Limestone Excavation and Rehabilitation Management Plan

Lot 1, Nowergup Road, Nowergup

WA Limestone

25 OCTOBER 2010

W.A. **LIMESTONE**

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SUMMARY

WA Limestone seeks Development Approval and an Extractive Industries Licence for twenty years to enable an extractive industry to be located on Lot 1, Nowergup Road, Nowergup for the removal of limestone and minor sand and the production of reconstituted limestone products by limestone batching.

The proposed excavation area is 7.0 hectares, with 1 hectare for access. This represents 32.2% of Lot 1, of which a further 40%, north of Nowergup Road, has already been nominated for Bush Forever. Statement of Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region recognises the need for compromise with existing policies in Section 5.1.2.2. This proposal has been designed to be consistent with Statements of Planning Policy 2.4 and 2.8 with respect to a "Negotiated Solution".

This document provides the supporting information for the application for Planning Consent and an Extractive Industries Licence.

It is proposed to extract limestone and sand from the site for use as construction materials in the Perth Metropolitan Area. As part of this project the limestone will be used in reconstituted blocks which will maximise the resource usability.

The proposed quarry will supply a strategic resource of limestone to the north of Perth and the Perth Metropolitan Area.

The site lies in an important area of limestone resources that is strategic to the development of the Perth Metropolitan Area. Limestone on Lot 1 is identified as a Priority Limestone Resource in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials. The extraction of limestone is seen as an interim use of the land prior to utilisation of the area by the current land holder as a future rural residential and conservation subdivision.

The most appropriate and proposed end use is to restore the land surface and to rehabilitate the batter slopes with local native species.

Access is proposed to be directly to Nowergup Road, with the access road being sealed to minimise dust generation.

The closest dwelling is in the market gardening area 350 metres to the east behind a limestone ridge, thick vegetation and an existing quarry.

The operations have been designed to minimise visual impact.

Hours of operation will be 6.30 am to 5.00 pm Monday to Saturday inclusive or transport of limestone products, excluding public holidays. This is similar to the operations of nearby quarries in the local area. Crushing, bulldozing and other more noisy activities will not commence until 7.00 am.

Access is direct to Nowergup Road at the existing road on Lot 1. The first 100 metres of the access road will be sealed. Perimeter fences and locked gates will be maintained to prevent illegal entry. Warning signs will be maintained as required by the Department of Industry and Resources and the City of Wanneroo.

The end use is proposed to be rural living when rezoning and other planning matters are concluded. The eastern batter will be 1 : 2 vertical to horizontal vegetated to local native habitat. The western batter slopes will be < 1 : 5 vertical to horizontal with level building envelopes.

The following reports have been commissioned in support of this project.

- Vegetation and Flora Study

- Fauna Study
- Noise Management Study
- Karst and Stygofauna Study.

The vegetation study has been completed and did not record any Declared Rare or Priority species. Endangered Community Type 26a may occur but is excluded from the excavation area.

A study of Karst was completed by Lex Bastian who showed that the excavation could be undertaken without impacting on local caves. The proposed excavation will commence south of the line at the edge of the karst as identified by Lex Bastian.

The fauna study conducted by Western Wildlife concluded that there may be some fauna species of conservation significance that may utilise the site and recommended that the extent of clearing be minimised.

The Noise Study prepared by Herring Storer concluded that noise emissions received at the closest sensitive premises could comply with the Regulations and that no particular amelioration is required.

Detailed Management Plans are submitted to cover;

- Visual Management
- Dust Management
- Noise Management
- Rehabilitation Plan

The Environmental Protection Authority listed the project for a limestone quarry and batching plant as “Not Assessed – Managed under Part V of (Works Approval and Clearing)” on 9 September 2009. This decision was subsequently appealed and the Appeal dismissed by the Minister for the Environment on 30 March 2010.

The EPA determined that that neither the quarry or the limestone batching would contribute to a significant environmental impact and that adequate controls are available under the Works Approval and Licensing Processes.

This proposal is for 20 year Planning Consent with an Extractive Industries Licence for 20 years.

CONTENTS

1.0 OVERVIEW

1.1 Proposal

WA Limestone is applying for Planning Consent and Extractive Industries Licence for Lot 1, Nowergup Road, Nowergup, for a period of 20 years.

The proposal provides for buffers to the adjoining roads, protection of significant vegetation and karst structures, and preservation of 10 hectares of vegetation to the north of Nowergup Road.

The limestone removed will help provide a strategic resource of road making and construction materials in the northern Perth Metropolitan Area. Reconstituted limestone products are proposed to be manufactured by limestone batching to maximise the use of the limestone by making reconstituted limestone blocks.

Lot 1 adjoins an older existing limestone extraction area.

Importance and Rationale

The reality is that the limestone and sand is only extracted for the community. If the community did not need the limestone there would be no extraction. Almost all the limestone is used on public works projects and for structural works, such as footings, structural walls in subdivisions and for building materials.

Whilst limestone might seem common, most of the resources closer to Perth have been sterilised by development, conservation of vegetation considerations, and public intolerance.

For example, in the northern Perth Metropolitan Area good limestone is either held predominantly by one company or is located in State Forest and potential extension of the Yanchep National Park. In southern parts almost all the suitable limestone is restricted to the Hope Valley area and a significant part of that area has already been excavated. The local area is the only high grade limestone remaining in the northern Perth Metropolitan Area that is not sterilised by Planning and Conservation Policies. The importance of the Priority limestone resource is currently being investigated in revisions to Statement of Planning Policy 2.4 being undertaken by the Western Australian Planning Commission, supported by the Department of Mines and Petroleum.

Limestone is used for dimension stone, road bases, the construction industry, reconstituted stone, armour rock, lime and cement manufacture.

Not all limestone has the same characteristics, and the best deposits are valuable community assets. The limestone on Lot 1 and the surrounding area is a particularly valuable community resource. Quality material that is suitable for construction purposes therefore has very high community value as the Perth Metropolitan area spreads north.

Limestone on Lot 1 is identified in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials as a Priority Limestone Resource.

The Chamber of Commerce and Industry 1996, considered the need for limestone and the potential sterilisation of resources. The Chamber of Commerce and Industry updated their data in 2008 and found limestone restricted.

Documentation on the shortage of high grade limestone is provided in Appendix 5. The current status of the protection of this local area is also provided in Appendix 5.

Research on the limestone resources can be found in the following;

- Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5
- Western Australia, Western Australian Planning Commission*, Statement of Planning Policy 2.4, Basic Raw Materials.*
- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.
- Western Australian Planning Commission, *Statement of Planning Policy 2.4, Basic Raw Materials.*

The limestone resource on Lot 1 has already been partially sterilised through Bush Forever, although Statement of Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region recognises the need for compromise with existing policies in Section 5.1.2.2. This proposal has been designed to be consistent with Statements of Planning Policy 2.4 and 2.8 with respect to a "Negotiated Solution".

WA Limestone purchased Lot 1 as an integral part of their long term northern resources. Unfortunately a significant part of the resource has been sterilised by the creation of Nowergup Road which cuts through the centre of the resource, cutting it in two and negating the availability of significant reserves of limestone that would have been available to the community.

Following that partial sterilisation, Bush Forever was placed across the northern portion of Lot 1. This effectively sterilises the northern portion of the resource because, whilst Bush Forever has currently no legislative backing, the Government authorities (WAPC and DEC) who implemented Bush Forever, are also the approving authorities for limestone quarries. Bush Forever was implemented over the northern portion of Lot 1 without consultation with WA Limestone or any compensation. This proposal is an attempt to recover some limestone resource from Lot 1, but is a compromise through the need to provide adequate buffers.

As noted above the limestone is a community resource and is only taken because the community needs the resource. If the limestone is not taken from Lot 1 it must be taken from elsewhere, which will also involve land clearing and probably longer transport runs with consequent greenhouse gas penalties.

Requested Approval

Planning Consent could be issued for 20 years to provide long term protection, and, if more control is required, an Extractive Industry Licence issued for say 10 – 20 years.

The flora and vegetation study included will form the basis for an application for a Clearing Permit.

The taking of limestone from Lot 1 will help maximise the land uses for the site by using the limestone for construction purposes in the northern Perth Metropolitan area prior to it becoming sterilised.

1.2 Proponent

The proponent is WA Limestone, a large limestone quarrying operator, with significant and diverse experience in limestone extraction, road making supplies, processing and coastal construction work. For example the company was involved in the supply of materials and the construction of the Dawesville Channel, Mindarie Quays, Hillarys Boat Harbour and several marinas in the Mandurah area, and has supplied many local roads and construction projects with limestone materials.

Contact can be made through

WA Limestone
41 Spearwood Avenue
Bibra Lake WA 6163

1.3 Location, Ownership and Agreements

Lot 1 lies on the corner of Nowergup and Wanneroo Roads, Nowergup. The title is attached before the Figures.

1.4 Aims of the Proposal

The aims of the proposal are to;

- Supply WA Limestone with reserves of strategically located limestone suited to a variety of end products, such as road base, screened limestone products, raw material for reconstituted limestone blocks, reconstituted limestone blocks and armour stone.

- Maximise the use of high grade limestone to the north of Perth, to minimise greenhouse gases, transport, and other environmental issues associated with alternative resources, to be minimised.

- Help to keep the prices of local limestone products at the lowest possible levels, by maintaining small transport distances and competition. This benefits the whole community.

- Comply with Statement of Planning Policy No 2.4 Basic Raw Materials, and Rural Land Policies for the Metropolitan Area which state that basic raw materials should be taken prior to sterilisation of the area by development.

2.0 PLANNING ISSUES

2.1 Alternative Resources

Limestone resources on Lot 1, in the northern Perth Metropolitan area, are seen as strategic resources for the community, which is why they are identified in SPP 2.4.

In the northern Perth Metropolitan area good limestone is either held predominantly by one company or is located in State Forest or potential extension of the Yanchep National Park. The only alternatives are hard rock products from the Darling Scarp, which involve large transport distances and clearing and excavation of portion of the Darling Scarp.

There are no other resources of limestone available, with all resources held by Adelaide Brighton Cement Ltd for their long term future or held and utilised by smaller operators.

For road base the only alternatives to limestone are hard rock products which involve clearing of vegetation on the Darling Scarp, further travel distances and consequent significantly increased greenhouse gas emissions and higher production and energy costs.

A consideration of the shortage of high grade limestone is covered in Appendix 5 in which documents detailing the location and shortage of limestone are provided. These documents have been supplied to Government Departments and the Minister for Mines.

2.2 The Site and Land Zonings

The planning related to the proposal is considered By Greg Rowe and Associates and is attached in Appendix 6. A summary is presented here.

The land is currently zoned "Rural Resource" under the City of Wannero District District Planning Scheme No 2 and "Rural" under the Metropolitan Region Scheme.

The objects of the Rural Resource Zone are to:

> *Protect from incompatible land uses or subdivision, intensive agriculture, horticulture and animal husbandry areas with the best prospects for continued or expanded use:*
>
> *Protect from incompatible land uses or subdivision basic raw materials priority areas and basic raw materials key extraction areas.*

The proposed quarry is consistent with the current zoning, which also seeks to protect the adjoining quarry, poultry farm and intensive horticulture and market gardens.

The production of reconstituted limestone products occurs locally on both private "Rural Zoned Land" and on Mining Leases on Crown Land. There are similar facilities on Wesco Road 1.8 km to the east (Meteor Stone), at Carabooda 5 km to the north east (Limestone Resources and Limestone Building Block Company) and on Dayrell Road 2 km to the south east (Crown Limestone).

Statement of Planning Policy 2.4 recognises the site as a Priority Limestone Resource and requires that resources be staged and taken prior to sterilisation by other land uses.

Lot 1 is listed as being within the notional area identified as potential future landscape preservation/enhancement and rural small lot subdivision within the Future of East Wanneroo Strategy. The boundary line is shown as "subject to further investigation".

2.3 End Use

At this stage the end use of the site is to be rural living with building envelopes located on the sloping final batter slopes. The site will be revegetated to local native vegetation. Building envelopes will be allocated. Provision for a cul de sac with small infiltration basins will be designed in the concept final contour plan.

The eastern batter will be 1 : 2 vertical to horizontal vegetated to local native habitat. The western batter slopes will be < 1 : 5 vertical to horizontal with level building envelopes.

- The indicative subdivision layout includes the creation of 6 lots.
- This subdivision will be accessed via a cul-de-sac from Nowergup Road.
- An emergency fire escape, to Wanneroo Road, should also be included.
- Three of the lots have dual road frontage, but will access be from the nearly constructed cul-de-sac.

The 10 hectares of Lot 1, north of Nowergup Road, will be retained as remnant vegetation as part of Bush Forever Site 383.

Final Contours

The final contours of the excavation will be to a flat floor at an elevation of 20 – 22 metres, suitable for a development, with batter slopes back to natural ground level 1 : 2 vertical to horizontal, as shown in the Concept Final Contour Plan, adjacent to Community Type 26a in the east and slopes of 1 : 4 vertical to horizontal where building envelopes are to be located.

Sequential Planning

Sequential planning is considered By Greg Rowe and Associates and is attached in Appendix 6. A summary is presented here.

State Planning Policy 2.4, Basic Raw Materials requires that development applications for exrtactive industries include “the ability to rehabilitate the land to a form of for use which is compatible with the long term planning for the site and surrounding area”.

The Future of East Wanneroo report released in 2007, notes that subject to further investigations, the area adjacent to Wanneroo Road may be suitable for rural small lot subdivision. This report does not address any of the potential constraints that might otherwise restrict small lot subdivision from occurring.

The Future of East Wanneroo report does however in Section 5.4 highlight the importance of State Planning Policy 2.4. It further notes that interim rural /tourism landues “may be able to occur until the limesone and sand is required for extraction”.

Further the Future of East Wanneroo report notes that extraction of basic raw materials in this area is a threat to the long term landscape and scenic values of the area. “Site specific landscape management measures need to be put in place where there is conflict between preservign landscape and scenic amenity and proposals for future extraction of limestone and sand.

Lot 1 is such a situation.

Greg Rowe and Associates noted that the City has not commenced any no specific discussions with WA Limestone or any other landowners regarding the detailed future planning for this area, but understands that the City has commenced preparation of a Scheme Amendment that seeks to enable future subdivision. Accordingly they have taken the view that the City of Wanneroo maintain the preference for rural small lot subdivision or similar end use as suggested by the "Future of East Wanneroo Structure Plan".

3.17.2 (f) of DPS 2 includes a requirement for a restoration plan to accommodate future land uses.

"(t) There is a presumption in favour of applications for the extraction of basic raw materials in the basic raw materials resource areas identified in the Local Rural Strategy subject to the management of offsite impacts and an approved land restoration plan to a standard suitable for intended subsequent long term land uses."

Greg Rowe and Associtates notes that the City have not, in the past supported subdivision within the Rural area for rural living subdivisions. Accordingly the subdivision of Lot 1 could not occur without a change to the zoning of the site.

A poultry farm lies 400 metres to the north east across Nowergup Road. The adjoining property is used for lime manufacture. Greg Rowe and Associates noted that the intended long term use of the site (LOT 1) will be dependant on the relocation of this nearby poultry farm and the ceasing of operations on the adjoining property.

No rural living lots could be created on Lot 1 without a change to the land zoning. Given this, there is likely to be a considerable period between when the site could be used for another purpose or subdivided. Therefore the proposed operation period of 20 years is consistent with the likely operating period of the constraints to development.

The long term intention of the landowner is for the site, after the completion of the extraction of the resource, to rezone the site and subdivide to allow for rural living development. Taking account of the above, Greg Rowe and Associtates determined that the proposed sequential landuse appears to be in accordance with the intent of the City

This sequence is in compliance with the intent and specification of 6.5.Sequential Landuse in Statement of Planning Policy 2.4. Therefore a quarry in a Priority Limestone Resource area is appropriate and is part of sequential land planning as required by Statement of Planning Policy 2.4.

As the land requires rezoning, with a subsequent subdivision application to follow, both which requires the approval of the Western Australian Planning Commission, it is only appropriate to prepare an indicative plan that demonstrates how the future subdivision might occur.

The indicative subdivision layout includes the creation of 6 lots.

This subdivision will be accessed via a cul-de-sac from Nowergup Road.

An emergency fire escape, to Wanneroo Road, should also be included.

Three of the lots have dual road frontage, but will access be from the nearly constructed cul-de-sac.

To facilitate the future subdivision of the property the final contour plan includes:

- The avoidance of the portions of the site containing karst.
- Revised batters and base of quarry
- Level building envelope areas (2,000m2)

The batter grades have been re-worked from the original application to limit the flat area at the base to only include the road and drainage basin. This will also minimise grades throughout the remainder of the extraction area.

A further reduction in batter grades could be achieved in some portions of the site by re- contouring between the excavation area and the property boundaries. The applicant is not proposing to do this at this point, but this option could addressed as part of the ongoing reviews of the Management Plan.
.
See Appendix 6 for a discussion of the planning issues by Greg Rowe and Associates.

2.4 Surrounding Landuses and Buffers

Limestone has been extracted locally and on site for many years and there is an existing limestone excavation and processing plant adjoining to the east.

A hotel lies 260 metres to the south. This will be hidden by excavating from the floor of the quarry.

A poultry farm lies 400 metres to the north east across Nowergup Road.

The closest dwellings are in Gibbs Road, 350 - 450 metres to the east.

Bush Forever Site 383 covers the 10 hectares of Lot 1 to the north of Nowergup Road.

Figure 8 shows the buffers to the existing land uses in the local area.

A number of Government Policies relate to buffer distances and the protection of basic raw materials. Statement of Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004) discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority as the basis for a Draft guideline on recommended buffer distances. These formed the basis of EPA Guidance Statement Number 3, Separation Distance between Industrial and Sensitive Land Uses, June 2005.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. ***A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable.*** EPA Guidance for the Assessment of Environmental Factors 3 June 2005 provides for a case by case separation, based on the potential impacts. See EPA Guidance Statement Number 3.

For limestone extraction a generic buffer is suggested of 300 to 500 metres with case by case assessment where grinding and milling are used.

The main issues are the potential generation of dust and noise.

These are generic buffers and can be varied on the basis of environmental and management studies.

The excavation of limestone from the site complies with these policies. The closest dwellings are to the east behind natural landform and several tree belts of dense vegetation associated with a poultry farm or with an existing quarry between.

The site assessment and studies show that the generic buffers are complied with and that compliance is achieved at the closest sensitive premises. See 4.10 Noise Management and 4.11 Dust Management. It should also be noted that the sensitive premises are related to market gardens and poultry production.

The excavation will be worked from the floor of the pit with the landform and remant vegetation assisting visual management.

BUFFERS				
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**	**Timing**
Adjoining properties	• The excavation is to be work from the floor of the pit behind the active face. • The nearby sensitive land uses will be protected by an intervening ridge to the east • The proposal complies with generic Government buffer policies for dwellings	WA Limestone will operate according to the Management Plan to maintain the buffers.	Compliance with the Excavation Management Plan and Noise Regulations.	Ongoing

2.5 Aboriginal Sites

The database of the Sites Department of the Department of Indigenous Affairs has no record of any aboriginal sites on Lot 1.

A search of the Department of Indigenous Affairs databases on 24 November 2009 showed that Orchestra Shell Cave covers a very broad area which has the corner touching the site. Orchestra Shell Cave does not occur on this site but some kilometres away. It is believed that the nomination on the map is to protect the site and therefore its exact location is not listed here.

ABORIGINAL SITES				
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**	**Timing**
Aboriginal sites	***Aboriginal Heritage Act 1972-1980*** • Should any evidence of early aboriginal occupation be uncovered, development will be stopped pending an assessment by a recognised consultant. • If the site is confirmed as a site under the provisions of Section 15 of the Aboriginal Heritage Act 1972-1980 and Amendments operations will cease pending relevant negotiations.	WA Limestone will comply with the *Aboriginal Heritage Act 1972-1980*	None required at this time.	Ongoing

2.6 Community Consultation

Both the City of Wanneroo and the EPA have advertised the proposal.

2.7 Responsible Authorities

A number of local and state authorities are responsible for quarrying of this type or have an interest in its operation.

City of Wanneroo

- Has responsibility for local roads in the area.
- Issues Development Approval under the Town Planning Scheme.
- Issues and oversees the Extractive Industries Licence.

Department of Mines and Petrolem

- Controls the safety and methods of extraction.
- Oversees the health and safety of workers.

Department of Environment and Conservation

- Oversees all significant environmental impacts.
- Licenses any screening or crushing plant used in the processing of limestone.
- Responsible for flora and fauna.

- Manages Clearing of Vegetation under Part V of the *Environmental Protection Act 1986.*
- Manages Limestone Batching under Part V of the *Environmental Protection Act 1986.*

Department of Water

- Issues guidelines for water quality management for extractive industries.
- Oversees protection of groundwater and water courses.

Western Australian Planning Commission

- Responsible for Statement of Planning Policy No 2.4, Basic Raw Materials Policy.
- Approval under the Metropolitan Region Scheme.
- Issues Planning Consent under the Metropolitan Region Scheme.
- Prepared the Future of East Wanneroo Planning Strategy.

Main Roads

- Responsible for construction and maintenance of main roads and the use of these roads by truck traffic on Wanneroo Road.

Department of Indigenous Affairs

- Oversees the Native Title Amendment Act and the *Aboriginal Heritage Act 1972 - 1980*.

Environmental Protection Authority

- Listed the proposal as "Not Assessed – Managed under Part V of (Works Approval and Clearing)" on 9 September 2009.

3.0 GEOLOGY, REGOLITH and CLIMATE

3.1 Geology and Geomorphology

The site is a sloping landform dropping from a ridge of 60 metres AHD in the south down to 28 metres on the edge of the limestone in the central north where it forms a relatively flat area.

The site is underlain by the Tamala Limestone which is widespread along the coastal area of Western Australia, but is in many areas sterilised by development.

The age of the limestone is late Pleistocene. In other localities, dates of between 25 000 and 100 000 years have been obtained for the Tamala Limestone. (Playford 1988).

The limestone is an aeolian calcarenite (formed from wind blown calcareous sands) derived from beach sands and categorised as the Tamala Limestone. Calcrete formation which has occurred on top of the ridge as calcium carbonate has been dissolved and re-precipitated. This has formed a hard cap rock of higher calcium carbonate content and has resulted in minor pinnacle formation and solution structures. Some of the solution structures follow old tree roots and are filled with sand to shallow depth as the calcium carbonate has been dissolved by slightly acidic soil moisture. See Perth Environmental Geology 1 : 50 000 Series, Yanchep and Perth maps, (Geological Survey, 1982 and 1986).

The Tamala Limestone extends from Exmouth in the north to, and along, the south coast. It consists of foraminifer, shell fragments and quartz grains. Grade of the limestone ranges from 81 % to 86 % calcium carbonate, although some variation can be expected laterally and vertically as excavation proceeds. Geological Survey of WA, 1990.

Sand shed from the weathering limestone provides the soil cover on the limestone deepening to the north west corner.

Soil coverage is deeper sand over limestone at depth. The soils are classified as Cottesloe soils; Uc1.23 (Northcote). Where present, soil depth is generally only 200 to 300 mm On the north western corner of Lot 1 the soils become deeper and tend to be more like the Spearwood Sands.

Potential for Karst

The geology of Lot 1 was assessed by Lindsay Stephens of Landform Research during the field investigations on 30 November 2006. Lex Bastian also inspected the site. He is a widely recognised expert in local karst formations.

Jennings, undated, summarised the conditions of Karst formation in the Tamala Limestone of Coastal Western Australia, from previous published information. The observations on site concur with Jennings conclusions.

The adjoining Lot 52 to the east has been excavated for limestone, and some worked faces are visible near the boundary between Lot 1 and Lot 52.

These faces and the edges of the excavation in that area show rifts and karst development. A cave is exposed on the boundary of Lot 1 and Lot 52. A small depression occurs in the central east near the boundary with Lot 52.

The north eastern corner of Lot 1 looks “cavey” as does the small scarp in the north east.

The pattern of development matches other cave development in the local area and appears to be related to an old wetland at a higher elevation than the current wetland north of Wesco Road. The current wetland is at an elevation of 16 to 20 meters AHD, whereas the level ground that extends south across Nowergup Road, and appears to be an ancient wetland, is at a natural elevation of 28 metres or thereabouts, with some excavation below the base level.

There is potential for karst development at the small scarp in the north east of the 10 hectares north of Nowergup Road.

Lex Bastian provided data karst of the local area which was published in Csaky 2003, *Review of Karst Hazards in the Wanneroo Area, Perth, Western Australia.* Figure 3.1 from Csaky is reproduced here to show the Karst Hazard Zone mapped by Lex Bastian. The data for Lot 1 matches the geological mapping of Lot 1 conducted at the time of the site inspection.

The caves were inspected by Lex Bastian on 28 May 2007 in company with Lindsay Stephens of Landform Research and Denis Hill representing WA Limestone. Lex Bastian prepared a report on his investigations which is attached as Appendix 1. The caves on site do not have water in them due to climatic or human factors such as pumping of groundwater locally.

Lex Bastian noted that in the old lime kiln quarry to the east of and outside Lot 1 there is evidence of a former cave with several dried out stalictites and shawl.

A large rift 6 – 7 metres deep was recorded on the ridge on the eastern boundary of Lot 1, with a further smaller rift to the north. Following an internal inspection of the deepest rift Lex Bastian concluded that these rifts were typical of a ridge undermined by solution weathering which then allows a partial eastern collapse to form the rifts.

The cave was inspected by Lex Bastian who noted that this is a common type of cave in the Yanchep-Waneroo region and developed as a consequence of subsidence of solution cavities at the water table. The cave lies on the edge of Lot 1 extending under the ridge on the eastern boundary.

Lex Bastian also noted that there was the potential for caves under the Tuart Woodland but that they were likely to be filled by sand and soil.

He concluded that the caves are restricted to the eastern edge of Lot 1 and will not be impacted on by the excavation. The excavation is not proposed to intersect the water table and will have a separation of 4 metres to the water table, which provides an allowance for seasonal changes.

His map shows that there is possible deep karst under the central and western portion of Lot 1 in the area nominated as Limestone Heath by Lex Bastian (Appendix 1). In reference to these areas Lex states “Experience has shown that such caves become progressively smaller due to increasing saturation of dissolved calcium carbonate westwards in cave streams. Thus although they may be present they are likely to be deep at the water table as well as not of significant size, such as would preclude the proposed operations”.

Even so the staging has been revised to commence excavation south of the line of karst, as identified by Lex Bastian. North of the line the activity will be restricted to the access road which will require a cutting.

Soils

Soil coverage is thin over the limestone ridge with shallow yellow brown sands over abundant limestone outcrop. They are classified as Cottesloe soils; Uc1.23 (Northcote). Where present, soil depth is generally only 200 to 300 mm.

On the lower elevations, on the edges of the lease in the south west, the soils are deeper and tend to be more like the Spearwood Sands.

The soils are alkaline at least at depth. The underlying limestone and calcareous subsoils are alkaline.

3.2 Description of the Resource

Scattered limestone outcrops occur across the central, southern and western parts of the site with deeper sand towards the north west corner.

The limestone has been indurated on the outcrops, raising the calcium carbonate content to between 50% and 80%. The underlying limestone is of slightly lower grade of Calcium carbonate.

The degree of lithification (hardness) changes both vertically and horizontally over the site and determines the use to which each type of limestone can be put.

The sand resources are deep yellow sands that are suitable for fill and concrete sand.

Although the limestone resource extends to depth, extraction will be limited by the quality of stone encountered at depth.

3.3 Climate

The climate of the area is Mediterranean with warm to hot summers and cool wet winters.

The closest recording station is Beenyup (Wanneroo), although averages of only six years' data have been recorded. Other weather data must be taken from Perth.

The highest temperatures are in February, with average 30.0 maxima, and the lowest are recorded in July with average maxima of 18 degrees Celsius and 7.4 degrees C minima.

Rainfall for the area is slightly less than Perth at 722 mm, compared to Perth's 869 mm, of which more than 90% falls in the months April to October inclusive. Evaporation is high and exceeds rainfall in all but the four wettest months, May to September.

The prevailing winds are from the south west, particularly in the afternoon. In summer the easterly in the mornings and the sea breeze in the afternoon can be quite strong. At 3.00 pm wind speeds exceed 10 kph for 80 % of the time in summer but only 30 % to 40 % in winter. At other times the wind speed is calm for 30 % of the time in winter at 9.00 am and 10 % in summer, with 40 % of the time exceeding 10 kph in summer and 20 % in excess of 10 kph in winter.

4.0 EXCAVATION MANAGEMENT

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any potential impact on the local community. Dust and noise can be contained by the methods of extraction to be used and the control measures which will be put into place. Measures to protect the site and minimise the influence of dieback are addressed under Environmental Management.

4.1 Extraction of the Resource

It is proposed to excavate the limestone by coming in from the north eastern corner at floor elevation, gradually expanding the excavation to the south and west.

The type of excavation will be similar to other limestone pits in the local area.

Excavation will be conducted to the:-

- *Mines Safety and Inspection Act 1994 and Regulations 1995.*

The entrance will be designed to minimise impact on Tuart Trees.

Excavation Methods

Excavation will be carried out as a sequence.

1. Tuart trees will be marked in the field at the time the perimeter of the quarry footprint is surveyed. The access road will then be designed to minimise Tuart tree removal and will be located in a manner that provides safe entry/exit to Nowergup Road. The entrance is proposed to adjoin the existing entrance that services the lot to the east. In effect no new entrance will be required, but rather it may be widened. See the figures in Appendix 2 for the location of Tuart Trees.

