of the reserve	Throughout mine life	DEP	Advice with annual reports
14	Keep disturbed areas to a minimum.	To minimise dust emissions	Within and in the vicinity of the reserve	Throughout mine life	DEP	Advice with annual reports
15	Develop a groundwater management plan	To ensure appropriate management of water issues including abstraction	Around minesite and borefield area	Prior to Mining	WRC, DEP	WRC approval of Plan
16	Implement a groundwater management plan	To ensure appropriate management of water issues including abstraction	Around minesite and borefield area	Throughout minelife	WRC, DEP	Advice with annual reports

	Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
17	Enhance or maintain vegetation screens	To minimise impacts on visual amenity	Around mining area	Throughout mine life	DEP	Advice with annual report
18	Cease production in any area where Aboriginal sites are discovered and consult with DME and Dept of Aboriginal Affairs.	To comply with the Aboriginal Heritage Act 1972	Within the mining area	Throughout mine life	AAD	Letter from AAD
19	Prepare a Management Plan for Decommissioning of the Yarloop Rubbish Tip	To ensure appropriate management of rubbish tip	Within mining area	Prior to Mining	Shire of Harvey, DEP	Letter form Shire and from DEP
20	Implement the Management Plan for Decommissioning of the Yarloop Rubbish Tip	To ensure appropriate management of rubbish tip	Within mining area	Throughout minelife	Shire of Harvey, DEP	Advice with annual report
21	Prepare a programme for mining and rehabilitation of Reserve 31900 in consultation with CALM and DEP. The programme will include the requirement to re-instate the final landform, consistent with the surrounding terrain, within 12 months of completion of mining of the orebody	To ensure appropriate rehabilitation of mined areas and degraded areas	Throughout Reserve 31900	Prior to Mining	CALM, DEP	Letter from CALM
22	Implement the mining and rehabilitation programme	To ensure appropriate rehabilitation of mined areas and degraded areas	Throughout Reserve 31900	Throughout minelife	CALM, DEP	Advice with annual report

5. REFERENCES

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