2. The approved footprint will be surveyed and marked on the ground by flagging and survey tape in the same manner as all developments. The bulldozer will then push to that marked line.

3. Along the edge of the possible Community Type 26a in the east a wire fence will be erected to mark the edge of the footprint in that area as an act of good faith by WA Limestone.

4. The vegetation will be removed by pushing it into windrows for use on the batters to minimise soil erosion and assist spreading soil on the final batters as part of the final rehabilitation.

5. The topsoil bund and overburden perimeter bunding will be pushed to the surveyed line, but not outside the line or footprint. There will be no disturbance of the vegetation outside the perimeter bunding. The perimeter bund will be planted in the south to provide better visual management for patrons of the Tavern as shown in the attached plans.

6. Vegetation clearing will be progressive and minimised to that required for each stage of excavation.

7. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on the batter slopes of completed areas. It will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

8. Any topsoil will be removed for spreading directly onto areas to be revegetated, batter slopes and screening bunds. If direct spreading is not possible the top soil will be stored in low dumps, for spreading at a later date. Weed affected topsoil from the cleared area will be buried to reduce the future weed loading on the site.

9. Where possible topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated. Where this is not possible the topsoil and overburden will be stored in low dumps to less than 1.0 metre high for future use in rehabilitation. This will assist in preservation of the local genetic diversity

10. Soil overburden, as yellow and brown sand and low grade limestone, will be directly transferred or stored in low dumps for later use and for forming the screening bunds around the perimeter of the excavation area.

11. Excavation will be worked progressively in the stages as shown on the attached staging plan commencing in the north east and spreading south west.

12. Limestone will be excavated to a floor level at 20 – 22 metres AHD in the centre of the site.

13. Excavation methods will include;

Road Base	Deep ripped with a bull dozer and loaded into a portable crusher for reduction into the required size. This will use waste from armour stone production.
Armour stone	May be excavated from suitable materials.

14. All static and other equipment such as crushers and screens, will be located on the floor of the quarry to provide visual and acoustic screening. Stockpiles of products will be retained on the floor of the pit where possible to reduce visual impact.

15. The northern and eastern boundaries will be left in a stable manner to the requirements of the *Mines Safety and Inspection Act 1994*.

16. It is not anticipated that blasting will be required. If blasting is to be used, a "Blasting Management Plan" will be prepared and approved by the City of Wanneroo prior to any blasting taking place.

17. At the end of excavation the floor of the quarry and batter slopes will be rehabilitated to local native vegetation prior to decisions being made for an end use.

Processing

1. The amount of material to be excavated annually will depend on market demands, and this is expected to build up over time.

2. It is hoped that the throughput will be between 50 000 and 100 000 tonnes. A mobile crusher throughput of <50 000 tonnes does not require licensing by the DEC. When the throughput is likely to exceed 50 000 per year a licence from the DEC will be applied for.

3. The mobile crushing plant will be located in the base of the pit. The crushed material will be taken to the limestone block production area where a small amount of cement will be added, combined with water, to make the feed for the reconstituted block manufacture.

4. The reconstituted limestone manufacturing will utilise a limestone batching plant that will be located on the floor of the proposed pit in a similar manner to other such quarries operating in the local area.

5. The raw feed is provided to the limestone batching plant from which reconstituted limestone is utilised or moulded into the reconstituted limestone blocks. The blocks are then stacked into a concrete curing area where they remain for 24 – 48 hours depending on weather conditions.

6. From the curing area the products are loaded into the stacking facility onto pallets for transport.

7. Blocks are loaded onto road transport from the product storage bay.

Details of the Landform Restoration and Rehabilitation are Listed under 6.6 Rehabilitation Program.

4.2 Staging and Timing

The proposed excavation is planned to commence in the north eastern corner and move south and west. An access road will wind in from Nowergup Road, with excavation commencing some 160 metres from the entrance.

See the Staging plan.

A total of 7.0 hectares of resource is proposed to be excavated within a 20 year approval period. With a 12 year approval period an anticipated area of 4.0 hectares is likely to be able to be excavated in the time frame.

4.3 Hours of Operation

Hours of operation will be 6.30 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays. This is similar to the operations of nearby quarries in the local area and is necessary to enable a 7.00 am start at construction sites and road works. For example the City of Wanneroo and Main Roads require construction materials at 7.00 am.

The commencement of operations further south will enable the operations to comply with the *Environmental Protection (Noise) Regulations* 1997 at earlier start times than 7.00 am.

A 6.30 am start time is proposed for transport of limestone products, with crushing and dozing not to commence until 7.00 am.

Transporting material on Saturday should not present a problem because of the high traffic volumes using local roads and low numbers of dwellings. Truck traffic will travel west along Nowergup Road to Wanneroo Road. Transport will not be along Gibbs Road or past any dwellings.

HOURS OF OPERATION			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Operating times	• Hours of operation will be 6.30 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays for transport, with other operations such as crushing and dozing commencing at 7.00 am.	The proponent will comply with the approved hours of operation.	Compliance with the Excavation Management Plan. Compliance with Licence and operating conditions

4.4 Machinery and Equipment

The following equipment is likely to be used during the excavation of limestone.

Site office/lunchroom	Located in the south west for the management and security of small items.
Toilet system	A septic or serviced portable toilet system is to be installed at the site office.
Machinery shed	Located in the south west of the site for the sharpening of dimension stone saw blades and minor day to day servicing of plant.
Bore	A bore is proposed if a water allocation and licence is available through DEC. Water will be pumped to a tank on the high elevation and gravity fed to the operations from that tank. If a bore cannot be sunk arrangements will be made with an associate to source water from an existing nearby licensed bore such as WA Limestone Flynn Drive operation.
Fenced compound	Located on Lot 1 for the storage of mobile plant.
Bulldozer	Clearing and movement of limestone as required and for use in land restoration. Operation will be intermittent
Water tanker	Used for dust suppression on the access road and working floors as required. Alternatively a tank with sprinklers can be used for dust suppression.
Loader and bobcat	The loader will be used for the movement of limestone, loading road trucks and feeding any crushing and screening plant.
Blasting	Unlikely to be used. If used will only be required to produce armour stone. Prior to any blasting a blasting management plan will be prepared.
Weighbridge	At this stage a weighbridge is not proposed but may be

	included at a later date if required.
Fuel Storage	Unlikely to be used but if required is to be located on site and lined with impermeable membrane to DOIR and DEC guidelines
Site office	A site administration/office area will be attached to the main processing shed.
Toilet system	A conventional septic toilet system will be installed at the administration area.
Machinery shed	A colourbond storage shed will be located on site within the fenced compound for the storage of excavation equipment and small maintenance items.
Processing facility	A colourbond shed 30 x 35 metres with two curing areas attached.
Bore	A bore will be installed to supply water to the site
Fenced compound	A fenced compound will be installed to manage machinery. Some machinery is to be brought to the site as required.
Water tanker	Used for dust suppression on the access roads and working floors as required. Alternatively a tank with sprinklers can be used for dust suppression.
Forklift	Loading palleted product onto road trucks
Portable crushing and screening plant	A portable crushing and screening plant is required for the preparation of raw feed for the processing plant and the preparation of road bases and construction materials. This will be located on the floor of the pit. Initially as the throughput will be less than 50 000 this will not require a licence through the DEC. However when a throughput of >50 000 tonnes is proposed a licence will be obtained from the DEC.

All static and operational equipment will work on the quarry floor to provide maximum sound and visual screening where possible.

A fenced yard and large shed are proposed for the security of mobile plant.

All mobile and static plant associated with the processing of limestone will be registered or licensed by the Department of Environment and Conservation.

Scale and Intensity of the Operation

To cut 1 : 2 batters there will be 850 000 m^3 of limestone and sand. It is likely that not all sand will be taken and some excavation batters will be 1 : 4 vertical to horizontal, so the volume is more likely to be 750 000 m^3 for a 20 year approval.

This equates to 1 125 000 tonnes. For a 12 year approval the respective volume is likely to be 500 000 m^3.

Final batter slopes for the western side where the building envelopes are to be located will be less than 1 : 5 vertical to horizontal. See the attached contour and staging plans.
Truck sizes vary but with say a maximum of 40 tonnes in each truck and trailer, and at a maximum of 10 loads per day on say 300 days, this equates to 120 000 tonnes per year on average working at full intensity. This provides for a ten year life at that rate of excavation. However as truck loads vary, contracts are intermittent and with competition, a likely scenario is that less material will leave site annually and therefore the 12 and 20 year concept footprints are appropriate.

As this is anticipated to be the maximum rate of excavation an application for 20 years is made to cover slower rates of excavation. It should be noted that at slower rates of excavation the number of daily truck movements will be less on average.

The number of trucks is finite. If more material is carted out in a shorter time, the life of the pit will be reduced, or there may be more traffic on some days and less on others. The trucks will not have to travel past any dwelling in Nowergup Road.

The quarry is likely to be worked intermittently when the limestone is used as roadbase.

It is still proposed to cut to 1 : 2 or steeper operational batter slopes/faces adjacent to Community Type 26a in the east, but to reflect the City of Wanneroo wishes the final land surface will be pushed to a slope of 1 : 5 and lower horizontal to vertical over all other areas and rehabilitate to native vegetation.

The eastern face will be reformed at 1 : 2 horizontal to vertical as no building envelopes are proposed for that face, which will allow the quarry to be cut to 21 to 23 metres AHD to enable the pit to be worked well below the natural land surface and to maximise the limestone resource. See attached plans.

4.5 Access and Transport

Transport is proposed along Nowergup Road directly to Wanneroo Road. This will negate transport impact on local residents.

Access to the site will continue to be the road that is used by the adjoining limestone operation to the north which uses an access road located on Lot 1. From the entrance the access road will wind between the larger Tuart trees to the excavation area commencing at the break of slope.

The first 100 metres of access road will be sealed to minimise dust generation and carry to Nowergup Road. The crossover will be formed, kerbed and sealed to the satisfaction of the City of Wanneroo prior to commencement of limestone extraction.

The site will be fenced in the area of the access point and extending along the boundaries to prevent inadvertent and unauthorised entry. In places large boulders will be used to discourage four wheel drive access.

A stranded wire fence and signs will be erected above vertical faces.

Appropriate signs will be erected on site as required, combined with locked gates and perimeter fences maintained at all times when the site is not manned, as required by the Department of Mines and Petroleum, Main Roads and the City of Wanneroo.

In some areas vehicle barrier fences are not likely to be required because the vegetation is so thick and prickly that the public is unlikely to walk across the site, and the limestone is rough with pinnacle formation preventing off road vehicles.

WA Limestone will use a range of semi-trailer truck or truck and trailer combinations to transport limestone products, with an average of up to 10 laden vehicle movements per day.

4.6 Workforce

The workforce will vary, depending on the level of operation and market demands, but usually 2 to 3 persons can be expected to be working on site at any one time.

4.7 Water Use

Water is to be mainly used for dust suppression and the manufacture of reconstituted limestone products through limestone batching. The Environmental Protection Authority listed the project for a limestone quarry and batching plant as "Not Assessed – Managed under Part V of (Works Approval and Clearing)" on 9 September 2009. This decision was subsequently appealed and the Appeal dismissed by the Minister for the Environment on 30 March 2010.

The EPA determined that that neither the quarry or the limestone batching would contribute to a significant environmental impact and that adequate controls are available under the Works Approval and Licensing Processes.

The site lies within the Nowergup Groundwater Sub-Area.

As noted in the Management Plan water supply will be sought by approaching the Department of Water, arranging the transfer of an allowance from a related party or transporting water to the site.

A bore is proposed if a water allocation and licence is available through Department of Water. Water will be pumped to a tank on the high elevation and gravity fed to the operations from that tank.

If no bore allocation is available an allocation will be transferred from the quarry operated by an associate of WA Limestone or trucked in from WA Limestone pit in Flynn Drive. WA Limestone has links with other operators such as Building Block Company in Hopkins Road who may have a small excess allowance. WA Limestone also operates on Lot 22 Flynn Drive Neerabup.

Experience by WA Limestone shows that on a relatively small quarry such as this 1 500 kL is sufficient to adequately manage dust risk.

Potable water is to be brought to the site as needed.

4.8 Safety

The site will operate to the *Mines Safety and Inspection Act 1994 and Regulations 1995,* which are administered by the Department of Mines and Petroleum.

The issues of road safety are discussed under 4.3 Hours of Operation and 4.5 Access and Transport.

WA Limestone is committed to maintaining a safe working environment.

WA Limestone has Safety Management Plans for all their sites to cover operational procedures which includes workforce induction and training to ensure that all employees involved in limestone excavation are made aware of the environmental and safety implications associated with all stages of the mining activities.

Where applicable Safe Operating Procedure Sheets are available for hazards. Workers and staff are trained in the use of the procedures and all employees provided with site induction and training as necessary prior to commencing work on the site.

See 4.5 Access and Transport for site security and 4.12 Fire Management.

A key aspect of site safety is the provision of fencing and signage.

SAFETY			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Operational Safety	*Mines Safety and Inspection Act 1994 and Regulations 1995.* ▪ The site is within mobile and landline telephone contact. ▪ Safety Management Procedures will be implemented prior to commencement. ▪ All workers will be provided with site induction and necessary training prior to entering the site.	WA Limestone is committed to maintaining a safe working environment. WA Limestone has standard Safety Management Plans for all operations.	Compliance with *Mines Safety and Inspection Act 1994.* Ongoing
Adjoining properties	*Mines Safety and Inspection Act 1994 and Regulations 1995.* • Warning signs are to be erected around the operating area. • Locked gates and fences will be maintained on site.	WA Limestone is committed to maintaining a safe working environment.	Compliance with the Excavation Management Plan. Compliance with *Mines Safety and Inspection Act 1994.* Compliance with Licence and operating conditions

4.9 Visual Management

Visual Impact can occur in a number of circumstances, by the operation being set too high in the landscape, by being too close to neighbours and by insufficient visual protection.

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible. The general management actions are summarised below together with the visual impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise visual impact.

The quarry will cut below natural ground level which will minimise visual impact from local roads. There may however be some visual impact from the northern part of the grounds of the hotel to the south.

The access road will wind between the Tuart trees to the first stage. A small cutting will be required. This will assist in better visual management from Nowergup Road.

Overburden will be used to form screening perimeter bunds particularly along the southern edge of the excavation area. These will be planted with local native trees to provide temporary vegetation screening. Planting rate for the screening vegetation will be 100 trees and shrubs per linear metre.

The batter slopes will be rehabilitated with seeding and direct transfer of topsoil and local vegetation cleared from the site, to minimise the long distance visual impact.

The closest existing dwellings are to the east associated with market gardens, intensive poultry and other horticulture activities. The dwellings are also separated by an existing quarry and lime manufacturing facility which adjoins the east of the site. The closest dwellings to the east are 350 – 450 metres away.

The tavern to the south is 260 metres from the southern edge of the excavation. No windows at the tavern face the quarry, but a small outdoor area does have view of lot 1. Most of the focus of the tavern is to the west away from Lot 1.

A line of fast growing local Eucalypt trees and shrubs at 100 of each per linear metre will be planted around the southern edge of the pit, on the bunding of overburden inside the approved footprint, to provide additional visual screening for the tavern. It is noted that most tavern patronage will occur in the evening when the site is dark. See Figure 9.

The pit will be progressively rehabilitated by the careful use of top soil as discussed in 6.6 Rehabilitation Program.

Excavated areas will be progressively rehabilitated as they are completed.

IDEAL OPERATIONAL PROCEDURES	**COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE**
• Locate exposed features behind natural barriers and landform.	• A bund is proposed for the perimeter formed by pushing overburden to the edges when the pit is opened. • The bund will be provided with interim vegetation of shrubs and trees in the first winter. • Excavation will be from the floor of the pit.
• Operate from the floor of the pit below natural ground level.	• This is proposed. • The pit will be worked from the inside via an internal haul road.
• Avoid breaks in the skyline due to workings and haul roads.	• The operations will be below natural ground level.
• Push overburden and interburden into positions where they will not be seen or can form screening barriers.	• Perimeter bunds are proposed to screen operations, stockpiles and dumps. See above.
• Construct screening bunds and plant tree and shrub screens to reduce visual impact.	• Perimeter bunds are proposed. A line of trees and shrubs at 100 of each per linear metre are to be planted along the southern edge of the approved pit to provide additional screening for the patrons of the tavern.
• Stage workings and progressive rehabilitation to provide visual protection of later activities.	• This is proposed. • The access road will wind between Tuart trees to the break of slope providing better visual screening from Nowergup Road.
• Cover barriers and landscaping with forms, colours and textures compatible with the natural environment.	• Perimeter bunds are proposed and are to be provided with interim trees and shrubs in the first winter following formation.
• Adopt good house keeping practices such as orderly storage and removal of disused equipment or waste.	• WA Limestone maintains a tidy work environment on all sites. • A waste management plan of procedures is proposed.
• Provide progressive rehabilitation of all completed or disturbed areas.	• The final end use is native vegetation and ultimately small rural lots. Revegetation of completed surfaces will be interim using local native species prior to that end use.
• Minimise the amount of ground used at any one time.	• This is proposed. Only ground required for excavation will be prepared, and rehabilitation will progressively follow excavation. • Sufficient ground must be opened to provide a full range of products.
• Install fences and gates which are compatible with the style of the area.	• Gates and fences are to be maintained at the entrance from Nowergup Road.
• Minimise offsite impacts of night	• Night operations are not proposed.

lighting.	• Some security lighting may be used, directed away from sensitive views such as the tavern.
• Paint and maintain buildings exposed, plant and equipment with low impact colours.	• Plant is located on the floor of the pit so this is less applicable. None is likely to be visible from dwellings or roads.
• Locate roads and access to prevent direct views into the site	• The internal access/haul road will commence from the entrance. • Access is proposed to be from the sealed Nowergup Road. • The access road will wind between Tuart trees to the break of slope providing better visual screening from Nowergup Road.
• Locate buildings, plant and stockpiles in areas of low visual impact and maintain appropriate size.	• Plant is to be located on the floor of the pit so this is less applicable. None is likely to be visible from dwellings or roads.
• Provide temporary revegetation of road embankments and disturbed areas as soon as practicable.	• Interim native vegetation will be used for temporary soil stabilistation where required.
• Control weeds and maintain amenity planting.	• A weed control program is proposed.
• Ensure transport vehicles do not spill material on public roads and ensure prompt cleanup if it occurs.	• Company practices and drive/operator training address the need to minimise spill by ensuring the trucks are not overloaded or material is not left on the outside of trays. • Collection of spills is carried out when reported. • Drivers are instructed to be responsible for their loads. • All loads are required to be covered by company policy.

Light Overspill

The site will not operate at night. The only lighting that might be required at night could be security lighting. Security lighting if used will be located to minimise light visibility from roads and neighbours.

VISUAL MANAGEMENT			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Neighbours or road users.	• The active operations are unlikely to be seen from the closest dwellings at 350 - 450 metres to the east, but may be seen from grounds of the hotel to the south. • Tree belts will be used to the south to minimise the visual impact from the grounds of the hotel. • The methods of excavation and staging have been designed to minimise visual impact. • Every effort will be made to minimise the visual impact using appropriate methods from those listed above. • Rehabilitation will progressively follow excavation as outlined In 6.6 Rehabilitation Program.	WA Limestone is committed to minimising visual impact and will implement the measures outlined.	Compliance with the Excavation Management Plan. Ongoing

4.10 Noise Management

Offsite noise is governed by the Environmental Protection (Noise) Regulations 1997.

The Environmental Protection (Noise) Regulations 1997, require that sensitive premises including dwellings in non industrial areas are not subjected to noise levels exceeding 45 dBA for more than 10% of the time, 55 dBA for more than 1% of the time and never exceeding 65 dBA during normal working hours. There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, although impulsiveness is not likely to be relevant.

Occupational noise associated with the quarrying processes falls under the Mines Safety and Inspection Act 1994 and Regulations 1995. The management of occupational noise is normally handled by providing all necessary hearing protection, as well as conducting worker inductions, and educational programs for all staff. Regular site audits of quarry and mining operations are normally conducted by the Department of Industry and Resources.

Blasting noise (airblast overpressure) is controlled by the Department of Environment and Conservation under the Environmental Protection (Noise) Regulations 1997. Environmental Protection (Noise) Regulations stipulate that 9 out of 10 consecutive blasts are to be less than 120dB with no blast exceeding 125dB. Ground vibration is controlled by Australian Standard which lists a maximum vibration of 10mm/sec for dwellings and 20mm/sec for commercial premises. The Department of Environment and Conservation normally requires that 9 out every 10 blasts are to be below 5mm/sec with none above 10mm/sec.

Blasting

Blasting is not likely to be used.

Normal Quarry Management

There are a number of management actions that can be taken in quarries to minimise noise generation or travel and these will be used wherever possible. The general management actions are summarised below together with the potential noise impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise noise on this site.

The effective management of personal noise levels for workers on site will also assist in reducing environmental noise generally.

Compared to existing sand and limestone pits in Perth, where the pits are operated behind screening bunds, the buffers can be as small as 40 – 60 metres. For example Cockburn Cement at Fanstone Avenue in Munster, or Italia Stone Group in Dalison Road and Wattleup Roads, and WA Limestone at Kerosene Lane. These are all approved limestone and sand pits that use bulldozers in continuous or campaign operations and demonstrate that compliance is able to be achieved at distances of less than 100 metres.

These other quarries are able to operate as a result of earth bunding and effective dust management.

Earth bunding and the form of the quarry will be used to maximise noise screening. Crushing operations will occur behind bunds or screening walls.

The commencement of operations further south will enable the operations to comply with the *Environmental Protection (Noise) Regulations* 1997 at earlier start times than 7.00 am.

A 6.30 am start time is proposed for transport of limestone products, with crushing and dozing not to commence until 7.00 am.

The following table summaries the methods that are normally used in quarries to minimise unacceptable noise generation and ensure compliance with the regulations.

IDEAL NORMAL OPERATIONAL PROCEDURES	**COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE**
• Comply with the *Environmental Protection (Noise) Regulations 1997.*	• WA Limestone will comply with the Regulations. • WA Limestone will comply with the Noise Consultants' report and any recommendations that are contained within that report.
• Maintain adequate buffers to sensitive premises.	• The closest existing dwellings to the west are over 350 to 450 metres from the edge of the limestone excavation, behind natural landform and tree belts, with an old limestone quarry and lime plant between. • A hotel lies to the south at a distance of 260 metres. This is a commercial premises which has higher allowable noise levels and is influenced by the close proximity of Wanneroo Road. • The proposed quarry will operate at similar distances from the dwellings as occurs at other quarries, demonstrating that compliance with the Noise regulations is achievable. • Excavation has been designed and staged to minimise potential impact.
• Locate exposed features behind natural barriers and landform.	• Excavation and processing will be conducted on the floor of the pit 5 - 20 metres below natural ground level behind constructed perimeter bunds.
• Operate from the floor of the pit below natural ground level.	• This is proposed.
• Push overburden and interburden dumps into positions where they can form screening barriers.	• Perimeter bunding is proposed.
• Design site operations to maximise the separation and protection from sensitive premises.	• Any crushing plant will be located on the floor of the pit behind bunding where appropriate and in a location to maximise the effectiveness of landform screening.
• Maintain all plant in good condition with efficient mufflers and noise shielding.	• WA Limestone has modern equipment that is maintained in good condition.
• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades.	• The access road will be maintained to a suitable standard in combination with other operators. The first 100 metres will be sealed. • Nowergup Road is sealed.
• Implement a site code outlining requirements for operators and drivers.	• WA Limestone have site induction and training for all personnel for all their operations.
• Design the operations to provide enhanced landform and constructed noise screening.	• This is proposed.
• Shut down equipment when not in use.	• WA Limestone use this policy to save fuel and maintenance costs in addition to noise minimisation.

• Scheduling activities to minimise the likelihood of noise nuisance.	• Any more noisy aspects of the operations which might lead to offsite impacts are to be conducted during normal working hours with potentially noisy operations between 7.00 am to 5.00 pm, Monday to Saturday. • Transport is proposed to commence at 6.30 am.
• Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible.	• Lights or low frequency frog beepers are to be used rather than high pitched beepers to restrict noise intrusion.
• Use transport routes that minimise community disruption.	• Transport will use Nowergup Road to Wanneroo Road.
• Avoid the use of engine braking on product delivery trucks in built up areas.	• Truck drivers will be instructed to minimise the use of engine braking.
• Minimise and conduct at the least disruptive times, non day to day activities such as vegetation, topsoil or overburden stripping on exposed ridgelines.	• Any more noisy aspects of the operations which might lead to offsite impacts are to be conducted during normal working hours with potentially noisy operations between 7.00 am to 5.00 pm, Monday to Saturday. • Transport is proposed to commence at 6.30 am.
• Provide a complaints recording, investigation, action and reporting procedure.	• A complaints recording and investigation procedure is proposed.
• Conduct training programs on noise minimisation practices.	• WA Limestone maintain site induction and training for all personnel.
• Provide all workers with efficient noise protection equipment.	• All personal noise protection equipment will be provided to staff.
IDEAL BLASTING PROCEDURES	
• Blasting is conducted to the *Mines Safety and Inspection Act 1994 and Regulations 1995.*	• Blasting is not likely to be used. However if it is used to produce armour stone, the operators will use small charges, with millisecond delays, to reduce air blast over pressure and ground vibration. If blasting is to be used, a "Blasting Management Plan" will be prepared and approved by the City of Wanneroo prior to any blasting taking place.

A Noise Study has been completed by Herring Storer, who found that the operations can comply with the Regulations. With commencement at the break of slope the potential for impact on the nearby dwellings is less and more easily managed.

The Noise Study prepared by Herring Storer concluded that noise emissions received at the closest sensitive premises would comply with the Regulations and that no particular amelioration is required, particularly when commencing south of the karst line. Appendix 4.

NOISE			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Noise may impact on neighbours	*Environmental Protection (Noise) Regulations 1997.* • The quarry complies with the Generic EPA Buffer Guidelines. • All static equipment and stockpiles will be located on the floor of the quarry. • Every effort will be made to minimise the noise impact using appropriate methods from those listed above. • Herring Storer completed a Noise Study and found the proposal complied with the Regulations.	WA Limestone is committed to minimising noise emissions and will implement the measures outlined. WA Limestone will comply with the *Environmental Protection (Noise) Regulations 1997.* WA Limestone will comply with the Noise Consultants' report and any recommendations that are contained within that report.	Ongoing
Blasting	• It is not anticipated that blasting will be required. However if blasting is to be used, a "Blasting Management Plan" will be prepared and approved prior to any blasting taking place.	WA Limestone is committed to minimising noise emissions and will implement the measures outlined.	If blasting is proposed, a "Blasting Management Plan" will be prepared and approved prior to any blasting taking place.
Workers	*Mines Safety and Inspection Act 1994 and Regulations 1995.* • All workers will be supplied with the correct noise protection equipment. • Workers will be inducted to the site and instructed in the use of noise protection equipment and the potential hazards and minimisation.	Noise management implemented by WA Limestone will comply with the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995.*	All workers will be supplied with adequate noise protection equipment as required when operating machinery. Ongoing

4.11 Dust Management Plan

Excessive dust has the potential to impact on both the workers and the adjoining land.

Dust can originate from a number of operations and may impact on onsite workers, or travel offsite. Potential dust impacts are addressed by reducing the dust generated from the quarrying, processing and transport operations.

Dust emissions fall under the Guidance for the Assessment of Environmental Factors, EPA, March 2000. Assessments of the potential dust risk are normally made using the Land development sites and impacts on air quality, Department of Environmental Protection and Conservation Guidelines, November 1996.

There are a number of management actions that can be taken in quarries to minimise dust generation or travel and these will be used wherever possible. The general management actions are summarised below together with the potential dust issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise dust on this site.

It is not acceptable to permit environmental dust to travel offsite or to be generated at levels that may impact on health and safety. Therefore every effort will be taken to minimise dust generation. The methods proposed are the same as those used in all limestone and sand quarries.

Excessive dust has the potential to impact on both the workers and the adjoining land. The effective management of personal dust levels for workers on site will also assist in reducing environmental dust generally.

The access road will be bitumen and will be swept as necessary or have sprinklers installed to reduce the generation of dust in the drier months.

Transport will be to the west to Wanneroo Road, away from dwellings.

On this site, WA Limestone will take the necessary steps to manage and contain dust by incorporating the methods listed above.

The surrounding land is used for quarrying, poultry farms and market gardens.

The existing perimeter natural bushland will be retained, and in strategic locations vegetated screening bunds are proposed to be added.

From sand and limestone extraction the main particles are sand sized particles from the sand itself and from the limestone.

For sand these are normally in excess of 0.5 mm and have a capability of moving by saltation and do not travel far, being easily stopped by vegetation, pasture, small banks or other features. For limestone the calcareous material can crush from transport and other activities into fine dust that is capable of blowing if not treated with water.

Crushing and screening the limestone does not normally produce significant dust because even in summer the limestone remains moist. On the other hand the continuous traffic on the access roads and work areas is what generates the highest dust potential. These are the areas treated with water.

Dust can also be a potential problem during land clearing and reinstatement and during excavation and crushing in the summer months in times of strong winds.

It should be remembered that the most significant potential dust impact is occupational dust, which requires good environmental and health and safety management and is regulated by the *Mines Safety and Inspection Act 1994 and Regulations 1995*. When occupational dust is managed then environmental dust is also minimised.

A water tanker is to be maintained on site during excavation when there is a risk of generating excessive dust. The capacity of the tanker is 10 000 L or similar. During potentially dusty conditions the water truck will make as many sweeps around the site as required, but normally 5 – 6 sets of sweeps around a limestone pit are required to suppress dust. In winter when rain occurs the water truck may only require one or two sweeps around the site or none in sufficient rainfall conditions.

The water is used to settle dust on the pit floor and reduce the dust emanating from any crushing operation.

Apart from the initial topsoil clearing and surface reinstatement, all operations are proposed to be conducted below natural ground level. Bearing in mind the distances involved and the dust suppression methods in place, dust should not impact on any dwellings.

When limestone is placed and not disturbed it readily develops a crust of reprecipitated calcium carbonate that tends to stabilise the surface. Also the fine particles are washed below the surface leaving only coarse material behind. Therefore bunds do not normally generate dust, and become stabilised after experiencing a winter. It is really only the traffic and active areas that are highly susceptible to dust generation.

The prevailing winds are from the south west, particularly in the afternoon. In summer the easterly in the mornings and the sea breeze in the afternoon can be quite strong. At 3.00 pm wind speeds exceed 10 kph for 80 % of the time in summer but only 30 % to 40 % in winter. At other times the wind speed is calm for 30 % of the time in winter at 9.00 am and 10 % in summer, with 40 % of the time exceeding 10 kph in summer and 20 % in excess of 10 kph in winter.

The most likely time for dust to become an issue is on summer mornings when winds are easterly, blowing away from the dwellings to the east. With operations below natural ground level, protected by landform and tree belts, it is unlikely that dust will impact on nearby residences.

Dust emissions fall under the *Guidance for the Assessment of Environmental Factors, EPA, March 2000*. However an assessment of the dust risk can be made using the *Land development sites and impacts on air quality*, Department of Environmental Protection Guidelines, November 1996 and *DEC 2008, A guideline for the development and implementation of a dust management plan*, which reveal that the risk of dust impacting on the closest dwellings is as listed below. It must be remembered that this guideline is not really appropriate for quarries. It was developed for subdivision earthworks at a time when dust management was a lower priority.

Activity	Calculated Score	Allocated Risk of Dust
Excavation of limestone	252	Low
Land clearing and excavation	252	Low

Treatment of dust is normally managed through the use of water for dust suppression, and therefore dust is not normally a problem in winter.

DEC has a draft guideline for the development and implementation of a dust management program, which has been considered in the development of this dust management plan. The actions suggested by DEC are included.

All quarries have active and comprehensive dust management procedures in place and are required to do so to protect visual amenity and their staff. The Guidance has been used, but factored in is a reasonable amount of dust management. Using the normal dust management there is a negligible risk of dust impacting on sensitive premises west of the quarry.

- Best practise dust management procedures apply to quarries and are used on site. These are listed in the following table with a comment on how WA Limestone proposes to manage potential dust issues.

- The trigger for dust management is to be the generation of visual dust.

- The site supervisor is normally the loader driver or site weighbridge operator, who is in the best position to assess dust generation and to direct remediation.

- No visible dust will cross the lot boundaries.

- On site operators are to be instructed to visually monitor dust, report and treat any visible dust.

DUST MANAGEMENT ACTIONS

ACTIVITY	POSSIBLE RISK SEVERITY and FREQUENCY	IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE	RISK AFTER MANAGEMENT
GENERAL				
Legislation	----	• Comply with the provisions of the Mines *Safety and Inspection Act 1994 and Regulations 1995*.	• WA Limestone comply with the Act and Regulations at all their pits.	----
Buffers	----	• Maintain adequate buffers to sensitive premises.	• Buffers are similar to existing operating limestone quarries and are considered adequate. A poultry farm and existing quarry lie between dwellings and this proposed pit. • The prevailing winds blow away from the tavern.	----
Landform	----	• Locate activities behind natural barriers, landform and vegetation.	• This is proposed.	----
Landform	----	• Work below natural ground level.	• This is proposed.	----
		• Push overburden and interburden dumps into positions where they can form screening barriers.	• This is used.	----
Vegetation	----	• Retain natural vegetation buffers and plant screening barriers with trees.	• A buffer of established perimeter vegetation will be retained around all sides of the pit. • Perimeter revegetated earth bunding will be established in strategic locations. See Figure 9.	----
Staging	----	• Design operational procedures and staging, to maximise the separation to sensitive premises.	• Excavation is proposed to commence in the north eastern corner as this presents the most environmentally sound orientation for excavations.	----
Pit design	----	• Design the excavation to provide enhanced landform and constructed dust screening.	• See above.	----
Screening	----	• Use landscape screening, wind breaks and tree belts.	• This is proposed.	----
MANAGEMENT				
Occupation	----	• Provide air conditioned closed cabins on plant	• These are used for on site operational mobile plant.	----
Monitoring	----	• Provide monitoring and supervision of the processing and other practices on site.	• A monitoring system is proposed. see below “Trigger Conditions”.	----
Trigger conditions	----	• Trigger conditions are used to determine when additional dust management is required.	• Most dust generated from limestone excavation is visible dust with only minor smaller particulate dust. • The trigger for dust management is the generation of visual dust. • The site supervisor is normally the loader driver operator, who is in the best position to assess dust	----

			generation and to direct remediation. • A commitment is made that no visible dust will cross the lot boundaries. • On site operators are to be instructed to visually monitor dust, report and treat any visible dust.	
Adverse weather	Moderate - Uncommon in winter, more common in summer.	• When winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.	• This policy will be implemented and is normal company policy to minimise impact on adjoining land holders.	Low
Equipment failure	Low to moderate - Uncommon	• In the event of dust management not being able to be achieved through equipment failure operations will cease until full capability is restored.	• This is committed to.	Low
Training	----	• Conduct training programs on dust minimisation practices.	• WA Limestone will use on site induction and training to all personnel at all operations.	----
Complaints	----	• Provide a complaints recording, investigation, action and reporting procedure such as Appendix 3 of Land development sites and impacts on air quality, Department of Environmental Protection Guidelines, November 1996.	• A record of all dust complaints is to be maintained together with the mitigation measures to be used to reduce the dust impacts. • All complaints relating to dust are to be investigated immediately on receipt of a complaint. Appendix 3 of *Land development sites and impacts on air quality*, Department of Environmental Protection Guidelines, November 1996, will form the basis of the methods on which a complaint on dust is dealt with.	----
EARTHWORKS				
Land Clearing	Moderate - Once per year	• Schedule activities such as vegetation removal or topsoil stripping on exposed ridgelines at times when the materials are less likely to blow or during suitable wind conditions.	• This is proposed. • Land clearing will be infrequent and normally conducted only once per year. • Where possible clearing will be completed in wetter months or when winds are blowing away from sensitive premises.	Low
Overburden removal	Moderate - Once per year	• Schedule activities such as overburden stripping on exposed ridgelines at times when the materials are less likely to blow or during suitable wind conditions.	• This is proposed. • Overburden removal will be infrequent. • Where possible overburden removal will be completed in wetter months or when winds are blowing away from sensitive premises.	Low
Land restoration	Moderate - Once or twice per year	• Schedule activities such as ripping, overburden and topsoil spreading on exposed ridgelines at times when the materials are less likely to blow or during suitable wind conditions.	• This is proposed. • Land restoration will be infrequent and normally conducted only once per year. • Where possible clearing will be completed in wetter months or when winds are blowing away from sensitive premises.	Low

EXCAVATION				
Drilling	Moderate - Only if blasting is used; not proposed	• Ensure the drill is provided with dust extraction and shielding.	• Drilling will not be required.	Low
Excavation	Low to Moderate - Frequent	• Excavate from the face using techniques that minimise the crushing of dry matter.	• Excavation will be normally completed by bulldozer deep ripping and track rolling limestone. When freshly exposed at any time of year the limestone is normally moist and has less capability to generate dust. • It is only when air dried that dust becomes a greater issue.	Low
Loading at Face	High - Frequent	• Ensure that products to be loaded are moist and that the hardstand on which the loading occurs is wetted down or moist.	• Air dried product will be wetted down with water canon or other methods. • Operational hardstand will be wetted down when dry and dusty. • Other contingencies will be used relating to operating times, additional water or sealant treatment and ceasing operations in adverse conditions.	Low to moderate
Haulage	Moderate to High - Frequent	• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades.	• Haul roads are to be regularly graded and maintained. They are to be watered regularly and have speed limits imposed.	Low
		• Reduce the length of the internal roads by maximising internal servicing efficiency.	• The shortest most safe access roads are to be used.	
		• Providing speed management on hardstand and the road network.	• This is proposed.	
		• Provide air conditioned closed cabins on plant.	• All vehicles will be air conditioned.	
		• Limit speed on haul roads.	• Speed limits will be imposed on the haul and access roads as normal quarry practise.	
		• Treat access roads, hardstand and stockpile transport and loading areas with dust suppression sealant, water or seal coat.	• Water and/or road sealant will be used to suppress dust. • A dedicated water truck (10 000L capacity) is to be maintained on site at all times during operations when dust lift off is a potential hazard. Alternatively sprinkler systems could be used.	

PLANT - PROCESSING				
Hardstand traffic	Moderate to high - Frequent	• Maintain hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades	• Effective maintenance of the hardstand combined with adequate water treatment is used to minimise dust. • Water treatment is most commonly carried out by water truck.	Low
Processing	Moderate - Frequent	• Treat processing areas with water sprays.	• Dust generated during processing is managed by dust suppression sprays, covers and shields installed throughout the crushing and screening plants as appropriate. • These sprays can used to moisten the material moving along the conveyor belts, but this is not normally necessary because the limestone is naturally moist when excavated and treating limestone wet product can clog crushers and screens so it is often not possible. • All dust covers and suppression equipment will be maintained and regularly serviced.	Low
Mobile and static plant Operation	Low to Moderate - Frequent	• Maintain all plant in good condition.	• WA Limestone has modern equipment that is maintained in good condition including the maintenance of dust minimisation measures.	Low
		• Ensure mobile and static plant is provided with dust extraction, shielding or filtration systems or wetting down as appropriate.	• Operators are instructed to visually monitor dust, report and treat any visible dust. • Faults are to be repaired promptly. • Regular maintenance programs for all dust suppression equipment are proposed. • Regular emptying of any dust collection devices and the renewal of any filter devices is programmed. • Dust management and monitoring forms part of the site induction programs.	
Loading and Stockpile Creation	Low to moderate - Frequent and in campaigns	• Shut down equipment when not in use.	• WA Limestone uses this policy to save fuel and maintenance costs in addition to noise minimisation.	Low
		• Limit drop heights from conveyors and dump trucks.	• This is implemented. It is a good safety and site management procedure.	

TRANSPORT				
Road condition	Moderate - Frequent	• Maintain access roads in good condition (free of potholes, rills and product spillages).	• Effective maintenance of the hardstand and access road in addition to a sealed crossover will be used to minimise dust. • Nowergup Road is sealed.	Low
		• Water and/or treat access roads and paved areas using a water tanker or sprinkler system.	• A dedicated water (10 000L) truck is to be retained on site and used when dust lift off is a potential hazard. Sprinklers may be used in some parts of the operation.	
Road Transport	Moderate - Frequent	• Wet down or cover loads on trucks that are likely to blow during transport.	• This is used for road haulage trucks. • An automatic wet down spray or loads will be covered. • Trucks are required to install tarpaulins or cover prior to exiting the quarry.	Low
		• Implement a site code outlining requirements for operators and drivers.	• A site code and induction system is proposed for the quarry.	
		• Maintain road trucks in a clean condition.	• WA Limestone road trucks are maintained in a clean condition. • Individual contractors are required to do likewise.	
		• Avoid spillages on roads and clean up promptly.	• WA Limestone has a policy of covering or wetting down loads and instructs drivers to report and clean up spillages.	Low
		• Ensure that during loading, product does not become lodged on the sides of trucks from where it can fall off during transport.	• This forms part of WA Limestone normal operational procedures.	
		• Drivers are to inspect trucks prior to leaving site. Any product not correctly located and secured is to be removed prior to exit from the site.	• This forms part of WA Limestone normal operational procedures.	

STOCKPILES				
Stockpiles	Moderate - Frequent and in campaigns	• Wet down stockpiles using water canon or sprinklers as required.	• Stockpiles will be assessed for their dust lift off potential and treated accordingly. Where required wetting down is to be used. • Sprinklers and water canon are proposed where necessary. • Limestone stockpiles readily form a crust that protects from dust lift off. • Sand from stockpiles moves by saltation up to 1 metre off the ground and is unlikely to escape the quarry faces as they will be located on the floor of the pit.	Low
		• Locate stockpiles behind bunds/ windbreaks or other screening barriers.	• This is normal practice.	
		• Reduce the height of stockpiles. Low flat stockpiles are less likely to be disturbed by wind than high conical ones.	• Stockpiles will be located on the floor of the pit at generally low elevations.	
		• Wash crushed products where possible.	• No washing is proposed.	
		• Locate coarser products around fine materials to assist wind protection of the finer products that are more likely to blow or contain greater amounts of dust.	• This is normal practice. • Perimeter vegetation is in place. • Finer materials will be located where dust liftoff is minimised.	
		• Provide bunding, fencing and windbreaks around stockpiles and along the tops of bunds.	• Perimeter vegetation is in place.	
		• Seal the stockpiles with spray on sealant.	• See above. Water is normally used.	
		• In extreme conditions stockpiles can be covered although this is often not practical.	• This is not normally practical and liftoff will be managed by wetting down and locating stockpiles on the floor of the pit.	

In the event of dust management not being able to be achieved, such as a water source breakdown or exceptional weather conditions, the dust generating activities will be stopped until conditions improve, to minimise impact on adjoining land holders.

When winds are sufficiently strong to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.

All complaints relating to dust will be investigated immediately on receipt of a complaint. Appendix 3 of *Land development sites and impacts on air quality*, Department of Environmental Protection Guidelines, November 1996, (or similar) will form the basis of the methods on which a complaint on dust is dealt with.

A record of all dust complaints will be retained together with the mitigation measures used to reduce the dust impacts.

Appendix 3.

Procedures to be adopted following a complaint from a land development site

The procedures to be adopted by the developer following receipt of a dust-related complaint from a member of the public should be as follows:

- Record the details of the complaint as specified below. The complaint form should be retained by the developer and be made available upon request by the local government or an authorised DEP officer.
- Take measures to control any excessive dust by implementing the contingency arrangements which have been specified for the agreed site classification.
- If the developer regards the complaint to be unjustified, then the developer should forward the details of the complaint to the local government within 24 hours.

As a guide, the procedures to be adopted by local government, following receipt of a dust-related complaint from a member of the public or passed on by the developer, should be as follows:

- Record the details of the complaint as specified below or on a local government-approved complaint form. The complaint form should be retained by the local government and be made available upon request to an authorised DEP officer.
- Evaluate the complaint by conducting a visual inspection, preferably as soon as possible, taking into account the prevailing weather conditions which were being experienced at the time the complaint was lodged.
- If the complaint is valid, instruct the developer to take measures to control any excessive dust by implementing the contingency arrangements which have been specified for the agreed site classification.
- If the local government regards the complaint to be unjustified, contact the complainant and inform them of these findings.
- If the local government is unable to resolve the complaint, after exhausting all possible avenues, then the local government may request advice from the DEP.

Appendix 3.

Pollution Incident Report Form - Land Development Sites

Sheet 3

Date: .....(1) **Time:**.....(2) **Received by:** .....(3)

From:

Name:.....(4) Tel. Nº·(s):.....(5)

Address:.....(6)

Area/Suburb:.....(7) Municipality:.....(8)

Name of developer:.....(9)

Address of developer .....(10)

Address of development: .....(11)

Type of complaint (Odour, Dust, Smoke, Noise, Other).....(12)

Details of Incident Received (effect/frequency): .....

.....

.....(13)

Referred to:.....(14) Date: .....(15)

Action Taken/Advice Given/Matter Referred to: .....

.....

.....

.....

.....(16)

Recorded by: .....(17) Date:.....(18)

DUST			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Neighbours	*Guidance for the Assessment of Environmental Factors, EPA, March 2000.* *Land development sites and impacts on air quality, DEP, 1996 and 2008..* • WA Limestone use the dust management methods listed above. • The potential for dust nuisance is assessed as "Low".	WA Limestone will take the necessary steps to manage and contain dust by implementing and maintaining the Dust Management Plan methods listed above.	Compliance with the submitted Dust Management Plan. Ongoing
Workers	*Mines Safety and Inspection Act 1994 and Regulations 1995.* • All workers will have access to efficient dust masks for use as required. • All workers will be instructed in the use of dust minimisation equipment.	WA Limestone will ensure the quarry operates to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.*	All workers will have access to efficient dust masks for use as required. All workers will be instructed in the use of dust minimisation equipment. Ongoing

4.12 Fire Management

The safety of workers is managed through a Safety Management Plan developed through the Mines Safety and Inspection Act 1994 and Regulations 1995.

There are a number of management actions that can be taken in quarries to minimise fire risk and these will be used wherever possible. The general management actions are summarised below together with the potential issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise fire risk.

- *Restrict vehicles to operational area, particularly on high fire risk days*
- *Use diesel rather than petrol powered vehicles*
- *Maintain perimeter fire breaks as required*
- *Ensure fire risk is addressed and maintained through the Safety Management Plan*
- *Provide an emergency muster area, communications and worker induction and training*
- *Establish on site water supplies for potential use in extinguishing fire*
- *Secure the site from unauthorised access*

There is less potential fire risk from quarries than other land uses because quarries clear land, and vehicles are restricted to cleared access roads, the pit floor, processing and stockpile areas.

These cleared areas form a natural firebreak. The main risk comes from an external fire in the surrounding vegetation, impacting on the quarry. As such the fire risk is no greater than a rural property.

Fire risk is normally controlled through the *Bush Fires Act 1954* and local authority bylaws.

There is little potential fire risk from limestone mining operations of this type. The quarry itself will form a natural firebreak. However fire is always a potential risk in remnant vegetation around the perimeter of Lot 1, but this is no different now. With excavation the pit will form a natural fire break, and water and mobile plant will be available for fire management.

Perimeter firebreaks will be maintained.

FIRE PROTECTION			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Fire Protection	*Bush Fires Act 1954* City of Wanneroo bylaws. • The excavated area will provide a natural fire break. • Perimeter firebreaks will be maintained. • Public access to the site will be prohibited and fences maintained. • Water for dust minimisation will be available for fire fighting. • The site is serviced by telephone.	WA Limestone will ensure the quarry operates to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.* WA Limestone will ensure the quarry complies with the local fire safety requirements.	Compliance with City of Wanneroo requirements. Ongoing

4.13 Karst Management

Lex Bastian concluded that the caves are restricted to the eastern edge of Lot 1 and will not be impacted on by the excavation. The excavation is not proposed to intersect the water table and will have a separation of 4 – 7 metres to the water table, which provides an allowance for seasonal changes.

Lex's map shows that there is possible deep karst under the central and western portion of Lot 1 in the area nominated as Limestone Heath by Lex Bastian (Appendix 1).

In reference to these areas Lex states "Experience has shown that such caves become progressively smaller due to increasing saturation of dissolved calcium carbonate westwards in cave streams. Thus although they may be present they are likely to be deep at the water table as well as not of significant size, such as would preclude the proposed operations".

The excavations have been revised to commence south of the line identified by Lex Bastian, with just the access road crossing the area of possible karst identified by Lex Bastian. The area identified by Lex Bastian was identified as potentially having karst but those features are likely to be filled by sand.

KARST MANAGEMENT			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Karst Protection	• The excavation has been located to protect the known karst features. • Lex Bastian noted that the nature of the potential karst on site and the location and form of the proposed quarry would not preclude the proposed operations. • See Appendix 1.	WA Limestone will ensure the quarry operates to the approved plans.	Compliance with City of Wanneroo requirements. Ongoing

5.0 HYDROLOGY

5.1 Local Hydrology

The site is located on a low limestone ridge which rises from 20 metres in the north east to 60 metres in the south, with the deepest floor elevation proposed to be 20 metres AHD.

The water table was at a depth of 17 metres AHD on the eastern boundary of Lot 1, dropping to 15 metres AHD at the edge of the proposed excavation in May 2003, dropping from the north east (Perth groundwater Atlas). This elevation is 4 – 7 metres below the proposed base of the pit, which forms a buffer for seasonal changes to the watertable; even after allowing for rises in the water table. Flow of the groundwater is from the north east to south west. Perth Groundwater Atlas 2004. See also Appendix 1 Karst Assessment.

A bore will be applied for through the Department of Water. If no bore allocation is available water from an associate of WA Limestone or their operational pit in Flynn Drive will be used.

5.2 Protection of Water Quality

The protection of water whether groundwater or surface water is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Guidance on the quality of water can be found in;

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*

- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*
- *Environmental Protection Authority Victoria/Melbourne Water, undated, Urban Stormwater, Best Practice Environmental Management Guidelines*
- *Water and Rivers Commission, 1998, Manual for Managing Urban Stormwater Quality in Western Australia.*

Documents specific to the mining and quarrying operations are the DEC – DOIR Water Quality Protection Guidelines for Mining and Mineral Processing.

- *Overview*
- *Minestite water quality monitoring*
- *Minesite stormwater*
- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*
- *Mine dewatering*

A list of the management actions which are contained in the above documents is provided below. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

IDEAL OPERATIONAL PROCEDURES	**COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE**
• Contain all stormwater on site and only release clean, treated water	• The pit will be internally draining. • All stormwater will collect on the porous floor of the pit and infiltrate into the ground as happens on all other limestone pits. • At the end of excavation the internal road will drain to small adjoining soakage basins.
• Maintain all plant in good condition	• All WA Limestone plant is maintained in an efficient operational condition.
• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades, and direct runoff to trapping and filtration device.	• Haul roads are to be limestone based, formed, graded, wetted down and maintained. • Nowergup Road is sealed. • Water from the entrance and crossover will be directed to small table drains or soakage basin.
• Recycle water through sediment settling ponds if possible.	• As the pit floor is so porous it is difficult to achieve recycling, and there is not proposed to be a wash cycle to recover water. Therefore sediment settlement dams are not appropriate and are not proposed.
• Provide an approved serviced portable or septic toilet system	• Portable serviced toilet systems will be used, but will be replaced by a septic system if the site is used more continuously. • The waste water system will be located with the site office in Stage 1.
• Separate extraction, washdown and storm water if water is used	• As stormwater is contained, all water is treated as pit stormwater. • Stormwater from the access road will be shed to the adjoining soils and table drains.
• Implement a site code outlining requirements for operators and drivers	• This forms part of the normal operational procedures of WA Limestone.

• Avoid spillages on roads and clean up promptly	• This forms part of the normal operational procedures. WA Limestone has procedures in place to deal with spillages of any type at all their pits.
• Conduct training programs on pollution minimisation practices	• Site induction and training will be used. These contain programs dealing with pollution prevention.
• In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved	• This is included as part of the normal operational procedures and is proposed.
• All significant adverse incidents are to be recorded, investigated and remediated. A record is to be kept of incidents and the Local Authority and Department of Environment and Conservation notified within 24 hours.	• A site office is proposed. • A site record book is to be retained. • Any incidents will be reported annually within one working day to the DEC, DMP and City of Wanneroo.
• Provide an environmental monitoring and audit program.	• WA Limestone has internal monitoring and recording at all operations.
• Monitor water quality	• As there is no surface water, sampling of that waterbody is not appropriate. • The pit floor will be 4 - 7 metres above the water table. • Groundwater pollution risk is recognised as low by the DEC/DOW and EPA who permit excavation of sand with a 3 metre separation to the water table in Priority 1 Groundwater Protection Areas and 2 metres in other areas. • Water monitoring bores are to be established at both the eastern and western edges of the site to provide data on groundwater quality. Data collection is to be conducted six monthly.
• Provide a complaint and remediation program in the event of non conformities.	• A site record book is to be retained. • All complaints are to be investigated. remediated and recorded in the record book
• Comply with all operational conditions.	• This is normal operational procedures.

The extraction of limestone and sand is a chemically free operation with the only liquids used being lubricants for machinery. Extractive Industries are one of the few industries permitted to operate in Groundwater Source Protection Areas provided a 2 metre vertical buffer is in place.

The proposal complies with Department of Environment and Conservation Guidelines.

Recharge and Water Use

The area has no surface drainage because of the permeable and porous nature of the sand and limestone. The site lies outside the Gnangara Priority Water Source Protection Area. There is no surface drainage from the excavation site. All excess water infiltrates the permeable limestone.

There will be no alteration to drainage lines, and neither surface water nor ground water will be affected. On closure the surface will continue to be free draining to the water table.

Drainage is to the water table which has a separation of at least 4 metres from the proposed excavated surface therefore providing allowance for any seasonal changes to the water table.
The nature of limestone extraction is that excavation is conducted dry with water being used as a dust suppressant. There is no potential for water recycling or reuse as the limestone is so porous, and this will not be undertaken.

As the limestone is so porous the only potential runoff is minimal surface water during heavy storm events. Therefore the only requirement for stormwater treatment is the direction of stormwater away from hard surfaces towards infiltration areas which will normally be broad areas of infiltration adjacent to the roads and hard stand.

Recharge from native vegetation is anticipated to be near 10% based on the vegetation and elevation above the water table. Recharge on excavated areas will increase to perhaps 40% because of smaller separations to the water table and removal of the vegetation. (Environmental Protection Authority Bulletins 512, 788, 821 and 818). This will result in an increase in recharge equivalent to 72 mm per year to 288 mm.

As the cleared area will be 7.0 hectares the recharge increase will be 15 120 kL per year. This will add to the regional water table and help compensate for bore water draws in the local area and reduced rainfall in recent years. As rehabilitation grows this additional recharge will decrease progressively.

The proposed operation complies with all Government Policies and Guidelines.

Acid Sulfate

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64.

However the interest has been over-reactive with assessments sought and risk applied in many areas where there is no geological risk or evidence of acid sulfate potential or actual conditions.

The most definitive survey procedure was produced by the Acid Sulfate Soil Management Advisory Committee NSW, 1998, in their *Acid Sulfate Manual.* This Manual forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment and Conservation. The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

On this site the resource of limestone is high in the landscape, highly oxidised and alkaline. The same limestone is in fact used for neutralisation of acid soil conditions. For example agricultural lime is produced from the same Tamala Limestone in the local area.

The site is shown as Low to No Risk of acid sulfate conditions at depths of > 3 metres in WAPC Planning Bulletin 64.

A geological examination of the site by Lindsay Stephens of Landform Research showed that the site has no risk of containing acid sulfate conditions in the proposed depths of excavation.

Unauthorised Access and Illegal Dumping

The potential for rubbish to be dumped relates mainly to unauthorised access and is low as the site is set back from roads. The site is currently fenced. Gates will be locked at all times when the site is unmanned and equipment is retained on site. Fences will be maintained.

Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site. Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

Employee Amenities, Washdown, Wastes and Servicing

All major servicing of vehicles will be conducted off site. Wastes generated from excavation and processing activities will be collected and removed off site regularly to an approved landfill site. Regular inspections (at least weekly) will be conducted to ensure no wastes, litter and the like are present in or around the excavation area.

Vehicle washdown will not normally be required.

A septic toilet or serviced portable toilet system will be maintained at all times when the site is operating.

Refuelling and Maintenance

The protection of water from fuels and other chemicals is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed

See 5.2 Protection of Water Quality above.

Documents specific to the fuel and maintenance are the DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*

A list of the management actions for fuel and maintenance is provided below. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

- *Maintain adequate buffers to sensitive watercourses and wetlands*
- *Maintain a separation of 3 metres to the highest known groundwater level*
- *Minimise the quantity of fuels, lubricants and chemicals stored*
- *Store fuels in bunded lined facilities designed to contain 110% of the storage volume*
- *Workshop and fuel/liquid handling facilities are to be installed with hardstand from which all stormwater is directed to filtration and collection facilities*
- *Incorporate oil/water separators in sediment traps for vehicle and equipment washdown areas,*
- *Regularly clean out bunded fuel facilities and take contaminated water offsite*
- *Effectively treat process waters through settling pond systems, retention tanks/ponds, water clarifiers or other , water filtration systems*
- *Major servicing of large machinery is only to be undertaken offsite or in specially designed facilities approved for the location of the quarry*
- *Prepare an accidental spill containment and cleanup protocol*

- *Store flammable and combustible liquids in accordance with AS1940*
- *Storing and handling of corrosive materials in accordance with AS3780-8*
- *Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site.*
- *Any illegally dumped materials are be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.*
- *Regularly inspect fuel, oil and hydraulic fluids in storages and liners for wear or faults*
- *Service plant and equipment in accordance with a maintenance schedule*
- *Ensue refuelling and lubricating activities occur in designated areas, and equipment for the containment and cleanup of spills is provided*
- *Contain spillages in plant and working areas shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so)*
- *Dispose of waste chemicals in accordance with the Waste Guideline*
- *Transport chemicals in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code);*
- *Maintain the site in a tidy manner by removing all rubbish regularly offsite.*
- *All significant adverse incidents (such as a fuel spill of >5 litres) are to be recorded, investigated and remediated. A record is to be kept of incidents and the Local Authority and Department of Environment and Conservation notified within 24 hours*
- *See Refuelling and Maintenance for additional procedures*

Limestone excavation is a clean operation similar to sand excavation in the nature of the risk to groundwater. No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water for *Land Use Compatibility in Public Drinking Water Source Areas.*

Currently bulk fuel storage is not proposed and refuelling will be from a mobile tanker the same as used in many mine sites. All equipment is mobile and will move across the site as excavation proceeds.

If a permanent refueling facility is used, it will be bunded to the requirements of the Department of Environment and Conservation (*DEC – DMP Water Quality Protection Guidelines Mining and Mineral Processing*).

Soils such as those on this site are highly porous and adsorptive. The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter.

The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. A commitment is made to notify Department of Environment and Conservation/Department of Water and City of Wanneroo within 24 hours of any concentrated spill greater than 5 litres.

The procedures below will be used in the event of any fuel or hydrocarbon spill, including those in excess of 5 litres in one dump. Any spills will be contained by the excavation. Soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated limestone will be scooped up and removed to an approved landfill or other approved site.

No potential chemical pollutants, fuel or oils are to be stored on site. Minor servicing will be conducted onsite by mobile service vehicles, or offsite. Major servicing of large machinery will be conducted offsite.

Surface Water

Limestone is very porous and direct infiltration of rainfall is normal without any detention basins or other collection systems.

There are no watercourses on site or nearby and therefore surface water will not be altered or impacted on.

Recycling ponds will be used where possible in the production of reconstituted limestone products.

Ground Water

The water table will be at least 4 metres below the proposed base of the pit. The operation complies with all Government Policies and Guidelines.

There will be no significant changes to the water balance. Rainfall and infiltration rates will be essentially the same and the small amount of water loading of less than 1 500 kL will be negated by evaporation from dust suppression actions.

Dewatering of the pit will not be necessary because of the porous nature of the limestone base.

WATER QUALITY			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Surface water	*DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing* • *Overview* • *Minestite water quality monitoring* • *Minesite stormwater* • *Mechanical servicing and workshop facilities* • *Above-ground fuel and chemical storage* • *Mine dewatering* • There is likely to be minimal surface water runoff because of water reuse..	Compliance with DEC Licences	Compliance at all times
Ground water	*DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing* • Interpretation of the geology and hydrology, shows that there will be no significant alteration to the groundwater regime. • Complies with all Government Policies. • The management actions listed above will be complied with.	WA Limestone will implement and maintain the water protection policies to minimise the potential for alteration to surface or ground water.	None necessary at this time
Salinity	• No evidence of surface water or salinity.	None necessary.	None necessary at this time

Waste Materials	*DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing* • A septic or serviced portable waste water system will be maintained on this site. • No liquid or solid wastes will be disposed of on site. • All waste will be collected and either recycled or disposed of at an approved waste disposal site.	WA Limestone will ensure that all solid and liquid wastes generated are stored and disposed of appropriately without causing the contamination of the water regime.	Maintain a tidy site. Ongoing

6.0 BIODIVERSITY

6.1 Flora

The site is covered by remnant vegetation.

Landform Research conducted a vegetation assessment. See Appendix 2.

Vegetation Communities

The whole site is designated Cottesloe Complex, Central and South, as identified by Heddle et al, 1980, *Vegetation Complexes of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia,* Department of Conservation and Environment. This designation also includes the more sandy areas.

Cottesloe Complex, Central and South, *"Mosaic of woodland of Eucalyptus gomphocephala, and open forest of Eucalyptus gomphocephala – Eucalyptus marginata – Eucalyptus calophylla; closed heath on limestone outcrops."*

The vegetation communities are shown in Figure 2 of Appendix 2. The majority of the limestone resource is Open Heath. See Appendix 2 for site photographs.

The Environmental Protection Authority listed the project for a limestone quarry and batching plant as "Not Assessed – Managed under Part V of (Works Approval and Clearing)" on 9 September 2009. This decision was subsequently appealed and the Appeal dismissed by the Minister for the Environment on 30 March 2010.

Four community types were identified.

Limestone Closed Shrubland

The limestone areas in the south and along the eastern edge of Lot 1 are covered by Limestone Closed Shrubland which is typified *by Dryandra sessilis, Hakea trifurcata, Acanthocarpus pressii, Acacia pulchella, Acacia lasiocarpha, Xanthorrhoea preissii, Hakea prostrata, Phyllanthus calycinus,* and *Melaleuca systena*. *Acacia rostellifera* regrowth thicket occurs in patches.

***Melaleuca* Shrubland.**

Where more caprock and exposed pinnacles occur, at the edges of breaks of slope, and where soil cover is reduced, the community changes with *Melaleuca huegelii, Melaleuca systena* and *Dryandra sessilis* becoming dominant. This community is restricted to several clumps in the south and along the eastern edge of Lot 1. This community appears to be Type 26a *Melaleuca huegelii – Melaleuca systena* Shrublands on limestone ridges. This community is listed as Endangered and has been excluded from the area proposed for excavation.

The *Melaleuca* Shrubland along the eastern edge of Lot 1 also contains some less common or different species, including *Dodonea aptera, Logania vaginalis,* and *Eremophila glabra*.

***Banksia* Woodland**

The sandy area to the north west is *Banksia* Woodland with *Banksia attenuata, Banksia menziesii*, and including *Eucalyptus todtiana* over a low shrub layer of *Conostephium pendulum, Gompholobium tomentoseum, Hibbertia hypericoides, Allocasuarina humilis, Hakea prostrata, Patersonia occidentalis, Calothamnus quadrifidus, Calothamnus sanguineus* and *Petrophile linearis.*

Tuart Woodland

The north east of Lot 1 is dominated by Tuart Woodland with *Eucalyptus gomphocephala* over predominantly exotic species from past land disturbance. The Tuarts also grade into the *Melaleuca* Shrubland along the eastern side of Lot 1. The Tuarts in this location may be regrowth as a result of disturbance from past excavation on the adjoining land to the east. *Acacia pulchella* var *goadbyi* was recorded in this woodland.

A survey of the Tuart trees was conducted and the results placed on a site plan included in Appendix 2. The operations have been designed to minimise impact on larger or potentially significant trees.

Species

A total of 92 native plant taxa and 20 exotic species were identified.

Rare, Priority and Significant Species

No Declared Rare or Priority Flora were identified. See Appendix 2.

Three taxa are listed in Bush Forever 2000 as “Significant”, (Volume 2, pages 297 – 298) and several occur on site. These include;

Lechenaultia linarioides, typical Tamala Limestone taxa
Petrophile serruriae subspecies (GJK 11421)
Eucalyptus foecunda

None of the taxa is listed as a Priority species. Even the lowest level of Priority Taxa P4 are listed as “*Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.”*

As the taxa were not listed as Priority Species in 2007, after having been nominated as significant in Bush Forever 2000, then presumably the taxa are at the lower need for protection of P4 and are not currently threatened.

Endangered – Significant Communities

Several small patches of Community Type 26a occur on site, in the south and along the eastern edge of Lot 1. Community Type 26a is listed as a Threatened Ecological Community. This community is excluded from the proposed excavation area.

The *Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999* and State databases list Aquatic Root Mat Communities in Caves of the Swan Coastal Plain as an Endangered Community.

From an examination of the caves by Lex Bastian, and discussions with Brenton Knott on Root Mat Communities, the potential for root mat communities to occur on site is regarded as very low and even if they did occur the caves are not proposed to be disturbed and the water table is not proposed to be intersected. No Tuart trees are likely to be cut down because the access road appears to be able to be constructed to ensure they are retained. In addition Tuart trees are proposed to be included in the rehabilitation of the site. (Appendices 1, 2 and 3).

Lex Bastian concluded that the caves are restricted to the eastern edge of Lot 1 and will not be impacted on by the excavation. The excavation is not proposed to intersect the water table and will have a separation of 4 – 7 metres to the water table, which provides an allowance for seasonal changes.

Lex's map shows that there is possible deep karst under the central and western portion of Lot 1 in the area nominated as Limestone Heath by Lex Bastian (Appendix 1).

In reference to these areas Lex states *"Experience has shown that such caves become progressively smaller due to increasing saturation of dissolved calcium carbonate westwards in cave streams. Thus although they may be present they are likely to be deep at the water table as well as not of significant size, such as would preclude the proposed operations".*

The potential for damage to Root Mat Communities, if they occur, is considered very low. See Appendices 1, 2 and 3.

Significant Trees

The *Tuart Conservation and Management Strategy (draft December 2004*), prepared by the Tuart Response Group on behalf of the Government of Western Australia, addresses the protection of Tuart Woodlands. The vegetation on the north east of Lot 1 is Tuart Woodland.

The only impact on this woodland will be to locate an access road across it. The access road appears to be able to be constructed without taking any Tuart Trees. In addition Tuart trees will be included in the revegetation of the site. The location of the Tuart trees is shown on a plan in Appendix 2.

Vegetation Condition

Vegetation Condition on the proposed excavation area is listed as Very Good to Excellent. See Appendix 2.

Significance of the vegetation

- It is proposed to take only 7.0 hectares with an additional 1 hectare for access, which represents 32% of Lot 1, with 40% already covered by Bush Forever 383 and two hectares lost as road reserve for Nowergup Road.

- Clearing will be progressive. The end use of the site is rehabilitation to native vegetation, pending future land use decisions.

- The extent of Cottesloe Complex, Central and South quoted in Bush Forever 2000 is 36% remaining respectively in the Perth Metropolitan Area (Bush Forever 2000) which complies with the requirements of *EPA Position Statement No 2, December 2000, Environmental Protection of Native Vegetation in Western Australia.* The *National Objectives and Targets for Biodiversity Conservation 2001 - 2005* (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

  The 30% recommended level of protection does not apply to the Perth Metropolitan area as noted at the top of page 22 of the Flora report in Appendix 2. As also noted, Bush Forever used a cut off of 10% as the test of significance for the preservation of each Vegetation Complex in their considerations.

  This is also stated in EPA Guidance Statement No 10*, Level of assessments for proposals affecting natural areas within System 6 region and Swan Coastal Plain portion of the System 1 Region* (page 2).

- In DEC Clearing Approval CPS 1834/1 the representations of the various vegetation complexes are;

	% Remaining	% in Secure Tenure
IBRA Bioregion	38.8%	32.5%
Heddle vegetation complex Cottesloe Complex Central South	41.1%	8.8%
Beard Vegetation Type 998	41.6%	29.2%

Bush Forever 2000, noted that if fully implemented then 18% of Cottesloe – Central South Vegetation Complex will be protected. The Metropolitan Region Scheme Amendment 1082.33 in 2004 noted the following.

Total area included within Amendment 1082.33	895 ha
Total area proposed for inclusion in other Parks and Recreation amendments	11.5 ha
Total area already in Parks and Recreation	4 141 ha
Total area in Bush Forever Study Area	6 085 ha
Percentage of Bush Forever protected within Parks and Recreation	83%

If the area of Cottesloe Complex Central South remaining is 18 474 ha, out of a total of 44 995 ha of 1750 extant (EPA Guidance No 10, 2003), which appears to be the figure used during the DEC Clearing Permit Assessment quoted above, then the total area in Parks and Recreation would appear to now have a much higher level of protection.

That is MRS Amendment 1082.33 lists the total already in Parks and Recreation in 2004 as 6,085 hectares out of a pre 1750 total of 44 995 hectares (EPA Guidance No 10, 2003).

This means that 13.5% is already protected in Parks and Recreation which is more than is listed in EPA Guidance No 10, 2003, which now appears to be outdated.

With 13.5% already reserved in secure tenure, then the required 10% is already protected.

- No Declared Rare, Priority species were recorded.

- Threatened Ecological Community 26a was recorded and is to be excluded from excavation.

- The proposed quarry is to be progressively rehabilitated to local native species, pending decisions on the final end use.

- Whilst there will be some loss of vegetation this will be temporary and over time rehabilitation will replace that which has been lost and therefore help maintain habitat and flora and fauna corridors.

There is a community need for resources. In the case of Lot 1, limestone is essential for road making and other construction purposes and cannot easily be replaced. There is a shortage of available or protected reserves of limestone from the Perth Metropolitan area to Bunbury, and, as resources are sterilised by the creep of development and conservation, some resources are likely to never be available. The consequence of this will be the use of sometimes substandard materials and materials from much further away; for example gravels from the Darling Scarp and hard rock from the closest quarries at Red Hill. To get these products to a site will involve taking of vegetation in another area such as the Darling Scarp, and large transport distances, great numbers of truck movements and consequent large increases in greenhouse emissions, potential road pavement and safety impacts.

With limestone now becoming restricted in the Perth Metropolitan Area, there is a need to preserve and utilise alternative nearby sources in a staged manner to ensure future supplies for the community. See 1.1 Proposal, Importance and Rationale.

The Clearing Principles of the Environmental Protection (Clearing) of Native Vegetation Regulations 2004 are addressed in the vegetation assessment in Appendix 2.

FLORA			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Flora	• Whilst the site is covered by native vegetation, the return of the site to native vegetation, the community need for limestone and the negative environmental impacts of not using material from this site can offset issues arising from vegetation clearing. • 40% of Lot 1 has already been nominated for inclusion into Bush Forever Site 383. Only 32.2% of Lot 1 is to be cleared for excavation. • No Declared Rare or Priority Species or Endangered Communities will be impacted on by the proposed excavation. • The Clearing Principles of the Environmental Protection (Clearing) of Native Vegetation Regulations 2004 are addressed in the vegetation assessment in Appendix 2. • The EPA listed the project as Not Assessed. • The project has been designed to minimise the impact on Tuart Trees.	WA Limestone will restrict alteration to vegetation to the areas outlined in this management plan and implement an extensive rehabilitation plan. They will rehabilitate all areas where limestone and mining or associated activities have been carried out using locally occurring plant species with the aim of achieving stable and sustainable vegetation communities.	Undertake the Rehabilitation Program.

6.2 Fauna

The site is predominantly native vegetation.

The survival and disturbance to fauna depends on the end use of the site. The site is to be cleared progressively and returned progressively to local native vegetation in order to minimise impacts on fauna.

The re-establishment of local native flora species and habitats, with the various commitments to that achievement, will provide a mechanism for a return of fauna.

A search was made of the Department of Environment and Conservation database. A Fauna Study has also been completed by Western Wildlife. See Appendix 3.

Western Wildlife noted on page 6 of their report that the Tuart trees on site did not contain any suitable nesting hollows, but the site may provide feeding habitat.

The recommendations of Western Wildlife Fauna Assessment are included in the proposed fauna management.

Large Tuart trees occur in the north east in the area where the access road is to be constructed. However it is anticipated that no Tuart tree will need to be taken to construct the access road and therefore no potential sites of black cockatoos will be impacted on. The location is shown on the Figure in Appendix 2.

Western Wildlife commented on the need to maintain habitat. The amount of native vegetation to be cleared is to be minimised as recommended by Western Wildlife, with just 32% of Lot 1 to be cleared, in addition to adding the northern portion of Lot 1 to Bush Forever site 383. Western Wildlife also recommended that rehabilitation include species known to provide food resources for Black Cockatoos to be included in the rehabilitation. This is proposed.

Western Wildlife considered the other types of fauna, mammals, amphibians and reptiles, and summarised that the main issues were habitat removal.

As noted above the best means of minimising impact on fauna is to allow for progressive clearing and a return to local native vegetation which is proposed. It should be noted that the only reason that this site is to be quarried is to help satisfy the community need for basic raw materials. Only 32.2% of Lot 1 is to be affected by excavation.

It is also noted that very large areas of native vegetation are cleared to allow the development of urban areas from Merriwa, Ridgewood, Quinns Rocks, Jindalee, Alkimos and Eglinton. The creation of these urban areas requires the wholesale clearing of large numbers of hectares of native vegetation, much of it similar to or the same vegetation complexes as that on site, Cottesloe Complex Central South. The creation of the urban areas does not permit the progressive removal of basic raw materials from ahead of development and therefore there is no alternative but to source these materials from offsite, hence the need to open Lot 1 to excavation.

The differences between urban areas and excavation is that on urban areas the vegetation communities are lost whereas on Lot 1 local native species will be returned.

Lot 1 has always been earmarked for this purpose by its nomination in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials.

The issue of clearing native vegetation and fauna habitat cannot therefore be considered separately but must be considered in terms of community need in the northern Perth Metropolitan area. If development of urban areas was staged to extract the basic raw materials as recommended in Government Planning Policies the need for basic raw materials from other sites would be reduced. Unfortunately this is not so and there is no alternative but to take resources from sites such as Lot 1.

WA Limestone will liaise with Western Wildlife in relation to the area to be cleared and if, in the opinion of Western Wildlife, trapping of fauna is warranted then it will be completed. Trapping has been used in the past on other sites, but it has been noticed that with small areas of clearing even smaller fauna such as bandicoots go where they want to and do not always stay in the bush where they are placed.

As the final land surface will now be returned to local native vegetation better fauna management on the excavated surface is possible.

WA Limestone finds that its employees, like most members of the community, are genuinely careful to protect and save fauna.

Fauna Management will include the following.

- Clearing and excavation is staged in approximately 2.0 hectare stages.

- The clearing is completed by bulldozer pushing slowly towards the perimeter of the footprint. Pushing to the sides means that the maximum distance pushed will be in the order of 60 metres which provides opportunity for mammals and birds to move to natural vegetation.

- All timber and vegetation is pushed to the perimeter of the footprint with the topsoil. At the end of excavation this is pushed back over the rehabilitated surface. Any tree hollows and logs are returned at that time.

- Where trees with hollows are to be taken the hollows are saved and relocated to vegetation that will not be cleared, and either located on the ground or in trees, in liaison with Western Wildlife.

- It is standard WA Limestone policy not to harm any fauna and not to allow pedestrian access to uncleared areas both outside the footprint and on stages not yet opened.

- Reptiles and other fauna found are carried by staff to an area of vegetation that will not be cleared. Snakes are given the opportunity to move away.

- WA Limestone policy is to take any injured wildlife to an approved shelter, which includes the DEC Wildcare.

- Normal WA Limestone Policy provides for minimizing any impact on fauna on roads and in particular the access roads.

FAUNA			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Fauna	• The site is to be cleared progressively and returned progressively to local native vegetation in order to minimise impacts on fauna. • 40% of Lot 1 has already been nominated for inclusion into Bush Forever Site 383. Only 32.2% of Lot 1 is to be cleared for excavation. • No Declared or listed fauna species are likely to be significantly impacted on by the proposed excavation. • See Fauna Report in Appendix 3.	WA Limestone will restrict alteration to vegetation to the areas outlined in this management plan and implement an extensive rehabilitation plan. WA Limestone will comply with the Excavation – Rehabilitation Management Plan.	Undertake the Rehabilitation Program.

6.3 Wetlands

There are no nearby wetlands. Wetlands occur at Nowergup, 400 metres to the north with a poultry farm located between the proposed pit and the lake.

Groundwater flow is from north east to south west and does not flow towards Lake Nowergup which is hydrologically isolated from the proposed quarry.

WETLANDS			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Wetlands	• There are no proposed changes to the water recharge on site.	WA Limestone will comply with the Excavation – Rehabilitation Management Plan.	None necessary

6.4 Dieback Management Plan

Dieback of vegetation is often attributed to Phytophthora cinamomi even though there are other Phytophthora species and other diseases such as Armillaria that can cause dieback like symptoms.

In most cases dieback is caused by a pathogen which infests the plant and causes it to lose vigour, with leaves dying, and overtime may kill the plant. As such the management of Dieback is essentially related to plant hygiene when coming onto a site and within a site.

There are several guides to the management of Dieback.

- *Department of Environment and Conservation CALM Dieback Hygiene Manual 1992 is a practical guide to Dieback management.*
- *Department of Environment and Conservation CALM Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.*
- *Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.*

The Department of Environment and Conservation generally recognises that Dieback is less likely to impact on vegetation on limestone and Spearwood/Cottesloe Land Systems, Podger F D and K R Vear, 1998, Management of Phytophthora and disease caused by it, IN Phytophthora cinnamomi and the disease caused by it - protocol for identifying protectable areas and their priority for management, EPA 2000.

Dieback is only likely to be an issue when equipment is brought to the site from a dieback affected area either through vehicles or plant and soil materials therefore the following general principles are applied to Dieback management. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

- *Dieback diseases are more likely to be transported under moist soil conditions.*
- *All vehicles and equipment to be used during land clearing or land reinstatement, should be clean and free from soil or plant material when arriving at site.*
- *Washdown of vehicles and equipment off site should be prior to arriving on site and to the procedures in CALM Guidelines for Dieback Management.*
- *No soil and vegetation should be brought to the site apart from that to be used in rehabilitation.*
- *Plants to be used in rehabilitation should be from dieback free sources.*
- *Vegetated areas ahead of excavation should be quarantined to onsite access*
- *Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing*
- *Rehabilitated surfaces are to be free draining and not contain wet or waterlogged conditions.*
- *Illegally dumped rubbish is to be removed promptly.*
- *No contaminated or suspect soil or plant material is to be brought onto the site.*
- *Vehicles and earth moving equipment are to be cleaned prior to entering the site if they originate from a dieback affected area.*
- *When clearing land or firebreaks vehicles are to work from dieback free areas towards dieback free areas.*
- *Roads should be free draining and hard surfaced*

On Lot 1, Dieback principles will be followed even though there is a reduced risk of spread on calcareous soils such as this. (Podger F D and K R Vear, 1998*, Management of Phytophthora and disease caused by it, IN Phytophthora cinnamomi and the disease caused by it - protocol for identifying protectable areas and their priority for management,* EPA 2000*).* Murdoch University has however found some evidence of infestation in Tuart Woodlands.

The proposed intersection and access road will be bitumen.

Excavation and the placement of fill will be undertaken using practices recommended by CALM. See *CALM Dieback Hygiene Manual 1992* which is more practical and *CALM Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.* See also *Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.*

The aim of dieback management during excavation is to minimise the risk of entry of dieback into the site. The calcareous soils of the remnant vegetation are unlikely to allow *Phytophthora* to spread but there may be other pathogens such as *Armillaria.*

In many ways the management of the site for dieback is similar to that for the management of weeds, and the two management practices should be considered together.

The other management is to ensure that all excavation equipment and road transport vehicles are clean and free from soil and vegetable matter prior to entering the operations.

The specific onsite dieback management in addition to the above actions will be;

- Excavate the site in compliance with CALM Best Practice Guidelines for the Management of *Phytophthora cinamomi*, draft 2004 and Dieback Working Group 2005, Management of *Phytophthora* Dieback in Extractive Industries.
- Topsoil will be cleared according to 6.6 Rehabilitation Program.
- Topsoil and overburden will be stored in separate dumps.
- Vehicles used in clearing and removing topsoil, excavation or transport are to be clean and free from soil or plant material prior to arriving on site from an area known or thought to be dieback infected. Cleaning should be conducted offsite.
- All drivers and plant operators will be made aware of the need to have clean trucks and plant when initially arriving on or accessing the site.
- Machinery will work from higher vegetation condition to lower vegetation condition.
- The site is to be secured from unwanted access.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and maintenance activities.
- Restrict road transport to the stockpile loading and access areas.
- A hygienic site is to be maintained by not bringing any soil or plant material onto the site except for rehabilitation purposes or from known dieback free areas.

- All plants, seeds and other materials used in rehabilitation will be sourced from dieback free areas.

- Illegally dumped rubbish or materials are to be promptly removed from site.

DIEBACK DISEASE			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Dieback Disease	*CALM Dieback Hygiene Manual 1992.* *CALM Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.* Dieback Working Group 2005, Management of *Phytophthora* Dieback in Extractive Industries. • The management procedures listed above will be followed, even though there is a low risk of dieback because of the calcareous soils.	WA Limestone will implement and maintain the Dieback Management Policy to reduce the spread of *Phytophthora spp.*	Vehicles to be used on site will be washed down or cleaned prior to leaving the previous site. Any materials used in rehabilitation are to be dieback free

6.5 Weed Management Plan

The management of weeds is essentially similar to that for plant diseases. The impact of weeds is really the impact within the local area and the more they are controlled the better. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted at all sites.

Weeds can be declared under the Agriculture and Related Resources Protection Act 1976 which requires that Declared Weeds are eradicated. Other weeds are not Declared but may be classified as Environmental Weeds because they are well known for impacting on vegetation.

Generally if the actions taken for Dieback are applied they will also assist in the control weeds. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

- *All vehicles and equipment to be used during land clearing or land reinstatement, should be clean and free from soil or plant material when arriving at site.*
- *No soil and vegetation should be brought to the site apart from that to be used in rehabilitation.*
- *Plants to be used in rehabilitation should be free from weeds.*
- *Vegetated areas ahead of excavation should be quarantined to onsite access*
- *Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing*
- *Weed affected top soils may need to be taken offsite, used in weed affected areas, buried by 500 mm soil/overburden or taken offsite*
- *Illegally dumped rubbish is the major source of weeds and is to be removed promptly.*
- *No weed contaminated or suspect soil or plant material is to be brought onto the site.*

- *When clearing land or firebreaks vehicles are to work in conjunction with dieback principles and push from dieback free areas towards dieback free areas.*
- *Weeds should be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils.*
- *Grasses should be sprayed with grass selective spray prior to seeding or rehabilitation*
- *Weed management should work from least affected areas to most affected.*
- *Declared weeds should be treated promptly by digging out or spraying.*
- *Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.*

The potential for weeds is less likely to be a problem during excavation. However there are exotic species and weeds present in the north eastern corner of Lot 1. Soils from these areas should be contained and not used in areas to be rehabilitated unless spraying is used or the affected soils are used adjacent to already weed affected areas.

Revegetation will only take place when soils have been left in autumn to allow for germination of weed seeds and these sprayed prior to seeding or planting.

In addition to the actions listed above the following site specific management will be used.

- The Dieback Management actions will also be used to assist weed management.

- Inspections conducted to monitor the presence and introduction of weeds on an annual or more frequent basis. On identification of weed infiltration weeds will either be removed, buried, or sprayed with a herbicide.

- No, weed affected soil or fill material will be brought to the site.

- The site is secured to prevent illegal dumping of rubbish and all illegal rubbish is removed promptly.

- Weeds will be treated promptly no matter how few there are.

- Normally weed management will work from the least weed affected areas to the most weed affected, giving a smaller area to treat with spray or earthworks.

- Weed affected soils should not be used for rehabilitation and are to be buried.

WEED MANAGEMENT			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Weeds	***Agriculture and Related Resources Protection Act 1976.*** • The weed management actions listed above will be used as applicable to manage weeds on the site. • In autumn the soils will be monitored and a spraying program implemented for the rehabilitated surface prior to seeding and planting. • Declared or Environmental weeds will be controlled.	WA Limestone will implement and maintain a weed policy to try and prevent the introduction of Declared, Environmental or other weeds to the site.	Compliance with the weed management program listed above.

6.6 Rehabilitation Program

Rehabilitation will be directed towards the final end land use. In general it should be aimed at the highest level of rehabilitation, however there is no point planning good native vegetation or tree belts if they are to be immediately cleared for an alternative land use. On the other hand it is often beneficial to establish fast growing native vegetation as interim soil cover.

The species to be chosen and the planting densities should match pre-excavation vegetation, adjoining vegetation, soil conditions and function of each site. For example when revegetating land within a National Park or Reserve a higher level of species richness and plant density might be expected than on a visual screening bund.

The species will therefore need to be selected to match the local plant communities or a restricted number of fast growing species may be used. The species to be used in rehabilitation may be different to that which originally occurred on site, because the land surface might be much lower and have higher levels of soil moisture or the soil conditions may be different.

Rehabilitation should contain Dieback and Weed Management in addition to monitoring and replanting failed areas. There should also be a completion criteria against which the revegetation should be compared.

There are a number of management actions that can be taken in quarries to maximise rehabilitation effort and these will be used wherever possible. The general management actions are summarised below and will be used where applicable and as the opportunity presents.

The site specific issues that relate to this site are also listed to explain how this site compares to the general rehabilitation guidelines.

- *All buildings, equipment and machinery will be removed from site.*
- *Local education programs and the involvement of site staff should be undertaken to increase on site ownership.*
- *Save and directly transfer topsoil where possible.*
- *Where topsoil cannot be directly transferred it should be stored in low dumps of less than 1 metre high.*

- *Overburden and interburden should be removed and stored separate from topsoil.*
- *Weed affected topsoil and overburden is to be buried.*
- *Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.*
- *Topsoil will be spread at depths of 5 cm and should be spread during summer, preferably by the end of February.*
- *Vegetation clearing should be progressive and minimised to that required for each stage of excavation.*
- *Useful timber should be recovered for timber, fence posts and for firewood subject to liabilities and site safety.*
- *Where possible vegetation should not be burned, but at times it may be beneficial to seed germination.*
- *Seeds and other genetic material can be collected if suitable onsite areas are available.*
- *Vegetation fragments and leaf litter should be collected and directly transferred to rehabilitation areas.*
- *If direct transfer is not possible the vegetation is to be stored in low dumps to 1 metre high for later spreading.*
- *Compacted planting substrates should be deep ripped in two directions at 1 metre intervals.*
- *A minimum 400 mm of overburden is to be spread over the surface where available.*
- *Pre-seeding weed control may be required after any potential weed seeds have been allowed to germinate.*
- *Any weeds likely to significantly impact on the rehabilitation are to be sprayed with broad spectrum spray or grass specific spray depending on the species involved.*
- *Rehabilitation is to take place during the first winter months to minimise compaction effects.*
- *Local provenance seeds are to be collected from the site or purchased from commercial seed collectors.*
- *A mixture of tube plants and seeding combined with the direct transfer of topsoil is normally the most effective where available.*
- *Seeding conducted in summer will need to use scarified leguminous seeds.*
- *Seeding conducted in July to August will require the leguminous seeds to be heat treated or scarified.*
- *All seeds are to be smoke treated by soaking in "smoke water" for 24 hours prior to seeding, or dry smoked.*
- *A 10 g tree tablet or small handful of fertiliser beside each tube plant.*
- *Rehabilitation will progressively follow mining with completed areas of the excavation being revegetated as soon as practicable.*
- *Fertiliser is not always required and will add nutrients to the ground water. If used a fertiliser containing low nitrogen, phosphorous and potassium, and trace elements, is recommended to be spread at rates of up to 100 kg/hectare depending on the planting site.*
- *If completed correctly there should be no need for irrigation of revegetation in the south west of Western Australia*
- *Planting substrates should be left rough to encourage rainfall infiltration.*
- *Erosion of sloping surfaces can be minimised by leaving the surface soft, rough and undulating, with the undulations running along contour.*
- *The final machinery run should be along contour and not down slope.*
- *Wind erosion and the movement of sand grains can significantly impact on growth rates unless controlled in susceptible areas. Remedial actions can include but not be limited to; fence wind breaks, spray mulching, cover crops, interim native vegetation or spreading mulch and vegetation.*
- *Rabbit guards or control may be required.*

- *Stock must be excluded from rehabilitation.*
- *Completion criteria specifying the number of plants, species and structural form in a given area are required.*
- *Rehabilitation should be monitored at least annually to determine growth rates, any factors impacting on revegetation and to compare against the completion criteria.*
- *Steps to remedy deficiencies in rehabilitation should be taken during the next planting period.*
- *Monitoring and restoration should be undertaken for three years or until completion criteria is achieved.*

Rehabilitation Objectives

The concept excavated floor is proposed to be 20 – 22 metres AHD with batter slopes of 1 : 2 vertical to horizontal on the eastern side of the completed pit adjacent to the potential Community Type 26a.

To rehabilitate the land, the excavated western surface will be formed to a gently sloping flat floor and then at 1 : 5 and lower around the western and southern edges of the excavation as shown in the concept batter and final contour plan.

Level building envelopes will then formed on the gently sloping western and southern batter slopes.

The final land surface will be smoothed to be compatible with the existing natural landform of the area.

1. Quarry faces will be checked for stability and any substandard faces will be made safe to Department of Mines and Petroleum standards.

2. As the limestone is porous there will be no need for upslope contour or diversion banks to prevent water entering the void. Similarly there will be no need for drainage works on the floor of the void.

By achieving satisfactory performance in their Rehabilitation Plan, and establishing suitable vegetation coverage on the restored landform, WA Limestone will ensure that the site is suitable for a rural living end use, but including returning the site to native vegetation pending City of Wanneroo rezoning and plans for the area.

Revegetation activities will be integrated into the excavation and land clearing process. The process of collecting local seed and the direct return of topsoils for use in rehabilitation will be pursued wherever possible in order to maintain vegetation provenance. Because of the nature of the timing of the operation there may be a need to liaise with nearby operators to swap topsoil if there are no on site areas to directly place the topsoil.

It is the experience of Landform Research that whilst seed collection of local plants is possible it is much more productive to manage the topsoil and then respread it correctly.

The best source of seeds is the top 3 cm of the soil, leaf litter and vegetation cleared. The seeds of species such as *Melaleuca, Kunzea, Banksia, Eucalyptus* and other shrubby species are held on the stems, and when respread, provide a seed source. This is the same source that would be collected on site.

It is very difficult to collect seeds of small species such as *Conostylis, Patersonia, Lomandra* and other such species. The seeds of these species are quickly dropped

A great deal of time can be spent trying to collect these seeds when they are present in significant numbers within the topsoil and leaf litter. By wise use and management of the topsoil and leaf litter, as proposed, the local seed base is used. Seed collection of *Melaleuca, Kunzea, Banksia, Eucalyptus* is undertaken where it will be productive, such as brushing slopes.

Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface.

The best rehabilitation is to use a 4 pronged approach as listed in the management plan,

- Best Practise topsoil and leaf litter management and respreading,
- Respreading crushed vegetation matter
- The use of tube plants from local provenance particularly of the Proteaceae and Eucalypts as these can be reduced from topsoil use alone.
- The use of local provenance seed treated with smoke.

Landform Research has been involved in revegetation at WA Building Block Limestone quarry on Hopkins Road, interim revegetation at Flynn Drive limestone quarry, and WA Limestone quarries at Hope Valley.

Local seed collection is used as appropriate but is less efficient than other methods. Local provenance seeds can be sourced from on site and is done by the seed collection company used, where available, but the best sources may not always be local. WA Limestone normally uses Landcare Services to source and supply the seeds.

The *Draft Gudelines for Mine Closure Plan 2010* prepared by the EPA and DMP recognise the direct return of topsoil as the best method of returning local native species combined with other methods

Completion criteria

The aim of the rehabilitation is to provide an ecologically stable community as close as possible to the original native vegetation of the Neerabup area on land not used for future development.

- Achievement of an ecologically diverse and stable vegetation community, which requires minimal long-term management and maintenance on land not required for future activities.

- Stable post-mining landscape, and the minimisation of wind or water erosion.

- Create an environment that encourages re-colonisation by a diverse range of fauna species on land not required for future activities.

- Provide for the protection of the local groundwater resource in terms of both quality and quantity.

- Provide a self sustaining cover of local native groundcovers, shrubs and trees on land not required for future activities.

- Achieve weed species at levels not likely to threaten the native species.

Completion Criteria at 3 years

	Aim	Completion Criteria when topsoil is able to be used	Completion Criteria when topsoil is too affected by exotic species
Trees	1 tree per 50 m^2	1 tree per 100 m^2	1 tree per 100 m^2
Shrubs	1 plant per m^2	1 plant per m^2	1 plant per m^2
Groundcovers	1 plant per m^2	1 plant per m^2	difficult to achieve
Species Richness	10 species per 100m^2	15 species per 100m^2	10 species per 100m^2
% cover	100%	80%	70%

Depending on the success of rehabilitation, evolving community standards, and new research, the completion criteria may be adjusted to reflect emerging trends and also adjusted in terms of cover and species richness depending on the results achieved and emerging technologies or techniques.

- A bund around the southern edge of the approved pit will be vegetated with a double row of trees an shrubs at a planting rate of 100 trees and 100 shrubs per 100 linear metres. The area is shown on the attached plans.

Vegetation Clearing

1. Vegetation clearing will be progressive and minimised to that required for each stage of excavation.

2. The footprint will be surveyed and marked on the ground by flagging and survey tape in the same manner as all developments. The bulldozer will then push to that marked line.

3. Along the edge of the possible Community Type 26a in the east a wire fence will be erected to mark the edge of the footprint in that area as an act of good faith by WA Limestone.

4. Tuart trees will be marked in the field at the time the perimeter of the quarry footprint is surveyed. The access road will then be designed to minimise Tuart tree removal and will be located in a manner that provides safe entry/exit to Nowergup Road. The entrance is proposed to adjoin the existing entrance that services the lot to the east.

5. Remove the vegetation cover by pushing it into windrows for use on the batters to minimise soil erosion and assist spreading soil on the final batters as part of the final rehabilitation.

6. Useful timber will be taken for firewood, if feasible and subject to liabilities and site safety. Consideration also needs to be made of the possibility that large fragments of vegetation may inhibit future use of the site. Alternatively, chipping of removed vegetation may be used.

7. Seeds and other genetic material will be collected if suitable areas are available for rehabilitation and would enable the preservation of genetic material, such as on batter slopes and in green belts.

8. Where practicable vegetation will be directly transferred to a batter slope being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable, for example on the batter slopes of worked out areas. It will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

9. If direct transfer is not possible the vegetation will be stored in low dumps to 1 metre high or swapped with a nearby operator to try and ensure that the material is not wasted.

10. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on the batter slopes of completed areas. It will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

Topsoil and Overburden Removal

1. Where possible topsoil clearing will be undertaken in wetter months.

2. Any topsoil will be removed for spreading directly onto areas to be revegetated, batter slopes and screening bunds. If direct spreading is not possible the top soil will be stored in low dumps, for spreading at a later date. Weed affected topsoil from the cleared area will be buried to reduce the future weed loading on the site.

3. Where possible topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated. Where this is not possible the topsoil and overburden will be stored in low dumps to less than 1.0 metre high for future use in rehabilitation. This will assist in preservation of the local genetic diversity

4. Overburden, as yellow and brown sand and low grade limestone, will be pushed to the perimeters of the excavation, particularly the eastern and western edges, to assist with visual and noise screening. From there it can be used for the rehabilitation process. The topsoil bund and overburden perimeter bunding will be pushed to the surveyed line, but not outside the line or footprint.

5. There will be no disturbance of the vegetation outside the perimeter bunding.

6. Excavation will be worked progressively in the stages as shown on the attached staging plan commencing in the north east and spreading south west.

7. Limestone will be excavated to a floor level at 20 – 22 metres AHD in the centre of the site.

Landform Reconstruction and Contouring

1. All buildings, equipment and machinery will be removed from site at the end of activities.

2. The final landform will be formed to the interim final concept plan.

3. It is still proposed to cut to 1 : 2 or steeper operational batter slopes/faces with the final land surface pushed to a slope of 1 : 4 horizontal to vertical over all but the eastern face of the quarry. The eastern face will be reformed at 1 : 2 horizontal to vertical as no building envelopes are proposed for that face which will allow the quarry to be cut to 21 to 23 metres AHD to enable the pit to be worked well below the natural land surface and to maximise the limestone resource. See attached plans.

4. The land surface will be formed to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface.

5. Limestone floor will be deep ripped in two directions. The width between rip lines will be 1 metre intervals.

6. A minimum of 300 mm of overburden will be spread over the surface where available to provide a substrate for revegetation. On limestone, rehabilitation can be very successful with minimum overburden when the floor is adequately deep ripped.

7. Experience by Landform Research on limestone rehabilitation on mining leases north of Wesco Road is that good revegetation can be achieved by planting into soft overburden and deep ripped limestone floor, if suitable local species are used.

Vegetation Establishment

Pre-Planting/Seeding Weed Control

Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species such as in the north east of the site.

If required this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broadscale weed treatment can be detrimental to the germination and growth of native species but may be required if the weed load is to be reduced.

In May, after the first autumn rains, check for grass germination. Where grass has the potential to inhibit rehabilitation use a licensed contractor to spray with Fusillade or other suitable herbicide.

1. Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management Plan in 6.5 will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

Revegetation

1. WA Limestone will spread any vegetation, plus leaf, root and organic matter collected from the land clearing procedures. This will increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention. The difference in properties between existing topsoil and subsoils is not considered a major impediment to rehabilitation of native species in the area.

2. Topsoil will be re-distributed in rehabilitated areas to depths of 50 mm where available. Whilst burning is not always practicable or permitted the mixing of topsoil with ash and charcoal from burnt vegetation has shown a demonstrated improvement in the germination of local native species by triggering some species that do not normally germinate and by increasing germination rates. (Landform Research at Pickering Brook Gravel Quarry).

3. Topsoil provides a useful source of seed for rehabilitation of Limestone Heathlands, when the correct handling of the topsoil is used, stripped and replaced dry (autumn direct return). Maximum depth of 50 mm can be used to optimise revegetation of species-rich plant communities.

4. Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.

5. Topsoil will be spread directly from an area being cleared where possible, otherwise reclaimed from a topsoil dump.

6. Topsoil will be spread at depths of 50 mm and should be spread during summer, preferably by the end of February.

7. Rehabilitation will take place during the first winter months following the restoration earth works of each particular section of quarry. Leaving the completed earth works for one season will reduce the success of rehabilitation by at least 50%, due to compaction effects.

8. Local provenance seed will be collected from the site or purchased from commercial seed collectors. Tube plants are also desirable because they reduce the risk of failure by providing a third method of establishment;

   - topsoil spreading
   - seed spreading
   - tube plants

   A species list is attached.

9. A combination of the three methods is always preferred by Landform Research and has proven to be the most versatile and successful. The amount and species of additional seed and tube stock depends on the quality and seed store within the topsoil, and may vary from stage to stage.

10. Seeds of indigenous species will be scattered during late summer at the rate of approximately 1 - 2 kg seeds per hectare if required.

11. Seeding conducted in summer will use scarified leguminous seeds that have been “dry smoked”. Seeding conducted in July to August will have the leguminous seeds heat treated and all seeds will be smoke treated by soaking in “smoke water” for 24 hours prior to seeding.

12. Seed spreading will be achieved either using mechanical seed dispersal equipment or using manual methods. Bulking with a spreading agent such as sawdust, vermiculite or sand is desirable.

13. Plant an additional 1000 tube plants of local native species per hectare, in June/July.

14. Use a 10 g tree tablet or small handful of fertiliser beside each tube plant.

15. Rehabilitation will progressively follow mining with completed areas of the excavation being revegetated as soon as practicable.

Fertiliser

1. Fertiliser is not always required and may add nutrients to the ground water. If used a fertiliser containing low nitrogen, phosphorous and potassium, and trace elements, is recommended to be spread at rates of up to 100 kg/hectare, applied to rehabilitation areas in the year of planting. Nitrogen is provided by using leguminous seed in the seed mix and is added as a result of nitrogen fixing bacteria.

2. Further investigation will be needed to determine suitable rates and the timing of fertilisation. It may be possible to integrate seed dispersal and fertilisation into a single pass. The fertiliser will need to supply macro-nutrients, phosphorus, nitrogen and potassium, and other micro-nutrients.

Irrigation

1. Experience by Landform Research in rehabilitation of quarries in limestone has shown that when completed well there is no need for irrigation of the rehabilitation. It is cheaper to use additional seed than to install irrigation. For example irrigation was not used on rehabilitation in Hopkins Road, north of Wesco Road.

2. Also, water for irrigation is unlikely to be available because of reduced water allocations.

3. Should there be a high mortality rate in germinated seedlings after the first year, due to lack of water, the feasibility of providing irrigation will be investigated.

Erosion Control

1. Soil erosion occurs when soil is exposed and disturbed by wind or water. Erosion involves soil particles being detached from areas not adequately protected by vegetation, and moved down-slope. This is not normally a significnat problem in limestone which crusts after the first winter.

2. The soils are very permeable and runoff is normally minimal unless surface materials become non-wetting. Even so experience shows that there is minimal non wetting and surface particle movement under such conditions.

3. Water erosion on the batter slopes can be avoided by the permeability of the materials and by leaving the surface soft, rough and undulating, with the undulations running along contour. The final machinery run should be along contour and not down slope.

4. Wind erosion will be controlled by rehabilitating the disturbed ground as soon as practicable.

5. If wind erosion and soil stability become an issue measures will be taken to stabilise the soils. These could include but not be limited to fenced wind breaks, spray mulching, cover crops, interim native vegetation or spreading mulch and vegetation.

6. For rehabilitation areas, revegetation will take place as soon as possible following landform and soil reconstruction.

7. Cleared vegetation will be transferred from an area being cleared, to protect against erosion, assist with habitat creation and provide a seed source.

8. Control of wind erosion potential will be assisted by spreading brush and vegetation across the topsoil on the batter slopes and reconstructed soils where local native vegetation is to be established.

Monitoring

1. During late summer an assessment of the success of the rehabilitation will be made to determine the rehabilitation requirements for the following winter.

2. Monitoring includes visual assessments and, where necessary, counts to determine the success of the rehabilitation and restoration, as follows;

    - plant density
    - plant growth
    - plant deaths
    - regeneration
    - weed infestation

3. As necessary steps will be taken to correct any deficiencies in the vegetation.

4. Rehabilitation of each stage will be monitored for a period of three years to ensure that the revegetation meets the completion criteria of providing self sustaining indigenous shrub vegetation.

5. If rabbit damage is detected either place guards around the tube stock or bait using commercial baits laid under low concrete slabs.

6. Provide ongoing weed management to identify and treat significant environmental weeds or weeds likely to impact on the rehabilitation.

7. Plants that have not survived are to be assessed to determine the number of replacement plants required. To this is to be added the number of additional plants required to be installed in the following winter to bring any deficiencies up to the completion criteria.

8. In areas of rehabilitation that do not meet the completion criteria measures are to be taken to increase the stem density to achieve the completion criteria. This could include but not be limited to;

    - additional seeding,
    - planting additional tube plants,
    - additional use of fresh topsoil.

Suggested Plant Species to be Used

The species identified in the Flora and Vegetation Study will be used. However not all of these will be commercially available and some will be returned through the use of local topsoil.

All species are suitable for seeding

X To form signficant portion of the species list
T Suitable as tube plant

Tree/ Tall Shrub	*Acacia rostellifera*	XT	*Allocasuarina fraseriana*	XT
	Acacia saligna	XT	*Banksia ilicifolia*	XT
	Banksia attenuata	XT	*Banksia grandis*	XT
	Banksia menziesii	X	*Eucalyptus marginata*	XT
	Eucalyptus foecunda	XT	*Eucalyptus todtiana*	X
	Eucalyptus decipiens	XT	*Xylomelum occidentale*	XT
	Eucalyptus gomphocephala	T		
Shrub	*Acacia pulchella*	XT	*Acacia lasiocarpa*	X
	Adenanthos cygnorum	XT	*Anigozanthos humilis*	X
	Beaufortia elegans	XT	*Anigozanthos manglesii*	
	Calothamnus quadrifidus	XT	*Austrodanthonia occidentalis*	X
	Calothamnus sanguineus	XT	*Austrostipa elegantissma*	X
	Grevillea preissii	X	*Austrostipa flavescens*	X
	Jacksonia sericea	X	*Austrostipa occidentalis*	X
	Jacksonia sternbergiana	X	*Conospermum* spp	
	Jacksonia floribunda	X	*Conostylis aculeata*	
	Macrozamia riedlei		*Conostylis setosa*	
	Melaleuca huegelii	X	*Dampiera linearis*	
	Melaleuca systena	X	*Daviesia triflora*	
	Melaleuca thymoides		*Hakea prostrata*	XT
	Nemica reticulata		*Hakea ruscifolia*	XT
	Nuytsia floribunda		*Hakea trifurcata*	XT
	Petrophile macrostachya		*Hakea varia*	XT
	Stirlingia latifolia		*Kunzea ericifolia*	XT
	Viminaria juncea	X	*Spyridium globulosum*	
			Xanthorrhoea preissii	
Understorey shrub / ground cover	*Acacia latericola*	X	*Bossiaea eriocarpa*	X
	Acacia cochlearis	X	*Hardenbergia comptoniana*	
	Leucopogan spp	X	*Haemodorum spicatum*	
	Calytrix flavescens		*Hemiandra pungens*	
	Eremaea pauciflora		*Hovea trisperma*	X
	Gompholobium tomentosum		*Kennedia prostrata*	X
	Hibbertia hypericoides		*Lepidosperma squamatum*	
	Hibbertia racemosa		*Lomandra hermaphrodita*	
	Patersonia occidentalis		*Podotheca gnaphaliodes*	
	Petrophile linearis		*Scaevola canescens*	
	Scholtzia involucrata		*Trachymene coerulaea*	

REHABILITATION			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Rehabilitation	See the Rehabilitation, Weed Management and Dieback Plans outlined above. The Rehabilitation Plan aims to restore native vegetation on the site.	WA Limestone will implement and maintain the Rehabilitation Plan to rehabilitate the excavated surface as outlined above. WA Limestone will monitor the rehabilitation for a period of three years.	Implement and maintain the rehabilitation program Rehabilitate each completed section as soon as practicable.

8.0 References - Reading

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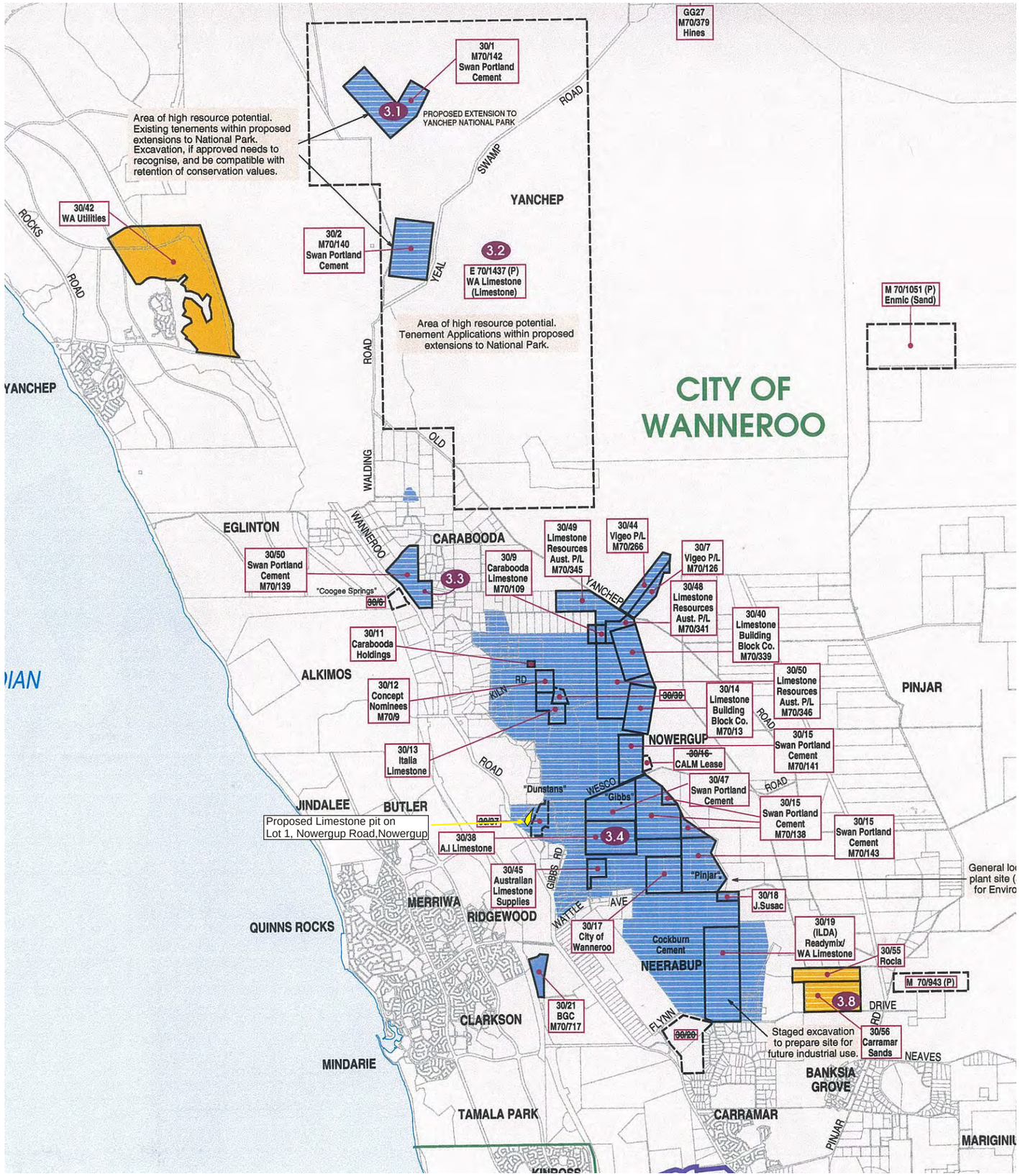


STATEMENT OF PLANNING POLICY 2.4
LIMESTONE RESOURCES
RECOMMENDED FOR COMMUNITY USE

LEGEND

- Limestone / Limesand Resource
- Sand Resource
- Clay Resource
- Rock Resource
- Gravel Resource
- Key Extraction Area
  Extraction sites of regional significance.
  Key extraction areas are considered to be:
  - essential to the needs of the region.
  - of a long term nature.
  - strategically located in relation to transport links and manufacturing plant.
- Priority Resource Location
  Known areas of high resource potential which should be held available for current and future extraction
- Extraction Area
  Areas of existing extractive industry operation
- 27/5 — WAPC Reference No.
- 27/5 — Tenement expired
- M70/89 P70/61 — DMPR Reference No.
- (P) — Pending
- Work Processing Plant
- Local Government Boundary
- Metropolitan Region Boundary
- Policy Area Boundary

LOT 1 NOWERGUP ROAD	
LOCATION and SPP 2.4	
Landform Research	June 2008

FIGURE 1

Poultry Farm

Market Gardens

Bush Forever Site 383

Nowergup Road

North of Nowergup Road to be retained as remnant vegetation.
Bush Forever Site 383

Edge of excavation adjusted to reduce potential impact on buried karst if it is present.
STAGE 1 will now commence south of this line.

Natural vegetation to be retained

Natural vegetation to be retained

Lime Kilns and Quarry

Lime Kilns and Quarry

Market Gardens

Natural vegetation to be retained

Wanneroo Road

Natural vegetation to be retained

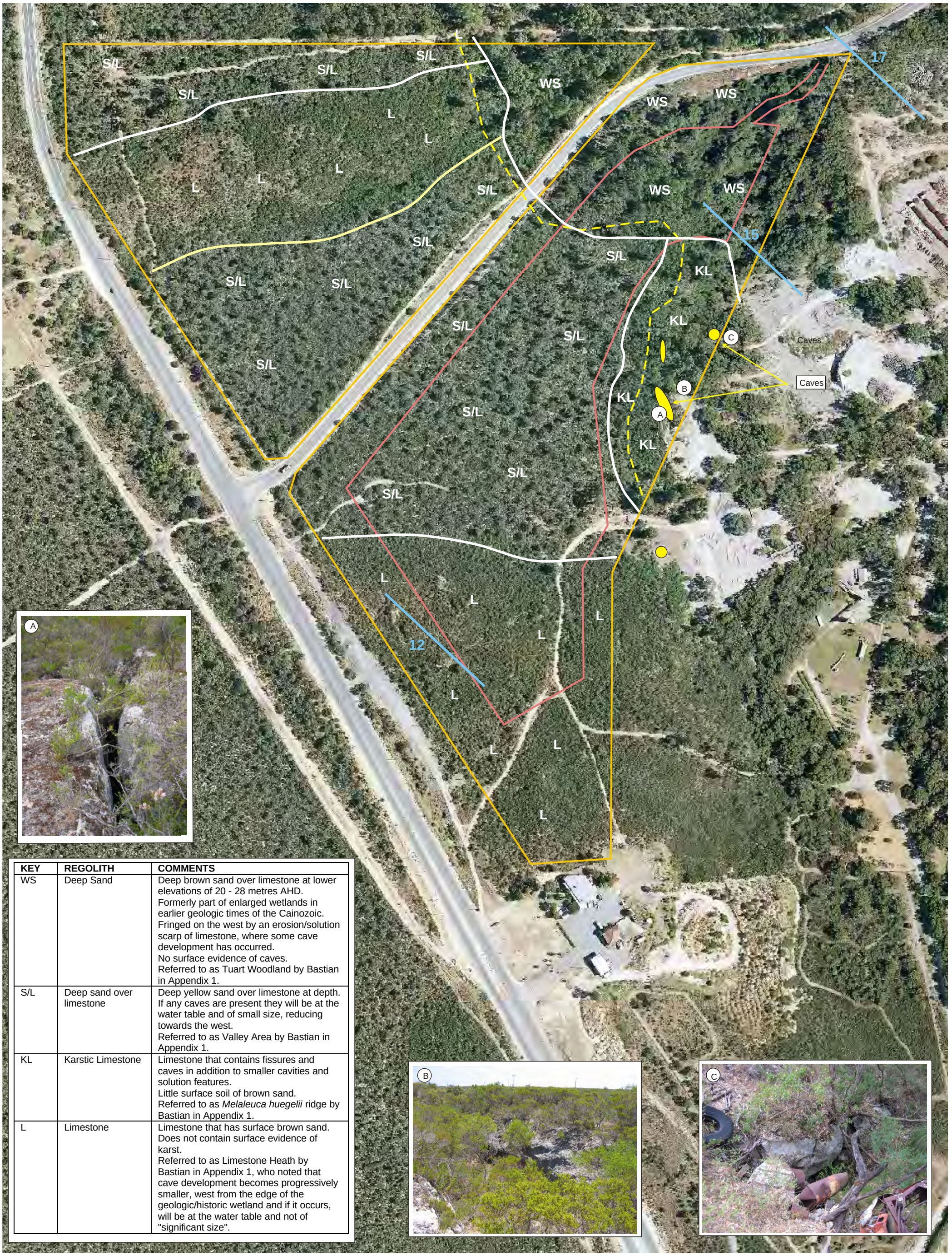
Hotel

Market Gardens

0 100m

LOT 1 NOWERGUP ROAD	
SURROUNDING LANDUSES	
Landform Research	October 2010
Base LANDGATE	Scale 1 : 5 000 at A3

Figure 2



KEY	REGOLITH	COMMENTS
WS	Deep Sand	Deep brown sand over limestone at lower elevations of 20 - 28 metres AHD. Formerly part of enlarged wetlands in earlier geologic times of the Cainozoic. Fringed on the west by an erosion/solution scarp of limestone, where some cave development has occurred. No surface evidence of caves. Referred to as Tuart Woodland by Bastian in Appendix 1.
S/L	Deep sand over limestone	Deep yellow sand over limestone at depth. If any caves are present they will be at the water table and of small size, reducing towards the west. Referred to as Valley Area by Bastian in Appendix 1.
KL	Karstic Limestone	Limestone that contains fissures and caves in addition to smaller cavities and solution features. Little surface soil of brown sand. Referred to as *Melaleuca huegelii* ridge by Bastian in Appendix 1.
L	Limestone	Limestone that has surface brown sand. Does not contain surface evidence of karst. Referred to as Limestone Heath by Bastian in Appendix 1, who noted that cave development becomes progressively smaller, west from the edge of the geologic/historic wetland and if it occurs, will be at the water table and not of "significant size".

0 60m

Extent of proposed excavation

12 Water table elevation, (May 2003)

Figure 3

LOT 1 NOWERGUP ROAD	
LOCATION OF CAVES AND KARST	
Landform Research	June 2008
Base LANDGATE	Scale 1 : 3 000 at A3

RESOURCE PREPARATION

Loader takes resource from dump to load the crusher. Loader operates on floor of pit, behind dumps, to reduce dust and noise.

Limestone is ripped and pushed into a resource dump by a bull dozer. Operating behind dumps and on floor of pit to provide visual screening and noise suppression.

Overburden pushed into dumps for later use in rehabilitation. The dumps assist dust and noise mitigation.

Topsoil pushed into low dumps for use in rehabilitation.

Buffer trees

Excavation is normally 10 to 15 metres deep

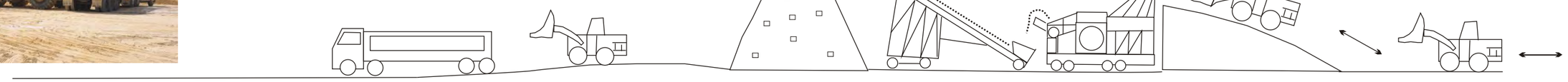
LIMESTONE PROCESSING

Product is loaded from stockpiles to road trucks. Road traffic is isolated from excavation for safety and to minimise risk of dieback introduction.

Screening plant to obtain correct product size, which is placed on stockpiles.

Electric primary and secondary crushers powered by self contained diesel generator. Operating plant is located on the floor of the pit to provide noise and dust screening.

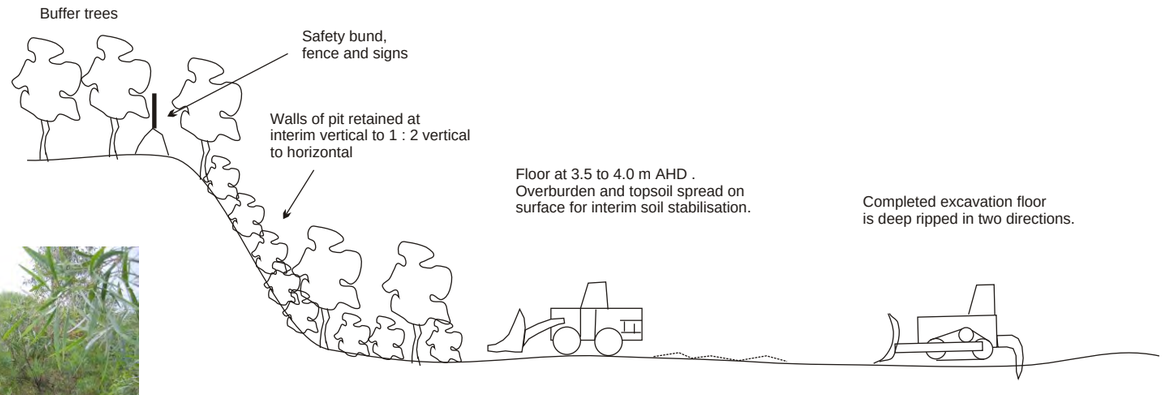
Loader takes resource from dump to load the crusher



Typical operational crusher

Typical operational pit with walls providing visual and noise screening and stockpiles on the floor of the pit

INTERIM LAND STABILISATION



Typical interim stabilisation pending decisions on future land uses in another pit

Four year old rehabilitation - M70/339

TYPICAL LIMESTONE CRUSHING OPERATION

Landform Research

Figure 4

Typical excavation with a bulldozer ripping the limestone

Loader loading screened limestone

Typical operation on the floor of a quarry with the loader feeding the crusher and small stockpiles

Typical mobile plant location on the floor of the excavation with near vertical faces

Loading road trucks in typical operation

Typical rehabilitation of limestone with local native species (four year old)

Figure 5

LOT 1 NOWERGUP ROAD	
TYPICAL LIMESTONE OPERATIONS	
Landform Research	June 2008

Reserve 24581

LOT 1
24 7787 ha

NOWERGUP ROAD

ROAD

CONCEPT YEAR 5

CONCEPT YEAR 10

CONCEPT YEAR 20

POTENTIAL COMMUNITY TYPE 26a

LINE OF KARST
(Lex Bastian)

Excavation of this area will require a new approval apart from excavation for the access road

Concept excavated area after 5 years, allowing for some battering of slopes.

Concept excavated area after 10 years, allowing for some battering of slopes.

Subject to new approvals the excavation will extend to the perimeter of the footprint and cut deeper.

SEE FIGURES 7A - 7D FOR INDICATIVE STAGING

LOT 1 NOWERGUP ROAD	
EXISTING CONTOURS	
WA Limestone	SEPTEMBER 2010
Base LANDGATE	Scale 1 : 2 000 at A3

SWAN LOC 1955

Figure 6

date	29 October 2010	job no.	6763
scale	1:2000	drwg no.	101002
designer	S Fairfoul	project mgr	S Jeleric
client			
title	**indicative** extraction and rehabilitation staging		stage 1: 1-2 years
address	lot 1 (No. 2350) wanneroo road,		neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 1
Year 1 - 2

date	29 October 2010	job no.	6763
scale	1:2000	drwg no.	101002
designer	S Fairfoul	project mgr	S Jeleric
client			
title	**indicative** extraction and rehabilitation staging		stage 2: 4 years
address	lot 1 (No. 2350) wanneroo road,		neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 2
Year 2 - 4

Figure 7A

2 November 2010 | 6763
1:2000 | 101002
5 Fairfoul | 5 Jeleric

indicative extraction and rehabilitation staging
stage 3: 6 years
lot 1 (No. 2350) wanneroo road,
neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 3
Year 3 - 6

2 November 2010 | 6763
1:2000 | 101002
5 Fairfoul | 5 Jeleric

indicative extraction and rehabilitation staging
stage 4: 8 years
lot 1 (No. 2350) wanneroo road,
neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 4
Year 4 - 8

Figure 7B

URBAN DESIGN
PROJECT MANAGEMENT
MASTER PLANNING
TOWN PLANNING

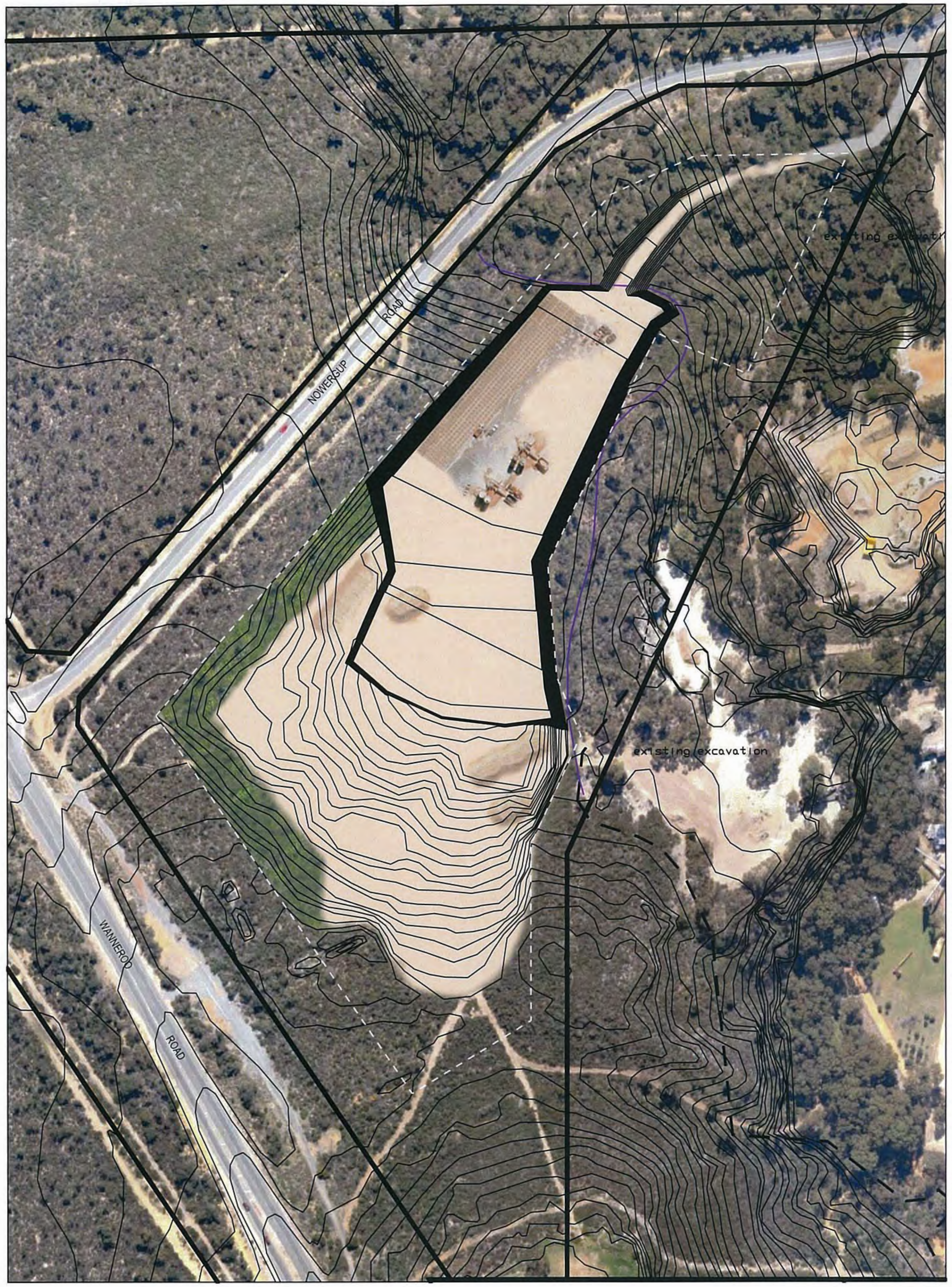
date 2 November 2010 | job no. 6763
scale 1:2000 | c ref 101002
design S Fairfoul | prepared by S Jeleric
client

title indicative extraction and rehabilitation staging
stage 5: 10 years
address lot 1 (No. 2350) wanneroo road, neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 5
Year 10

PROJECT MANAGEMENT | URBAN DESIGN | MASTER PLANNING | TOWN PLANNING



date 2 November 2010 | job no. 6763
scale 1:2000 | c ref 101002
design S Fairfoul | prepared by S Jeleric
client

title indicative extraction and rehabilitation staging
stage 6: 11-11.5 years
address lot 1 (No. 2350) wanneroo road, neerabup

GREG ROWE & associates
FOCUSED ON ACHIEVEMENT

INDICATIVE STAGE 6
Year 11 - 11.5
Figure 7C

PROJECT MANAGEMENT | URBAN DESIGN | MASTER PLANNING | TOWN PLANNING

INDICATIVE FINAL CONTOURS

EXAMPLES OF REHABILITATION BY WA LIMESTONE GROUP OF COMPANIES

WA Bluemetal rehabilitation, Mundijong Hard Rock Company, on 1 : 1.5 batter slope

Limestone Building Block Company rehabilitation on limestone, Hopkins Road, Nowergup

WA Bluemetal rehabilitation and access road Mundijong Hard Rock Quarry

WA Limestone Vegetated bund to limestone pit on Rockingham Road, Munster

Steep slopes and limestone outcrop retained at Joondalup Golf course in an old limestone quarry. Final slopes on site will be 1 : 2 vertical to horizontal on the eastern side and heavily vegetated with local native species. On the areas available for building envelopes, slopes will be 1 : 4 - 1 : 5 vertical to horizontal with flat building envelopes and heavily vegetated rehabilitated land surfaces.

Figure 7D

MINING TENEMENTS
COCKBURN CEMENT

COCKBURN CEMENT

COCKBURN CEMENT

MINING TENEMENTS
COCKBURN CEMENT

MINING TENEMENTS
COCKBURN CEMENT

MINING TENEMENTS

KEY	DESCRIPTION
	Future of East Wanneroo rural living proposed area
	300 metre buffer to poultry farm
	300 buffer to market garden-intensive horticulture
	300 metre to limestone quarry or mining tenement
	Proposed limestone quarry on Lot 1 Nowergup Road

NOTE
A 300 metre generic buffer is used. This does not imply impacts are less than or greater than that buffer but rather the 300 metres is similar to the EPA generic buffer at which supporting information may be required. The buffers are drawn to illustrate the existing constraints on the land.

Landform Research May 2010

BUFFERS TO EXISTING LAND USES IN THE NOWERGUP AREA

Figure 8

Poultry Farm

Market Gardens

Bush Forever Site 383

Nowergup Road

North of Nowergup Road
to be retained as remnant
vegetation.
Bush Forever Site 383

Lime Kilns and Quarry

Natural vegetation to be retained

Natural vegetation to be retained

LINE OF KARS
(Lev Bastian)

CONCEPT 5 YEAR

POTENTIAL COMMUNITY PARK

Lime Kilns and Quarry

Market Gardens

Natural vegetation to be retained

CONCEPT 10 YEAR

Wanneroo Road

Hotel

Natural vegetation to be retained

Market Gardens

SCREENING BELTS

Screening belt of local native trees and shrubs planted on perimeter firebreak and overburden bund at rate of 100 trees and 100 shrubs per 100 linear metres. Planted in first winter following approval.

0 100m

LOT 1 NOWERGUP ROAD	
SURROUNDING LANDUSES	
Landform Research	NOVEMBER 210
Base LANDGATE	Scale 1 : 5 000 at A3

Figure 9

Appendix 1

45 Nautical Grove
BELDON 6027
8th June 2007
(ph 9401 7158)

WA Limestone
41 Spearwood Avenue
BIBRA LAKE WA 6163
Attention: Denis Hill

KARST EXAMINATION OF NOWERGUP PROPERTY

The property east of Wanneroo Road on the south side of Nowergup Road was examined on the morning of 28th May, with respect to karstic features on it.

Result of inspection

1.Abandoned limekiln quarry:

The quarry reveals evidence of a former cave or caves in the presence of several old dried out stalactites and a shawl partway up the western wall of the quarry.

2. Rift:

The large north-south rift just to the west of the abandoned quarry is approximately 6-7 metres in depth. The rift was entered from the north end and examined. As is typical of such rifts its floor was found to have a great deal of rubble which tends to block access to caves. At least one crevice sloping down to the west was observed about midway along the base, however the rubble is blocking access. A side rift to the west was noted, which can be seen partly soil covered on the surface. On the surface smaller extensions northwards from the main rift were noted.

The alignment of the rift is significant, as it is typical for such rifts to run along the spine of a ridge, because solution beneath at the watertable will have undermined the ridge, causing it basically to split into two halves. Several examples of such spinal rifting along a ridge have been found at Yanchep, always amongst the general cave area. Such is the case here, where as mentioned above stalactites on the wall of the abandoned quarry show that a cave or caves had existed at that site.

3. Cave:

The cave entrance east of the quarry and situated approximately on the property boundary, was accessed, and found to be an inclined fissure type of cave. This is the most common type of cave in the Yanchep-Wanneroo region, developed as a result of subsidence of solution cavities at the watertable. The cave fissure was found to slope northwestwards via a minor enlargement to bottom in a chamber of medium size (standup height). Therefore the cave itself is under the property.

The main chamber is itself developed between the walls of large blocks of broken rock, indicating that this would be where the largest of the watertable chambering had collapsed. From it several accessible fissures were seen to continue further, again in a northwest direction.

4. Melaleuca huegelii ridge

Experience at Yanchep has shown that Melaluca huegelii are characteristically abundant on limestone ridges which are extensively fissured due to karst development beneath. Evidently this species requires the extensive fissuring for its root systems to be able to reach the watertable, in contrast to the tuarts with their much stronger taproots, which require minimal fissuring to force through to the water.

The fissures give this terrain a "broken" aspect, in contrast to the typical limestone terrain of more or less evenly distributed pinnacles projecting through the soil. Although in most parts of such ridges the fissuring proves too narrow to allow cave access, caves will be usually found in the near vicinity. This is exemplified by the presence of the cave accessed nearby, plus the likelihood that other caves had formerly existed which were quarried away.

The presence of strong karstification at depth is more or less certain. Therefore it is considered that the Melaleuca huegelii area as delineated by Lha on the vegetation survey is karstic as a whole.

5. Tuart woodland and valley area

Prime tuart woodland is in this region a strong indication of the main cave belt. Thus although no surface evidence of caves was observed in the tuart valley tract in the eastern portion of the property, their presence cannot be ruled out, as the soil accumulation in the valley could mask possible caves. Also in view of the fact that the caves in the Wanneroo-Yanchep area occur in a well defined belt tends to suggest that the karst features actually observed would not be isolated, but that the cave belt as a whole probably straddles the eastern portions of the property.

6. Limestone heath

No surface evidence of caves was observed in the limestone heath which occupies the higher elevations of the property. However since cave development proceeds westwards in the region due to groundwater flow towards the coast, the possible presence of caves cannot be excluded entirely.

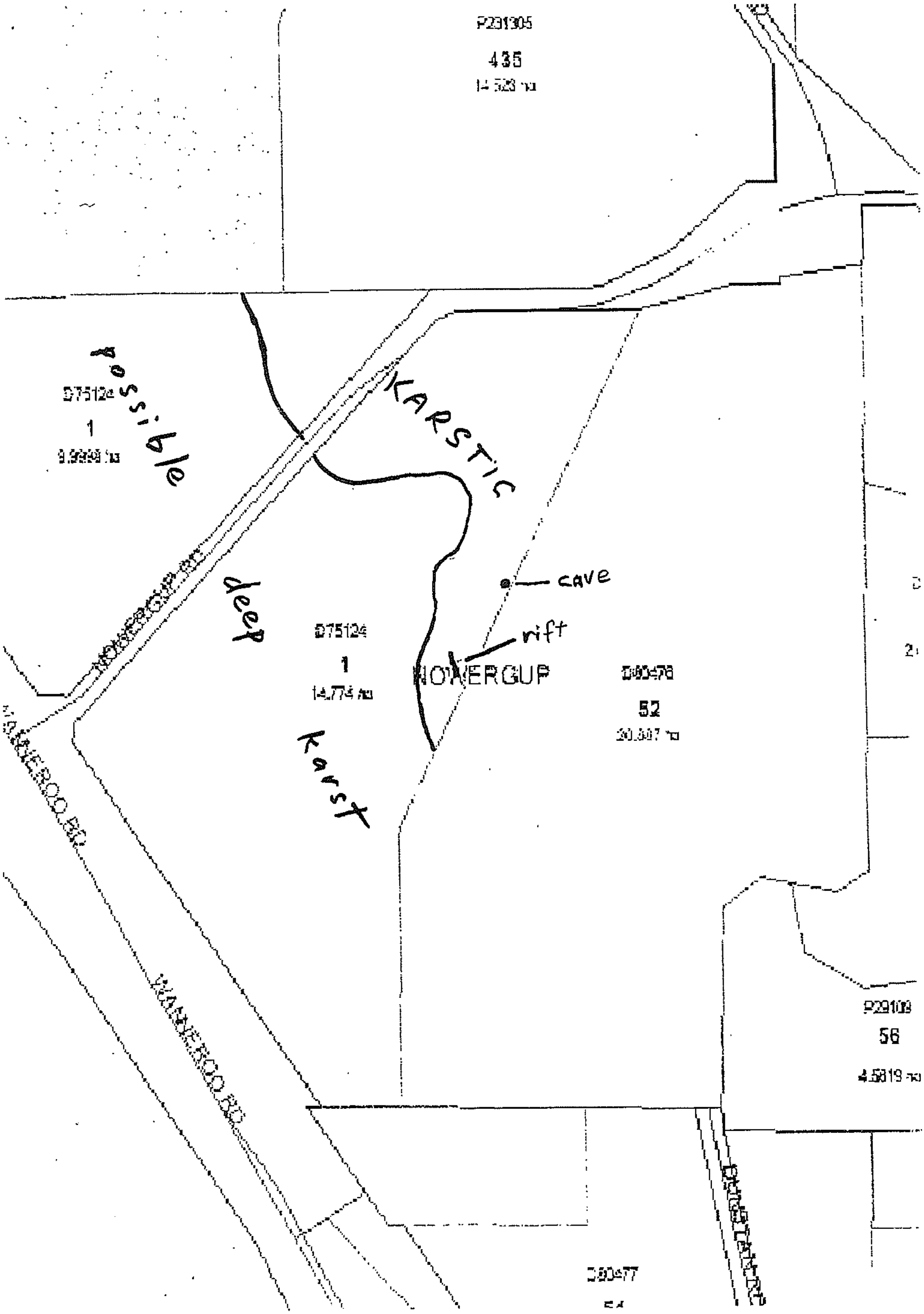
Experience elsewhere has shown that such caves become progressively smaller due to increasing saturation of dissolved calcium carbonate westwards in the cave streams. Thus although they may be present they are likely to be deep at the water table level as well as not of significant size, such as would preclude the proposed operations.

Conclusion

That portion of the property which lies from the Melaleuca huegelii ridge and the western edge of the tuart woodland thence eastwards, is either strongly karstic or likely to be karstic to a significant degree, and should be preserved. On the accompanying map this area has been delineated.

Yours faithfully

Lex Bastian
(L V Bastian, B.Sc, OAM)



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52
56
WANNEROO RD

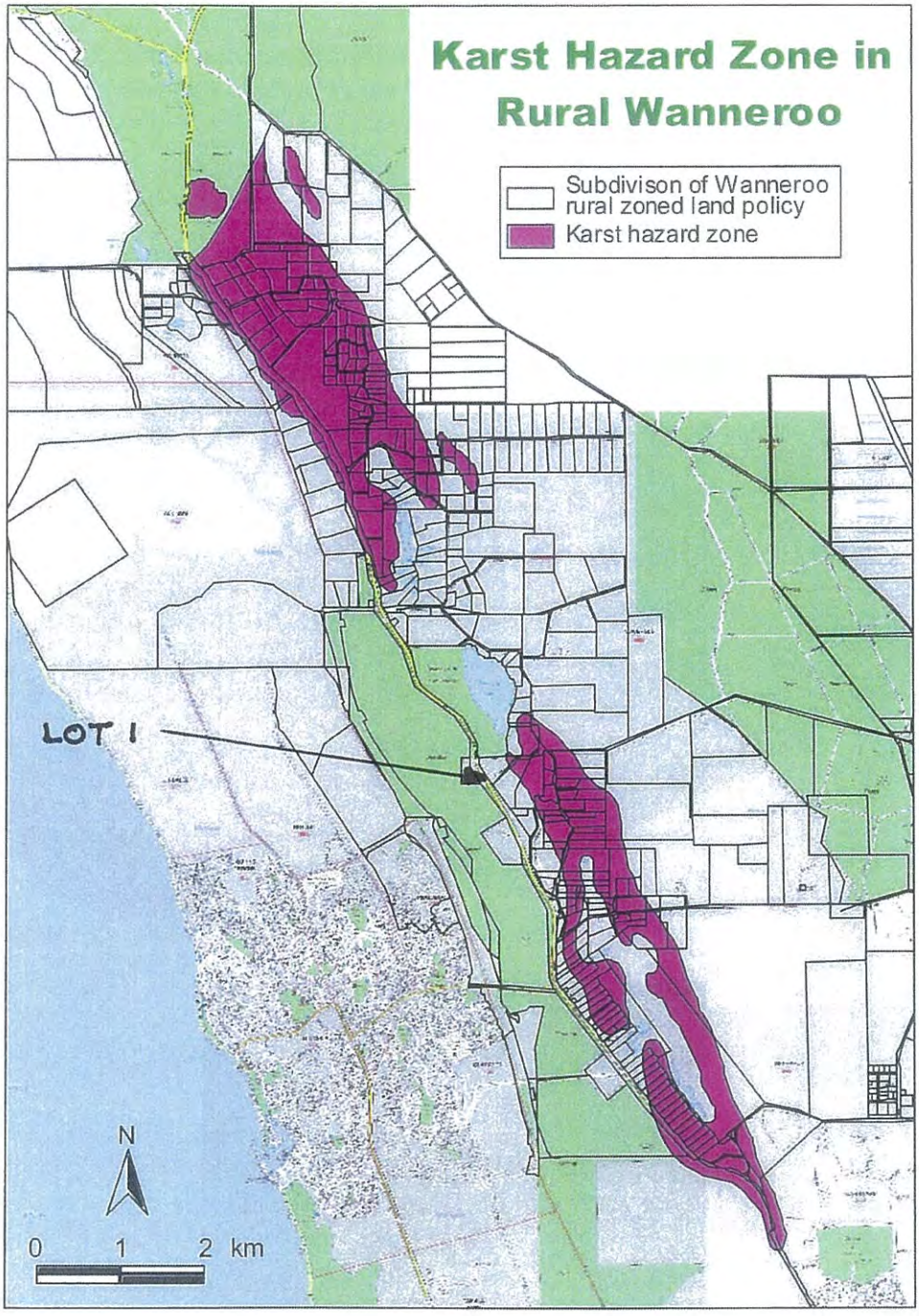

Figure 3.1 Karst Hazard Zone in rural Wanneroo. (Mapped by Lex Bastian).

Appendix 2

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

Vegetation and Flora Assessment, Lot 1, Nowergup Road, Nowergup

September 2010

1.0 INTRODUCTION

WA Limestone owns Lot 1 as an integral part of their long term northern resources.

A significant part of the resource was been sterilised by the creation of Nowergup Road which cut through the centre of Lot 1, cutting it in two and splitting the remnant vegetation communities.

Following the construction of the road, Bush Forever was placed across the northern portion of Lot 1; Bush Forever Site 383 which also extends to the west of Wanneroo Road.

It is understood that Bush Forever was implemented over the northern portion of Lot 1 without consultation with WA Limestone, or any compensation.

This vegetation and flora study is provided to identify the vegetation on the southern portion of Lot 1 and determine its significance in order that the most significant vegetation can be protected and at the same time allow limestone excavation on the less significant vegetation.

The proposed taking of limestone by WA Limestone is an attempt to recover some limestone resource from Lot 1, but is compromised by the need to provide adequate buffers.

The whole of Lot 1 is recognised as a Priority Limestone Resource in Statement of Planning Policy 2.4. The area has been shown as a high grade limestone resource in the earliest Basic Raw Materials Policies since the mid 1980's by the then Metropolitan Region Planning Authority and is now listed in SPP 2.4 by the Western Australian Planning Commission.

2.0 METHODOLOGY

Aims of the Survey

The aims of the survey were to assess the vegetation in terms of plant communities, vegetation condition, plant species and the potential for Rare and Priority Species to be present on this site.

The study was undertaken to comply with Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004.

25 Heather Road, Roleystone WA 6111
Tel 9397 5145 Fax 9397 5350

Lindsay Stephens Bsc (Geology), Msc (Botany) MEIANZ
Mem Aust Geomechanics Soc - Mem WA Environ Cons Assoc

Methodology

Lindsay Stephens of Landform Research conducted vegetation assessments on 30 November 2006, 28 May 2007, 5 November 2007 and 15 November 2007.

During the inspections the whole of Lot 1 south of Nowergup Road was traversed at intervals of approximately 40 metres. In the better or more visually significant vegetation traverse intervals down to 10 - 20 metres or less were used. All native species noted during the traverses were recorded.

Exotic species were recorded for the edge effects and north eastern corner, however these are opportunistic and do not in many cases contribute to the aims of assessing native vegetation. Few exotic species are present apart from immediately around the north eastern corner of Lot 1.

Four 100 m^2 plots were assessed for species presence and richness in each of the major vegetation types on 15 November 2007. The results are shown in Table 3. This data was compared to data in Gibson et al 2004, as outlined below, to confirm the community type and vegetation complex to which the vegetation is most closely aligned.

A brief inspection of the portion of Lot 1 north of Wesco Road was also undertaken to determine the vegetation communities, but as that portion of land is not proposed to be quarried detailed assessments were not conducted.

Prior to the site inspection the DEC Rare and Priority Flora database was searched. The Commonwealth EPBC databases were also searched.

The main references for plant identification were knowledge of the assessor, published texts, and Florabase, including as necessary comparison to the WA Herbarium Reference Collection.

Determinations and inferences on the Vegetation Complexes and Floristic Community Types were made in a number of ways, relating to comparisons to published floristics and geomorphic and regolith matching.

- Bush Forever used the same methodology based on comparisons to published floristics and geographic information, Bush Forever 2000, Volume 2 page 487.
- Comparisons were made to published boundaries of Vegetation Complexes in Heddle et al, 1980.
- Comparisons of species were made to the descriptions of Floristic Community Types in Gibson et al 1994, pages 29 to 45.
- Comparisons of species were made to the sorted table in Gibson et al 1994, Table 12, which shows the species frequency within each Floristic Community Type. Weston 2004 states that Neil Gibson noted that such comparisons are possible.
- Comparisons were made to the descriptions of the Floristic Community Types and maps in Appendix 1 of Gibson et al 2004.
- Descriptions of nearby Bush Forever sites in Bush Forever 2000, Volume 2, particularly Bush Forever Site 383.
- Comparison to regolith maps such as the 1 : 50 000 Perth Metropolitan Environmental Geology Map Sheets produced by the Western Australian Geological Survey.

- Comparisons were made to published boundaries of Landforms and Soils in Churchward and McArthur, 1980.

- Soil and regolith mapping and assessment of the geomorphology by Lindsay Stephens at the time of the site inspections. Soil and regolith mapping has been found to be very closely aligned to species composition through extensive field mapping by Landform Research, with small changes to the clay or sesqui-oxide content being related to the introduction and deletion of particular indicators.

- Comparisons to databases of Regolith and Vegetation Communities held by Landform Research and the field experience of Lindsay Stephens.

3.0 PHYSICAL ENVIRONMENT

3.1 Site Description

The site is a sloping site dropping from a ridge of 60 metres AHD in the south down to 28 metres of the edge of the limestone in the central north where it forms a relatively flat area.

The site is underlain by the Tamala Limestone which is widespread along the coastal area on Western Australia, but is in most areas sterilised by development.

The limestone is an aeolian calcarenite (formed from wind blown calcareous sands) derived from beach sands and categorised as the Tamala Limestone. Calcrete formation has occurred on top of the ridge as calcium carbonate has been dissolved and re-precipitated. This has formed a hard cap rock of higher calcium carbonate content and has resulted in minor pinnacle formation and solution structures. Some of the solution structures follow old tree roots and are filled with sand to shallow depth as the calcium carbonate has been dissolved by slightly acidic soil moisture. See Perth Environmental Geology 1 : 50 000 Series, Yanchep and Perth maps, (Geological Survey, 1982 and 1986).

Sand shed from the weathering limestone provides the soil cover on the limestone, deepening to the north west corner.

Soil coverage is very low with shallow yellow brown sands over abundant limestone outcrop. They are classified as Cottesloe soils; Uc1.23 (Northcote). Where present, soil depth is generally only 200 to 300 mm On the north western corner of Lot 1 the soils become deeper and tend to be more like the Spearwood Sands.

The site is well drained with at least 4 metres above the highest known water table, (Department of Environment and Conservation, 2004, *Perth Groundwater Atlas*).

4.0 VEGETATION

4.1 Community Types

Previous Work

Restricted vegetation studies have been conducted for Bush Forever 2000, mainly from edge observations.

The vegetation studies quoted in Bush Forever cover a large area that includes the northern portion of Lot 1 and extends along the western side of Wanneroo Road. The whole Bush Forever Site 383 is a large site and includes "five floristic groups" including wetlands. It also lists 315 native taxa which was estimated to be 85% of the total flora. It covers a large and diverse area with a total of 1736.1 hectares, compared to the whole of the southern portion of Lot 1 which has an area of 14.774 hectares, and the proposed excavation area of 7 hectares.

Bush Forever 2000 lists a number of "Significant Flora" although the reasons for their "significance" is not listed in most cases. Some of the species listed as "significant' are locally common species.

As far as is known no vegetation surveys have previously been completed on Lot 1.

Current Study

The current study of the site was conducted to EPA (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004.

The whole site is designated Cottesloe Complex, Central and South, as identified by Heddle et al, 1980, *Vegetation Complexes of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia*, Department of Conservation and Environment. This designation also includes the more sandy areas:

Cottesloe Complex, Central and South, "*Mosaic of woodland of Eucalyptus gomphocephala, and open forest of Eucalyptus gomphocephala – Eucalyptus marginata – Eucalyptus calopylla; closed heath on limestone outcrops.*"

Heddle et al, 1980, also nominates the north eastern extremity as Vegetation Complex 53 Herdsman Complex, "*Sedgelands and fringing woodland of Eucalyptus rudis – Melaleuca sp*" . None of these species occur on site and therefore the whole site is deemed Cottesloe Complex, Central and South.

Community Types were isolated by Gibson et al, 1994, *A Floristic Survey of the Southern Swan Coastal Plain*, Unpublished Report for the Australian Heritage Commission, prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia.

The assessments listed below generally concur with the findings of Bush Forever 2000 for Site 313 which was not sampled by Bush Forever but inferred. The Limestone Closed Shrubland is better ascribed to Community Type 26b rather than 27 as inferred by Bush Forever 2000.

Four community types have been identified.

Limestone Closed Shrubland

The limestone areas in the south and along the eastern edge of Lot 1 are covered by Limestone Closed Shrubland which is typified by *Dryandra sessilis, Hakea trifurcata, Acanthocarpus pressii, Acacia pulchella, Acacia lasiocarpha, Xanthorrhoea preissii, Hakea prostrata, Phyllanthus claycinus*, and *Melaleuca systena*. *Acacia rostellifera* regrowth thicket occurs in patches. The only Eucaypts are occasional *Eucalyptus foecunda*. This community is best related to Community Type 26b, "Woodlands and mallees on limestone".

One 100 m² sample plot was established in this community in the central south of Lot 1. The community appears to have been cleared in the past or severely grazed and allowed to regrow. The understorey and ground cover is more open than would normally be the case in an undisturbed community and contained 15 native species, mostly perennial species, but also contained 8 exotic species.

Melaleuca Shrubland.

- *Melaleuca* Shrubland A

Where more caprock and exposed pinnacles occur at the edges of breaks of slope and where soil cover is reduced, the community changes with *Melaleuca huegelii*, *Melaleuca systena* and *Dryandra sessilis* becoming dominant. This community is restricted to several clumps in the south and along the eastern edge of Lot 1. This community appears to be Type 26a *Melaleuca huegelii – Melaleuca systena* Shrublands on limestone ridges. This community is listed as Endangered and has been excluded from the area proposed for excavation.

- *Melaleuca Shrubland* B

This vegetation is termed *Melaleuca* Shrubland. The *Melaleuca* Shrubland along the eastern edge of Lot 1 also contains some less common or different species, including *Dodonea aptera*, *Logania vaginalis*, *Eremophila glabra* and the exotic *Malva dendromorpha*.

One 100 m² sample plot was established in this community on the eastern margin of Lot 1. This community is to be excluded from the proposed excavation. This vegetation is in generally very good condition and the sample plot contained 15 native species (mostly perennial) with 2 exotic species.

Banksia Woodland

The sandy area to the north west is *Banksia* Woodland with *Banksia attenuata*, *Banksia menziesii*, *and including Eucalyptus todtiana over a low shrub layer of Conostephium pendulum*, *Gompholobium tomentoseum*, *Hibbertia hypericoides*, *Allocasuarina humilis*, *Hakea prostrata*, *Patersonia occidentalis*, *Calothamnus quadrifidus*, *Calothamnus sanguineus* and *Petrophile linearis*.

The *Banksia* Woodland is classified as Community Type 28, "Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands".

There is a gradation in species from the limestone ridges with common limestone outcrop to the *Banksia* Woodland with the soils going through a transition of Limestone Pinnacles and this is reflected in the vegetation communities.

Two 100 m² sample plots were established in this community in the central north of Lot 1. This vegetation is in generally good to very good condition but shows signs of having been disturbed at some point in the past, particularly near tracks, and then been allowed to regrow. The sample plots contained 17 and 19 native species (mostly perennial) with 4 and 3 exotic species per plot.

Tuart Woodland

The north east of Lot 1 is dominated by Tuart Woodland with *Eucalyptus gomphocephala* over predominantly exotic species from past land disturbance. The Tuarts also grade into the *Melaleuca* Shrubland along the eastern side of Lot 1; the Tuarts in this location may be regrowth as a result of disturbance from past excavation on the adjoining land to the east. *Acacia pulchella* var *goadbyi* was recorded in this woodland. The Tuart woodland is to be excluded from excavation.

The level of disturbance to this vegetation makes it difficult to ascribe it to any Floristic Community Type.

4.2 Species List – Plant Density

The species recorded during the site investigation are listed in Table 1.

A total of 92 native taxa were observed in the site investigations during the site traverses together with an additional 20 exotic species.

Bush Forever lists the species richness of the two communities as Community Type 26b, "Woodlands and mallees on limestone" 49.8 species per 100 m^2 plots, with Community Type 28, "Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands" having 55.1 species per 100 m^2 plot.

The sample plots recorded in November 2007 contained much lower species numbers with most species being perennial species. This is likely to be due to the past clearing and disturbance, and reduced annual species as a result of seasonal and fire history factors.

Exotic species are often dominant in the north eastern understorey including pasture species, *Briza maxima*, *Watsonia* spp *Avena* spp, *Pelargonium* sp, *Euphorbia* sp, *Avena barbata*, among others. See Tables 2 and 3.

Table 1 Species List

X Denotes common species.
XXX Denotes a dominant widespread species
<10 Indicates present as between 1 and 10 plants in the surveyed area.
1 Indicates a single plant observed or the total number of plants of that species observed.

FAMILY	GENUS - SPECIES	Predominantly on the limestone ridge	Predominantly in sand
Amaranthaceae	*Ptilotus polystachyus*	X	
Anthericaceae	*Corynotheca micrantha* var *micrantha*	X	
	Tricoryne eliator	X	
Asteraceae	*Olearia axillaris*	X	
	Waitzia suaveolens	X	X
Casuarinaceae	*Allocasuarina fraseriana*		X
	Allocasuarina humilis	X	X
Chenopodiaceae	*Rhagodia baccata* subsp *baccata*	X	
Colchicaceae	*Burchardia congesta*	X	X
Cyperaceae	*Mesomelaena pseudostygia*	X	X
	Schoenus grandiflorus	X	
	Lepidosperma costale	X	
	Tetraria octandra	X	
Dasypogonaceae	*Acanthocarpus preissii*	X	
	Lomandra maritima	X	
Dilleniaceae	*Hibbertia hypericoides*	X	X
Epacridaceae	*Astroloma pallidum*		X
	Conostephium pendulum		X
	Leucopogon parviflorus	X	
	Leucopogon polymorphus		X
Euphorbiaceae	*Phyllanthus calycinus*	X	
Goodeniaceae	*Lechenaultia linerioides*	X	
	Scaevola canescens		X
Haemodoraceae	*Conostylis aculeata* subsp *preissii*	X	X
	Conostylis setigra		X
	Haemodorum laxum		X
	Haemodorum spicatum	X	
Haloragaceae	*Gonocarpus pithyoides*	X	
Iridaceae	*Patersonia occidentalis*		X
Lamiaceae	*Hemiandra glabra* subsp *glabra*	X	
Lauraceae	*Cassytha glabella*	X	
	Cassytha ramosa	X	
Lobeliaceae	*Lobelia tenior*		X
Loganiaceae	*Logania vaginalis*	X	
Loranthaceae	*Nuytsia floribunda*		X
Mimosaceae	*Acacia huegelii*	X	
	Acacia lasiocarpa var *lasiocarpa*	X	
	Acacia pulchella var *glaberrima*	X	X
	Acacia pulchella var *goadbyi*		X
	Acacia rostellifera	X	
	Acacia saligna		X
	Acacia truncata	X	
Myoporaceae	*Eremophila glabra*	X	

FAMILY	GENUS - SPECIES		
Myrtaceae	*Baeckea robusta*	X	X
	Calothamnus quadrifidus	X	X
	Calothamnus sangguineus		X
	Calytrix flavescens		X
	Eucalyptus foecunda	X	
	Eucalyptus gomphocephala		X
	Eucalyptus todtiana		X
	Melaleuca huegelii	X	
	Melaleuca systena	X	
Orchidaceae	*Microtis media* subsp *media*		
Papilionaceae	*Bossiaea eriocarpa*	X	X
	Daviesia divaricata	X	X
	Hardenbergia comptoniana	X	X
	Gomphlobium tomentosum	X	X
	Hovea trisperma	X	X
	Jacksonia calcicola	X	
	Jacksonia sternbergiana		X
	Kennedia prostrata	X	
	Templetonia retusa	X	
Phormiaceae	*Dianella revoluta* var *divaricata*	X	X
Pittosporaceae	*Sollya heterophylla*		X
Poaceae	*Amphipogon turbinatus*		X
	Austrostipa compressa	X	
Polygalaceae	*Comosperma integerrimum*	X	
Portulaceae	*Calandrinia calyptrata*	X	
Proteaceae	*Banksia attenuata*		X
	Banksia menziesii		X
	Conospermum acerosum subsp *acerosum*		X
	Conospermum stoechadis subsp *stoechadis*	X	
	Dryandra lindleyana var lineleyana	X	
	Dryandra sessilis	X	
	Grevillea preissii	X	
	Hakea lissocarpha	X	X
	Hakea prostrata	X	X
	Hakea trifurcata	X	
	Petrophile biloba		X
	Petrophile macrostachya		X
	Petrophile serruriae subsp *glanduligera*	X	
	Petrophile linearis		X
	Stirlingia latifolia		X
Restionaceae	*Desmocladus fasciculatus*		X
	Desmocladus flexuosus		X
	Loxocarya cinerea	X	X
Rhamnaceae	*Spyridium globulosum*	X	
	Trymalium ledifolium		X
Sapindaceae	*Dodonea aptera*	O	
	Nitraria billardierei	X	
Thymelaerceae	*Pimelia suaveolens*		X
Xanthorrhoeaceae	*Xanthorrhoea gracilis*	X	X
	Xanthorrhoea preissii	X	X
Zamiaceae	*Macrozamia riedlei*	X	X
TOTAL SPECIES		**92**	

Table 2 Vegetation Survey Exotic Plants

X Denotes common species.
XXX Denotes a dominant widespread species
<10 Indicates present as between 1 and 10 plants in the surveyed area.
1 Indicates a single plant observed or the total number of plants of that species observed.

FAMILY	GENUS - SPECIES	
Aizoaceae	*Carpobrotus edulis*	X
Asparagaceae	*Asparagus asparagoides*	X
Asteraceae	*Hypochaeris sp*	X
	Sonchus oleraceus	X
	Urospermum picroides	X
	Ursinia anthemoides	X
Euphorbaceae	*Euphorbia terracina*	X
Fabaceae	*Trifolium sp*	X
Fumariaceae	*Fumaria capreolata*	X
Geraniaceae	*Pelargonium capitum*	X
Iridaceae	*Gladiolus caryophllaceus*	X
	Watsonia sp	X
Malvaceae	*Malva dendormorpha*	X
Polygalaceae	*Polygala myrtifolia*	X
Poaceae	*Avena barbata*	X
	Briza maxima	X
	Bromus madritensis	X
	Cynodon dactylon	X
	Ehrarta calycina	X
	Lagurus ovatus	X
Primulaceae	*Anagallis arvensis*	X
TOTAL EXOTIC SPECIES		**20**

Table 3 Species Richness of 100 m² Sample Plots

X Denotes common species.
XXX Denotes a dominant widespread species
<10 Indicates present as between 1 and 10 plants in the surveyed area.
1 Indicates a single plant observed or the total number of plants of that species observed.

FAMILY	GENUS - SPECIES	100 m² plot number and Vegetation Community			
		1	2	3	4
		Limestone Closed Shrubland	*Banksia* Woodland	*Banksia* Woodland	Melaleuca Shrubland
Amaranthaceae	*Ptilotus polystachyus*				
Anthericaceae	*Corynotheca micrantha* var *micrantha*	X		X	
	Tricoryne eliator				
Asteraceae	*Olearia axillaris*				
	Waitzia suaveolens		X		
Casuarinaceae	*Allocasuarina fraseriana*			X	
	Allocasuarina humilis		X	X	
Chenopodiaceae	*Rhagodia baccata* subsp *baccata*	X			
Colchicaceae	*Burchardia congesta*				
Cyperaceae	*Mesomelaena pseudostygia*		X	X	
	Schoenus grandiflorus				
	Lepidosperma costale				
Dasypogonaceae	*Acanthocarpus preissii*				
	Lomandra maritima				
Dilleniaceae	*Hibbertia hypericoides*	X			
Epacridaceae	*Astroloma pallidum*				
	Conostephium pendulum			X	
	Leucopogon parviflorus				X
	Leucopogon polymorphus		X		
Euphorbiaceae	*Phyllanthus calycinus*	X			
Goodeniaceae	*Lechenaultia linerioides*				
	Scaevola canescens		X		
Haemodoraceae	*Conostylis aculeata* subsp *preissii*	X	X	X	
	Conostylis setigra		X		
	Haemodorum laxum		X	X	
	Haemodorum spicatum				
Iridaceae	*Patersonia occidentalis*			X	
Lamiaceae	*Hemiandra glabra* subsp *glabra*				
Lauraceae	*Cassytha glabella*				
	Cassytha ramosa				
Lobeliaceae	*Lobelia tenior*			X	
Loganiaceae	*Logania vaginalis*				
Loranthaceae	*Nuytsia floribunda*			X	
Mimosaceae	*Acacia huegelii*				
	Acacia lasiocarpa var *lasiocarpa*	X			
	Acacia pulchella var *glaberrima*		X	X	
	Acacia pulchella var *goadbyi*				
	Acacia rostellifera	X			
	Acacia saligna				
	Acacia truncata				X
Myoporaceae	*Eremophila glabra*				

FAMILY	GENUS - SPECIES	1	2	3	4
		Limestone Closed Shrubland	*Banksia* Woodland	*Banksia* Woodland	Melaleuca Shrubland
Myrtaceae	*Baeckea robusta*				
	Calytrix flavescens		X		
	Calothamnus quadrifidus				
	Calothamnus sangguineus				
	Eucalyptus foecunda				
	Eucalyptus gomphocephala				
	Eucalyptus todtiana				
	Melaleuca huegelii				X
	Melaleuca systena	XXX			X
Orchidaceae	*Microtis media* subsp *media*				
Papilionaceae	*Bossiaea eriocarpa*				X
	Daviesia divaricata				
	Hardenbergia comptoniana			X	X
	Gomphlobium tomentosum	X	X	X	
	Hovea trisperma		X		
	Jacksonia calcicola				
	Jacksonia sternbergiana				
	Kennedia prostrata				
	Templetonia retusa				X
Phormiaceae	*Dianella revoluta* var *divaricata*	X			
Pittosporaceae	*Sollya heterophylla*		X		
Poaceae	*Amphipogon turbinatus*				
	Austrostipa compressa				
Polygalaceae	*Comosperma confertum*				X
	Comosperma integerrimum				X
Portulaceae	*Calandrinia calyptrata*	X			
Proteaceae	*Banksia attenuata*		X	X	
	Banksia menziesii		X	X	
	Conospermum acerosum subsp *acerosum*				
	Conospermum stoechadis subsp *stoechadis*				
	Dryandra lindleyana var lineleyana	X			X
	Dryandra sessilis	XXX			X
	Grevillea preissii	X			X
	Hakea lissocarpha				X
	Hakea prostrata				
	Hakea trifurcata	X			
	Petrophile biloba				
	Petrophile macrostachya		X		
	Petrophile serruriae subsp *glanduligera*				
	Petrophile linearis			X	
	Stirlingia latifolia			X	
Restionaceae	*Desmocladus fasciculatus*			X	
	Desmocladus flexuosus	X			
	Loxocarya cinerea		X	X	
Rhamnaceae	*Spyridium globulosum*				
	Trymalium ledifolium				X
Sapindaceae	*Dodonea aptera*				
	Nitraria billardierei				
Thymelaerceae	*Pimelia suaveolens*				
Xanthorrhoeaceae	*Xanthorrhoea gracilis*			X	
	Xanthorrhoea preissii		X	X	X

FAMILY	GENUS - SPECIES	1	2	3	4
		Limestone Closed Shrubland	*Banksia* Woodland	*Banksia* Woodland	Melaleuca Shrubland
Zamiaceae	*Macrozamia riedlei*			X	
TOTAL NATIVE SPECIES PER 100 m² plot		**15**	**17**	**19**	**15**
EXOTIC SPECIES		**1**	**2**	**3**	**4**
		Limestone Closed Shrubland	*Banksia* Woodland	*Banksia* Woodland	Melaleuca Shrubland
FAMILY	**GENUS - SPECIES**				
Asparagaceae	*Asparagus asparagoides*				
Asteraceae	*Hypochaeris sp*				
	Sonchus oleraceus				X
	Urospermum picroides			X	
	Ursinia anthemoides		X		
Euphorbaceae	*Euphorbia terracina*	X	X		
Fabaceae	*Trifolium sp*	X			
Fumariaceae	*Fumaria capreolata*				
Iridaceae	*Gladiolus caryophllaceus*	X	X	X	
Malvaceae	*Malva dendormorpha*				
Polygalaceae	*Polygala myrtifolia*				
Poaceae	*Avena barbata*	X	X		
	Briza maxima	X		X	X
	Bromus madritensis				
	Cynodon dactylon				
	Ehrarta calycina	X			
	Lagurus ovatus	X			
Primulaceae	*Anagallis arvensis*	X			
TOTAL EXOTIC SPECIES PER 100 m² plot		**8**	**4**	**3**	**2**

4.3 Rare, Priority and Significant Flora

Flora can be significant on the basis of features of the taxa, its distribution and rarity. Flora as a vegetation community or complex can also be significant based on similar principles. The most commonly used determinants of significance are listed below.

A number of flora are regarded as significant even though they may not be listed as Declared Rare or Priority species. "Significant flora" and "Significant vegetation" are defined in ***Environmental Protection Authority (2004) Guidance Statement, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No 51, June 2004.***

SIGNIFICANT FLORA

Species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Declared Rare Flora or Priority flora, and may include the following:

- *a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;*
- *relic status;*
- *anomalous features that indicate a potential new discovery;*

- *being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);*
- *the presence of restricted subspecies, varieties, or naturally occurring hybrids;*
- *local endemism/a restricted distribution;*
- *being poorly reserved.*

SIGNIFICANT VEGETATION

Vegetation may be significant for a range of reasons, other than a statutory listing as Threatened Ecological Communities or because the extent is below a threshold level, and may include the following reasons:

- *scarcity;*
- *unusual species;*
- *novel combination of species;*
- *a role as a refuge;*
- *a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;*
- *being representative of the range of a unit (particularly, a good local and/or regional example of a unit in "prime" habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);*
- *a restricted distribution.*

THREATENED ECOLOGICAL COMMUNITY

Ecological communities that have been assessed through a procedure (coordinated by DEC) and assigned to one of the following categories related to the status of the threat to the community. (EPA Guidance Statement No 51 2004).

Presumed Totally Destroyed

Critically Endangered

<10% of the pre-European extent remains in an intact condition in the bioregion.

Endangered

10 – 30% of pre-European extent remains

Vulnerable

Declining and/or has declined in distribution and/or condition, and whose ultimate security is not yet assured (it could move into a category of higher threat in the near future if threatening processes continue)

PRIORITY ECOLOGICAL COMMUNITY

Ecological communities that have been assessed through the procedures for Threatened Ecological Communities, but do not meet the criteria although still potentially at risk are assigned to one of the following categories related to the status of the threat to the community. (Definitions and Criteria for Priority Ecological Communities, DEC and CALM Policy Statement No 9).

Priority One

Poorly known ecological communities that are very restricted and not actively managed for conservation.

Priority Two

Poorly known ecological communities that are restricted and mostly actively managed for conservation

Priority Three

Poorly known ecological communities that are of more widespread occurrence, which may not be well reserved or subject to disturbance pressures or significant communities that are not under threat.

Priority Four

Communities that are adequately known, but rare and not threatened, or are near the status of Threatened. They are divided into Rare, Near Threatened or communities removed from the Threatened List.

Priority Five

Communities that are not threatened, but are dependant on conservation for their survival.

DECLARED RARE FLORA

Species specially protected under the Wildlife Conservation Act 1950, *as identified in the current listing. Normally listed within a Wildlife Conservation (Rare Flora) Notice.*

R: ***Declared Rare Flora – Extant Taxa***

Taxa which have been adequately searched for and are deemed to be in the wild either rare , in danger of extinction, or otherwise in need of special protection *and have been gazetted as such.*

X: ***Declared Rare Flora – Presumed Extinct Taxa***

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, *and have been gazetted as such.*

PRIORITY FLORA

Lists of plant taxa, maintained by the Department of Environment and Conservation that are either under consideration as threatened flora but are in need of further survey to adequately determine their status, or are adequately known but require monitoring to ensure their security does not decline.

1: ***Priority One – Poorly known taxa***

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, *or being on lands under immediate threat, eg road verges, urban areas, farmland, active mineral leases, etc, or the plants are under threat, eg from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.*

2: ***Priority two – Poorly known taxa***

Taxa which are known from one or a few (generally <5) populations, at which some at least are not believed to be under immediate threat *(ie currently not endangered). Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.*

3: ***Priority Three – Poorly known taxa***

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat *(ie not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.*

4: ***Priority Four – Poorly known taxa***

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not in currently threatened by any identifiable factors. *These taxa require monitoring every 5 – 10 years.*

COMMONWEALTH LEGISLATION

Sometimes vegetation communities or plant taxa are listed under the ***Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999.***

Previous Studies

As far as is known no previous studies have been undertaken on Lot 1.

Current Study

- **Endangered Communities**

Community Type 26a., is listed as a Threatened Ecological Community. Endangered, and is recorded in the wider northern Perth Metropolitan Area and at Yanchep. Searches have been made through the local area by Department of Environment and Conservation (CALM) officers.

Several small patches of Community Type 26a occur on site, in the south and along the eastern edge of Lot 1. This ridge also contains some species that do not occur in the other patches to the south. The *Melaleuca* Shrubland along the eastern edge of Lot 1 also contains some less common or different species, including *Dodonea aptera, Logania vaginalis* and *Eremophila glabra.* The ridge also is karst rich and will not be cleared. The excavation has been located to avoid disturbance to this community type.

The *Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999* database lists Aquatic Root Mat Communities in Caves of the Swan Coastal Plain and Sedgelands in Holocene dune swales of the southern Swan Coastal Plain. The Holocene dune swales do not occur in the local area, being restricted to coastal localities.

With caves on the eastern edge of Lot 1 there is potential for Aquatic Root Mat Communities. The potential presence of these communities is discussed under Stygofauna in Appendix 3 of the main report, which follows this flora study report.

When contacted, Dr Brenton from the University of Western Australia made the point that requirements for the formation of root mat communities were well known and were contained in Jasinke 1997). No known communities fell outside these parameters.

The site meets some of those conditions for potential root mat communities with the presence of Tuart trees and caves along the eastern edge of Lot 1.

The caves were inspected by Lex Bastian on 28 May 2007 in company with Lindsay Stephens of Landform Research and Denis Hill representing WA Limestone. Lex Bastian wrote a report on his investigations which is attached as Appendix 1 of the main report, immediately prior to this flora study report.

The caves are restricted to the eastern edge of Lot 1 and will not be impacted on by the excavation. In addition the root mat communities require stream caves at the water table. The excavation is not proposed to intersect the water table and will have a separation of 4 – 7 metres to the water table which provides an allowance for seasonal changes.

The potential for root mat communities to occur on site is regarded as low, and even if they did occur the caves are not proposed to be disturbed and the water table is not proposed to be intersected. No tuart trees are likely to be cut down because the access road appears to be able to be constructed to ensure they are retained. In addition Tuart trees are proposed to be included in the rehabilitation of the site.

- **Priority Communities**

None of the vegetation on site is classified as one of the published Priority Ecological Communities. (DEC January 2008).

- **Declared Rare, Priority and Significant Species.**

The vegetation and flora surveys did not locate any Declared Rare or Significant Taxa. Prior to the site inspection the DEC Rare and Priority Flora database was searched (attached in Appendix 2). The Commonwealth EPBC databases were also searched (included in Appendix 3) of the main report.

No listed species were encountered on site.

Grevillea thelmaniana is listed on the DEC database, but it is believed that it should be delisted as it is now listed in error. *Grevillea thelmaniana* used to include *Grevillea preissii* which has been separated into a new species and is not listed as significant or as a Priority species. *Grevillea thelmaniana* remains listed as a P4 species but is restricted to clay pans on the eastern side of the Swan Coastal Plain and not on this site.

Over the years there has been extensive searching for *Eucalyptus argutifolia*, by a number of persons including Lindsay Stephens, but none was observed on Lot 1.

No Priority species were recorded on site.

No plant communities or taxa are listed as a Threatened Ecological Community or taxa under the *Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999.*

Three taxa are listed in Bush Forever 2000 as "Significant", (Volume 2, pages 297 – 298) and several occur on site. These are;

Lechenaultia linarioides typical Tamala Limestone taxa
Petrophile serruriae subspecies (GJK 11421)
Eucalyptus foecunda

Lechenaultia linerioides is listed in Bush Forever 2000 as poorly reserved, however it is a common coastal species, albeit not always locally in large numbers, that occurs from south of Perth to north of Geraldton. As much coastal land is now in reserves or partially protected in a number of other ways, it is difficult to see how this remains a significant species.

Eucalyptus foecunda occurs as a few trees in the south adjacent to a patch of Community Type 26a. It will not be impacted on by excavation.

Petrophile serruriae subspecies (GJK 11421) may now be *Petrophile serruriae* subsp *glanduligera*, which occurs as a coastal taxa from Yallingup in the south to just south of Geraldton. It is therefore unlikely to be under threat.

None of the taxa is listed as a Priority species. Even the lowest level of Priority Taxa P4 are listed as "*Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.*"

As the taxa are not currently listed as a Priority Species in 2007, after having been nominated as significant in Bush Forever 2000, then presumably the taxa are at a lower need for protection of P4 and are not currently threatened.

It is likely that most of the plants of the listed taxa will be retained, and others can be used in rehabilitation. The limestone ridge to the south and that along the eastern edge of Lot 1 are to be preserved.

Significant Tree Survey

The *Tuart Conservation and Management Strategy (draft December 2004)*, prepared by the Tuart Response Group on behalf of the Government of Western Australia, addresses the protection of Tuart Woodlands. The vegetation in the north east of Lot 1 is Tuart Woodland.

The City of Wanneroo Tree Preservation Policy appears to relate to vegetation in general and does not provide any cutoffs on what constitutes a significant tree or vegetation, which is not the case with other Local Government Tree Preservation Policies.

The fauna study conducted by Western Wildlife did not identify any Tuart trees as having hollows large enough for Black Cockatoos, but did not count smaller hollows.

Other Local Government Tree Preservation Policies across Australia use a diameter at chest height of 625 mm. The Commonwealth considers 500 mm in relation to Black Cockatoo management, but no measurement is used in the City of Wanneroo Tree Preservation Policy.

The study of the Tuart trees that has been undertaken measures the diameter of all trees and plots them on the attached plan. The methodology was to locate each Tuart tree using hand held GPS and to transfer that location using Landgate mapping and the GPS co-ordinates. The plan of the Tuart trees is attached.

The only impact on this woodland will be to located an access road across it. The access road appears to be able to be constructed without taking any Tuart Trees. In addition Tuart trees will be included in the revegetation of the site.

The Draft Tuart Conservation and Management Strategy provides for offsets in Section 1.6.7 and again in Section 2 as a means of ensuring no net loss of Tuart Woodland by providing compensatory habitat. To this end Tuart Trees are included in the revegetation of the site and the batter slopes. The operation will therefore comply with the Draft Tuart Conservation and Management Strategy.

4.4 Vegetation Condition

VEGETATION CONDITION

The vegetation condition mapping used is that used by the Department of Environment and Conservation and is taken from Bush Forever 2000.

Vegetation Condition Scale reproduced from page 48 (Bush Forever 2000).

Condition Score	*Vegetation Condition*	*Vegetation Descriptors*
1	***Pristine***	*Pristine or nearly so, no obvious signs of disturbance*
2	***Excellent***	*Vegetation structure intact, disturbance affecting individual species, and weeds are non aggressive species.*
3	***Very Good***	*Vegetation structure altered, obvious signs of disturbance.* *For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.*
4	***Good***	*Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic structure or ability to regenerate it.* *For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.*
5	***Degraded***	*Basic structure of the vegetation severely impacted on by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.* *For example disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.*
6	***Completely Degraded***	*The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.*

This condition scale uses a scale that can distort the public perception of middle vegetation condition when compared to previous vegetation studies. In previous studies the word "Good" would have been a lower classification such as "Poor" as shown in Bush Forever 2000, page 48. The scale Good also does not seem to match the vegetation description provided on page 48. The Bush Forever 2000 Condition Score is possibly better related to the potential for regeneration of remnant vegetation rather being a descriptor of its current condition. See Attachment 2.

Another approach is to use the number of remaining species as an indicator of vegetation condition. This provides for a less subjective assessment of the vegetation condition. Kaesehagen, 1995, Bushland Condition Mapping, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University, 1995, A copy of the Kaesehagen 1995 vegetation condition table is shown below.

Descriptor	*Percentage of species remaining*	*Comments*
Very Good - Excellent	*80 – 100%*	• *Vegetation structure intact or nearly so.* • *Cover / abundance of weeds less than 5%.* • *No or minimal signs of disturbance.*
Fair - Good	*50 – 80%*	• *Vegetation structure modified.* • *Cover / abundance of weed 5 – 20%, any number of individuals.* • *Minor signs of disturbance*
Poor	*20 – 50%*	• *Vegetation structure completely modified.* • *Cover / abundance of weeds 20 – 60% any number of individuals.* • *Disturbance incidence high*
Very Poor	*0 – 20%*	• *Vegetation structure disappeared.* • *Cover / abundance of weeds 60 – 100% cover, any number of individuals.* • *Disturbance incidence very high.*

Previous Work

No previous work has been undertaken on site.

Current Study

The vegetation is generally in Very Good to Excellent Condition (Bush Forever 2000 Scale) with the north eastern corner of Tuart Woodland being in Degraded Condition. See Figure 2.

The majority of the site, on first glance, appears to be weed and exotic species free. However the north eastern corner where the Tuart Woodland occurs has significant weed and exotic species in the understorey and ground cover with most areas being dominated by those species.

Other areas appear to have been cleared in the past or grazed and then allowed to regrow. This has reduced the number of native species in the understorey and led to the introduction of exotic species, including a number of pasture species. For example there are 20 exotic species recorded for the site and in the 100 m_2 sample plots the number of exotic species ranges from 2 to 8. The number of native species ranged from 15 to 19 for the 100 m^2 sample plots.

Bush Forever lists the species richness of the two communities as Community Type 26b, "Woodlands and mallees on limestone" 49.8 species per 100 m^2 plots, with Community Type 2B, "Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands" having 55.1 species per 100 m^2 plot.

This shows that the vegetation is modified, and, according to Kaesehagen 1995, would fall into the Poor or even Fair to Good vegetation categories after allowing for some annual species not having been detected for a number of reasons.

In Bush Forever the vegetation is classified as Good to Very Good with some areas of Excellent, and significant edge effects where clearing, and other disturbances have Degraded the vegetation. Vegetation Condition is shown on the attached plan.

5.0 SIGNIFICANCE OF THE FLORA

SIGNIFICANCE OF FLORA

The significance of the flora depends on a number of issues.

- *Rare, Priority or Significant species may be present.*
- *A Threatened Ecological Community may be present.*
- *The development may take the area of the particularly vegetation community or complex below desirable levels or guidelines.*
- *There may be an aspect of the flora that may be listed under the* ***Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999.***

EPA Position Statement No 2, December 2000, Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in 4.1, Clearing in the agricultural areas for agricultural purposes. In 4.3, Clearing in other areas of Western Australia, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.*

Section 4.3 Clearing in other areas of Western Australia, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, National Framework for the Management and Monitoring of Australia's Native Vegetation. ***The National Objectives and Targets for Biodiversity Conservation 2001 - 2005*** *(Commonwealth of Australia 2001) also recognise 30% as the trigger value.*

For the Perth Metropolitan Area and the Greater Bunbury Area the minimum retention figure is 10%.

Previous and Current Studies

All remnant vegetation has significance however a compromise is required between community need for basic raw materials and the maintenance of vegetation. The reason these areas remain as remnant vegetation is because they either were never cleared because of their low agricultural potential and were retained as limestone resources.

The majority of the proposed 7.0 hectares on Lot 1 are in Very Good or better condition with the only lesser quality vegetation in the north east and along the edges of tracks.

No Declared Rare or Priority Species was identified during the vegetation assessments. Three taxa are listed as "Significant" in Bush Forever 2000 (pages 297 – 298) but in 2007 none of these are listed as a Priority species and therefore are not regarded as currently under significant threat.

Community Type 26a which is listed as Endangered on State lists occurs to the south and east of the proposed excavation.

No Taxa or plant communities listed under Commonwealth Legislation were observed and there appears to be a low chance of Root Mat Communities under the excavation area. If they do occur the proposed excavation has been designed to minimise or negate any impacts on such communities. See Appendix 1 (Karst) and 3 (Fauna) of the Main Report.

Lot 1 has been a listed Priority Limestone Resource since the mid 1980's by the Western Australian Planning Commission and was overlaid by Bush Forever Site 383 north of Nowergup Road also by the Western Australian Planning Commission.

Over the years submissions have been made in respect of this listing on the grounds that the listing is incompatible with SPP 2.4.

Bush Forever 2000, Volume 2 page 8 states "Bush Forever recognises the importance of the extractive and mining industries in the context of broader community considerations".

The quality of the limestone and its high grade nature were examined in a number of studies and identified as being of high priority for staged community use.
See;

- Western Australia, Western Australian Planning Commission, *Statement of Planning Policy 2.4, Basic Raw Materials.*

- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.

- Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5.

At the end of the quarry life the land will be recontoured and have a base of limestone covered by overburden and respread topsoil. This can be planted with clumps of local tree species to replace those removed, including Tuarts and other local species.

The reality is that the limestone is needed by the community and that is the only reason it has been excavated. Therefore an examination of the significance of the flora and its value cannot be divorced from a consideration of the community need for limestone.

The northern portion of Lot 1, which is covered by Bush Forever Site 283, is 9.9998 hectares. This is not subject to a mining proposal. The southern portion of Lot 1 has an area of 14.774 hectares of which 7.0 hectares is proposed to be excavated.

The vegetation is designated Cottesloe Complex, Central and South, as identified by Heddle et al, 1980, *Vegetation Complexes of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia*, Department of Conservation and Environment.

The more sandy soils are designated as Karrakatta Complex - Central and South (Heddle et al 1980).

EPA Guidance 10 *Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region* lists Cottesloe Complex - Central and South as having 41.1% of the pre-European area still occurring and 8.8% in secure tenure.

EPA Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in *4.1, Clearing in the agricultural area for agricultural purposes.* In 4.3, *Clearing in other areas of Western Australia*, it is unclear what "other areas" refer to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 *Clearing in other areas of Western Australia*, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation.* The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

Bush Forever 2000 used a cut off of 10% for the Perth Metropolitan Area as a guidance to the significance of the vegetation complexes. The values for Cottesloe Complex, Central and South quoted in Bush Forever 2000 are 36% remaining respectively in the Perth Metropolitan Area (Bush Forever 2000).

The clearing restrictions introduced under the *Environmental Protection Act 1986*, through the 2004 Regulations, provide for significant protection for remnant vegetation. Therefore the value of both vegetation complexes, although not approaching the required levels in secure reserves, is provided with adequate protection.

Cottesloe Complex, Central and South forms the majority of the 1736.1 hectares of Bush Forever Site 383, which includes the Neerabup National Park and Reserve 24581, and provides for significant protection.

With the proposed excavation representing only 32% of the total area of Lot 1, allowing for 7.0 hectares of excavation and 1 hectare for access, this represents a significant sterilisation of a Priority Limestone Resource (SPP 2.4) and a community compromise.

In DEC Clearing Approval CPS 1834/1 the representations of the various vegetation complexes are;

	% Remaining	% in Secure Tenure
IBRA Bioregion	38.8%	32.5%
Heddle vegetation complex Cottesloe Complex Central South	41.1%	8.8%
Beard Vegetation Type 998	41.6%	29.2%

Bush Forever 2000, noted that if fully implemented then 18% of Cottesloe – Central South Vegetation Complex will be protected. The Metropolitan Region Scheme Amendment 1082.33 in 2004 noted that the following.

Total area included within Amendment 1082.33	895 ha
Total area proposed for inclusion in other Parks and Recreation amendments	11.5 ha
Total area already in Parks and Recreation	4 141 ha
Total area in Bush Forever Study Area	6 085 ha
Percentage of Bush Forever protected within Parks and Recreation	83%

If the area of Cottesloe Complex Central South remaining is 18 474 ha, out of a total of 44 995 ha of 1750 extant (EPA Guidance No 10, 2003) which appears to be the figure used during the DEC Clearing Permit Assessment quoted above, then the total area in Parks and Recreation would appear to now have a much higher level of protection.

That is MRS Amendment 1082.33 lists the total already in Parks and Recreation in 2004 as 6,085 hectares out of a pre 1750 total of 44 995 hectares (EPA Guidance No 10, 2003).

This means that 13.5% is already protected in Parks and Recreation which is more than is listed in EPA Guidance No 10, 2003 of 3 ,51 hectares, which now appears to be outdated.

With 13.5% already reserved in secure tenure, then the required 10% is already protected.

6.0 FAUNA HABITATS AND IMPACTS

The site is predominantly native vegetation.

The survival and disturbance to fauna depends on the end use of the site. The site is to be cleared progressively and returned progressively to local native vegetation in order to minimise impacts on fauna.

The re-establishment of local native flora species and habitats with the various commitments to that achievement will provide a mechanism for a return of fauna.

A database search was made of the Department of Environment and Conservation database. This is included in Appendix 3 of the Main Report. A Fauna Study has also been completed by Western Wildlife and is attached in Appendix 3.

The DEC database search found that a number of taxa of significance have been recorded within a 10 km radius of the site.

There are a number of sightings of Black Cockatoos in the general area. The listed taxa are *Calyptorhynchus latirostris* with *Caloptorhynchus* sp being recorded in 2005 at Pinjar. *Calyptorhynchus baudinii* has not been locally recorded on DEC databases. Both are listed on State and EPBC conservation databases. On the State database the taxa are listed in Schedule 1 as "Fauna that is rare or is likely to become extinct".

The species is listed as seasonally moving in flocks and feeding on Proteaceous shrubs. The Western Australian Museum (undated) lists *Calyptorhynchus latirostris* as visiting pine plantations, parks and gardens and proteace shrubs, especially *Dryandra sessilis*, *Banksia menziesii*, *B. attenuata* and *B. grandis* in the area from March to September.

Bamford Consulting Ecologists, in a personal communication, note that *Calyptorhynchus latirostris* occurs from Kalbari to east of Esperance, generally breeding in the Wheatbelt but more recently also in large trees with suitable nesting hollows in coastal areas. The trees on the proposed excavation area are very small and sparse and not suitable for breeding, based on the published requirements for breeding trees and pers com Mike Bamford.

Western Wildlife noted on page 6 of their report that the Tuart trees on site did not contain any suitable nesting hollows for these birds, but the site may provide feeding habitat.

Large Tuart trees occur in the north east, in the area where the access road is to be constructed. However it is anticipated that no tuart tree will need to be taken to construct the access road and therefore no potential sites of black cockatoos will be impacted on.

Calyptorhynchus latirostris may be a seasonal visitor to the site, but is unlikely to breed on site and as BSD/Meinhardt Joint Venture, 2004, notes "It is locally common on a seasonal basis". The main means of managing the site for this species is to progressively clear and use local species for rehabilitation. Western Wildlife also comment on the need to maintain habitat. The amount of native vegetation to be cleared is to be minimised as recommended by Western Wildlife, with just 32% of Lot 1 to be cleared, in addition to adding the northern portion of Lot 1 to Bush Forever site 383. Western Wildlife also recommend that rehabilitation include species known to provide food resources for Black Cockatoos. This is proposed.

Several invertebrate taxa have been recorded within 10 km of the site; a cricket *Austrosaga spinifer*, two records in 1981-82. This was discussed by Western Wildlife on page 9 of their report and an additional note in Appendix 3.

BSD/Meinhardt Joint Venture, 2004, notes that this species occurs in coastal communities from Neerabup to Cervantes and "is probably more common than the present results suggest".

There are four records of native bees, *Hylaeus globuliferus* four records from Neerabup 1995-96. BSD/Meinhardt Joint Venture, 2004 note that the species "is also widely in the south-west". The Commonwealth Department of Environment and Water Resources shows the species as occurring across the south west of Western Australia (south west coastal).

The native bee *Leiptroctus contrarius*, is listed by DEC database as 1 record at Gnangara which is "more widespread than previously thought".

The Graceful Sunmoth *Synemon gratiosa* has 5 records from 1984 to 1996 in the surrounding 10 km and is known to extend to Mandurah, being "under pressure from development, occurring in Spearwood and Bassendean dunes east through Whiteman Park, (BSD/Meinhardt Joint Venture, 2004).

There are also several records of mammals, Western brush Wallaby, *Macrocopus irma*, and Quenda *Isoodon obesulus fusciventer*. The Quenda may well occur on site, but is more likely to occur in the north east where the elevation is lower and the soils more loamy and moist. This area is to be retained.

The Peregrine Falcon *Falco peregrinus* is listed as uncommon with a preferred habitat, less likely on site, of rocky ledges, edges of open ground, open woodland and watercourses. Only two recordings are included in the database. Western Wildlife noted that although this species may be an occasional visitor they did not record any evidence of breeding.

Western Wildlife considered the other types of fauna; mammals, amphibians and reptiles, and summarised that the main issues were habitat removal.

As noted above the best means of minimising impact on fauna is to allow for progressive clearing and a return to local native vegetation which is proposed. It should be noted that the only reason that this site is to be quarried is to help satisfy the community need for basic raw materials. Only 32.2% of Lot 1 is to be affected by excavation.

It is also noted that very large areas of native vegetation are cleared to allow the development of urban areas from Merriwa, Ridgewood, Quinns Rocks, Jindalee, Alkimos and Eglinton. The creation of these urban areas requires the wholesale clearing of large numbers of hectares of native vegetation, much of it similar to or the same vegetation complexes as that on site, Cottesloe Complex Central South. The creation of the urban areas does not permit the progressive removal of basic raw materials from ahead of development and therefore there is no alternative but to source these materials from offsite, hence the need to open Lot 1 to excavation.

The differences between urban areas and excavation is that on urban areas the vegetation communities are lost whereas on Lot 1 local native species will be returned.

Lot 1 has always been earmarked for this purpose by its nomination in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials.

The issue of clearing native vegetation and fauna habitat cannot therefore be considered separately but must be considered in terms of community needs in the northern Perth Metropolitan area. If development of urban areas was staged to extract the basic raw materials as recommended in Government Planning Policies the need for basic raw materials from other sites would be reduced. Unfortunately this is not so and there is no alternative but to take resources from sites such as Lot 1.

7.0 CLEARING PRINCIPLES

Clearing Principles

*Clearing is controlled under the **Environmental Protection (Clearing of Native Vegetation) Regulations 2004.** These regulations provide for a number of principles against which clearing is assessed.*

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986*
1a	*High Level of diversity*
1b	*Significant fauna habitat*
1c	*Necessary to existence of Rare flora*
1d	*Threatened Ecological Community*
1e	*Significant area of vegetation in an area that has been extensively cleared*
1f	*Wetland or watercourse*
1g	*Land degradation*
1h	*Impact on adjacent or nearby conservation areas*
1i	*Deterioration of underground water*
1j	*Increase flooding*

As well as considering Biodiversity and other conservation issues the Clearing Principles that have to be satisfied are apparently designed for rural regions and do not address the issues of the metropolitan area or resource needs. Therefore some additional principles need to be added when considering the need for Basic Raw Materials. In an attempt to provide a better balance to the clearing principles those principles have been expanded as listed in the tables below.

Lot 1 has always been earmarked for this purpose by its nomination in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials, where Lot 1 is listed as a Priority Limestone Resource.

The issue of clearing native vegetation and fauna habitat cannot therefore be considered separately but must be considered in terms of community need in the northern Perth Metropolitan area. If development of urban areas was staged to extract the basic raw materials as recommended in Government Planning Policies the need for basic raw materials from other sites would be reduced. Unfortunately this is not so and there is no alternative but to take resources from sites such as Lot 1.

The CEO may take into account other matters that the "CEO considers relevant" (*EP ACT 1986 Section 51O*)

Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy.

There are many quarries and resource areas that have been allocated for use by the community prior to the introduction of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These approvals or nominations in planning policies such as Statement of Planning Policy 2.4 were made to ensure a sufficient availability of resources for the community, and pre-date the Clearing Regulations.

The proposal therefore has been assessed under the Clearing Principles of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and the additional considerations below to provide an assessment of the likely impacts of the proposal.

Proposed Clearing

	ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES
Environmental Protection Act 1984 Section 51O Planning Matters	
1	*Planning Matters*
Environmental Protection Act 1984 Section 51O Relevant Matters	
2a	*Need for the resource*
2b	*Classification of the resource and existing approvals*
2c	*Availability of alternative resources and the impact of their use*
2d	*Proposed final land use*
2e	*Offsite Environmental impacts if the resource is not used*
2f	*Sound environmental management and rehabilitation*

CLEARING PRINCIPLE *(Schedule 5, Environmental Protection Amendment Act, 1986).*		**COMMENT**
1a	High Level of diversity	• The site has been assessed in the flora survey and found to have a high level of diversity which is normal for these communities associated with Cottesloe Complex Central South. • The majority of the more significant taxa will be protected and excluded from excavation.
1b	Significant fauna habitat	• The habitat is in excellent condition but degraded in the north east. • It will provide fauna habitat. • Clearing will be progressive. The end use of the site is to be rehabilitated to native vegetation, pending industrial land use at some point in the future. • It is proposed to take only 32% of the site, with 40% already covered by Bush Forever 383 and two hectares lost as road reserve for Nowergup Road. • The fauna listed for the area will not be significantly impacted on. See general text previously, 6.0 Fauna Habitats and impacts.

1c	Necessary to existence of Rare flora	• No Declared Rare Flora was found • Six taxa are listed by Bush Forever as being significant but after seven years these are still not listed as Priority species and are not therefore regarded as currently threatened. • The majority of the plants of these taxa lie outside the proposed excavation area.
1d	Threatened Ecological Community	• The vegetation proposed to be cleared is not listed as a Threatened Ecological Community. The small areas of Community Type 26a which is listed as an Endangered Community are to be excluded from excavation. • Based on the site studies and a study of the karst by Lex Bastian, it is most unlikely that Root Mat Communities occur. If they did occur they will not be impacted on because excavation will leave a 4 metre buffer to the water table. No Eucalyptus *gomphocephala* are to be cleared. • The Tuart woodland is to be retained although an access road will be constructed through it. This complies with the *Tuart Conservation and Management Strategy (draft December 2004).*
1e	Significant area of vegetation in an area that has been extensively cleared	• The site is listed as a Priority Limestone Resource in Statement of Planning Policy 2.4. • Bush Forever has allocated an adjoining 1736.1 hectares in Bush Forever Site 383, which includes the northern 40% of Lot 1. • The vegetation complex meets the level of protection criteria. • EPA Guidance 10 *Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region* lists Cottesloe Complex - Central and South as having 41.1% of the pre-European area still occurring and 8.8% in secure tenure. • Bush Forever 2000 used a cut off of 10% for the Perth Metropolitan Area as a guidance to the significance of the vegetation complexes. The values for Cottesloe Complex, Central and South quoted in Bush Forever 2000 are 36% remaining respectively in the Perth Metropolitan Area (Bush Forever 2000).
1f	Wetland or watercourse	• No wetlands or watercourses occur on site. • The north east is lower in elevation but does not contain any wetland species.
1g	Land degradation	• The excavation can be managed in a manner that does not lead to degradation of the soil and land integrity apart from normal development issues. These are discussed in the main body of the Excavation and Rehabilitation Management Plan prepared for the site.
1h	Impact on adjacent or nearby conservation areas	• There are no nearby conservation areas, apart from Bush Forever Site 383 which lies to the north of Nowergup Road.

1i	Deterioration of underground water	• Excavation of limestone and sand is well known with respect to groundwater resources. Sand is extensively mined in the Gnangara Pine Plantation and Jandakot, and limestone and sand in the Hope Valley and Nowergup areas. These operations are managed in a manner to minimise any potential impact on groundwater. • There will be a separation of 4 metres to the water table. • Lex Bastian has assessed that the excavation will not impact on the karst formations in the east.
1j	Increase in flooding	• The high permeability of the limestone and depth of 4 metres to the water table ensure that flooding will not occur. • Recharge levels will increase slightly but not by significant amounts. Any increase will help compensate for reduced rainfall in recent years and pumping by land users to the east.

ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES		**COMMENT**
Environmental Protection Act 1984 Section 51O Planning Matters		
1	*Planning Matters*	• The whole of Lot 1 is recognised as a Priority Limestone Resource in Statement of Planning Policy 2.4. The area has been shown as a high grade limestone resource in the earliest Basic Raw Materials Policies since the mid 1980's by the then Metropolitan Region Planning Authority and is now listed in SPP 2.4 by the Western Australian Planning Commission. • Bush Forever Site 3B3 has already taken 40% of Lot 1. • Nowergup Road has taken an additional 2 hectares for road reserve.
Environmental Protection Act 1984 Section 51O Relevant Matters		
2a	*Need for the resource*	• Limestone is used for road bases, the construction industry, reconstituted stone, armour rock, lime and cement manufacture and is essential to community development and sustainability. • The reality is that the limestone and sand is only extracted for the community. If the community did not need the limestone there would be no extraction. Almost all the limestone is used on public works projects and for structural works, such as footings, structural walls in subdivisions and for building materials. • Whilst limestone might seem common, most of the resources closer to Perth have been sterilised by development, conservation of vegetation considerations, and public intolerance. • There are vast areas of the same vegetation communities through new urban area such as Clarkson, Butler, Jindalee and Alkimos. No limestone has been set aside for the community in these areas and the vegetation has been almost totally cleared leaving no alternative but for the community to source limestone from areas such as Lot 1. The failure

		to take basic raw materials from ahead of urban development is contradictory to Western Australian Planning Commission Policies.
2b	*Classification of the resource and existing approvals*	• Limestone on Lot 1 is identified in Planning Policies such as Statement of Planning Policy 2.4, Basic Raw Materials as a Priority Limestone Resource. *Section 51O of the Environmental Protection Act 1986* provides for Planning decisions to be taken into account. • It lies in an area that has always been earmarked as a source of limestone for the community.
2c	*Availability of alternative resources and the impact of their use*	• There are few alternative resources. Much limestone is already sterilised. The only alternatives are hard rock from the Darling Scarp, which involves clearing of vegetation on the Scarp. • Hard rock requires more energy and processing to extract than limestone. • Other limestone is available at Moore River and northwards but is often of lower quality and the transport distances lead to more road impacts and greenhouse gas emissions. The same applies for hard rock products brought from the Darling Scarp. • See comment in 2a with respect to the lack of availability of basic raw materials from ahead of urban development.
2d	*Proposed final land use*	• The proposed final land use is to return the site to local native species which helps negate the impacts of clearing, prior to industrial land use on an interim basis pending decisions on the final end use.
2e	*Offsite Environmental impacts if the resource is not used*	• Not taking the resource will result in additional greenhouse gas emissions and road impacts from the additional transport and processing of alternative products. • If this resource is not taken limestone or hard rock will have to be taken from another site resulting in land clearing on that site. • The site is to be returned to native vegetation, therefore reducing the potential impacts of clearing. • 40% of Lot 1 has already been covered by Bush Forever Site 383 and a further 2 hectares taken by the road reserve of Nowergup Road. • Only 7.0 hectare plus 1 hectare for access, or 32.2% of Lot 1, is proposed to be excavated.
2f	*Sound environmental management and rehabilitation*	• Extensive environmental and rehabilitation management procedures are to be used to minimise any environmental impact. • The site will be returned to native vegetation using local provenance species as an interim basis.

8.0 DISCUSSION

A total of 92 native taxa were found plus 20 exotic species.

No Declared Rare or Priority species were recorded. The Threatened Ecological Community 26a is to be excluded from excavation.

The proposed quarry is to be progressively rehabilitated to local native species, in areas not required for limestone batching.

Whilst there will be some loss of vegetation flora and fauna corridors will be maintained.

Bush Forever has already been placed over 40% of Lot 1, a Priority Limestone Resource, and the taking of limestone from 32.2% of Lot 1 is seen as a reasonable compromise that can be undertaken without significant environmental impact.

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Nowergup

Department of Conservation and Land Management

Conserving the nature of WA

Your Ref:
Our Ref: 2006F000108V
Enquires: Ben Lullfitz

Phone: 9334 0123
Fax: 9334 0278
Email: ben.lullfitz@dec.wa.gov.au

Landform Research
25 Heather Road
ROLEYSTONE WA 6111

Attention: Lindsay Stephens

Dear Mr Stephens

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 14 November 2006 for information on rare flora in the Hope Valley, Nowergup, Jurien and Seabird areas. The search co-ordinates used were as quoted in your request.

A search was undertaken for these areas of **(1)** the Department's *Threatened (Declared Rare) Flora* database (for results, *if any*, see "Summary of Threatened Flora Data" – coordinates are GDA94), **(2)** the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, *if any*, see "WAHERB Specimen Database General Enquiry"- coordinates are now GDA94 – see condition number 9 in the attached 'Conditions in Respect of Supply') and **(3)**, the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'; this list, which may also be used a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) – for results, *if any*, see "Declared Rare and Priority Flora List"].

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for $350 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 9334 0425.

Yours faithfully

J. Riley

.....

for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT and CONSERVATION

17 November, 2006

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.

2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.

3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Director General, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.

4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.

5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.

6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.

7. **It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.**

8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.

9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Note, the need for further survey of poorly known taxa is prioritised into the three categories depending on the perceived urgency for determining the conservation status of those taxa, as indicated by the apparent degree of threat to the taxa based on the current information.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING

AGR	Chief Exec Dept of Agriculture
ALT	Aboriginal Land Trust
BAP	Baptist Union of WA Inc
BSA	Boy Scouts Association
CC	Conservation Comission – NPNCA - LFC
CGT	Crown Grant in Trust
COM	Commonwealth of Australia
CRO	Crown Freehold-Govt Ownership
DOL	Dept of Land Administration
DPU	Ministry for Planning
EXD	Exec Direc CALM
FRE	Freehold
HOW	Homeswest
ILD	Industrial Lands Develop. Auth
JOI	Joint Vesting-NPNCA & Shire
LAC	LandCorp
LFC	Lands and Forests Commission
MAG	Minister for Agriculture
MED	Ministry of Education
MHE	Minister for Health
MIN	Minister for Mines
MPL	Ministry for Planning
MPR	Minister for Prisons
MRD	Main Roads WA
MTR	Minister for Transport
MWA	Minister for Water Resources
MWO	Minister for Works
NAT	Natural Trust of Australia WA
NON	Not Vested
NPN	NPNCA
OTH	Other
PRI	Private
RAI	Westrail
SEC	Western Power
SHI	Shire
SPC	State Planning Commission
TEL	Telstra
TGR	Timber Govt Requirement
TOW	TOWN
UNK	Unknown
WAT	Water Corporation
WEL	Minister Community Welfare
WRC	Water & Rivers Commission
XPL	Ex-Pastoral Lease

PURPOSES

ABR	Aboriginal Reserve
AER	Aerodrome
CAM	Camping
CAR	Caravan park
CEM	Cemetery
CFA	Conservation of Fauna
CFF	Conservation Of Flora & Fauna
CFL	Conservation of Flora
CHU	Church
CPK	Car Park
COM	Common
CON	Conservation Park
DEF	Defence
DRA	Drain
EDE	Educational Endowment
EDU	Educational purposes UWA
ENE	Enjoyment of Natural Environ.
EXC	Excepted from sale
EXL	Exploration Lease
EXP	Experimental Farm
FIR	Firing Range
FOR	State Forest
GHA	Grain Handling
GOL	Golf
GRA	Gravel Pit
GRE	Green Belt
GVT	Government Requirements
HAR	Harbour Purposes
HEP	Heritage Purposes
HER	Heritage trail
HOS	Hospital
KEN	Kennels
MIN	Mining lease
MUN	Municipal Purposes
NPK	National Park
NRE	Nature Reserve
OTH	Other
PAC	Public access
PAR	Parkland (& Recreation)
PAS	Pastoral lease
PFL	Protection of Flora
PIC	Picnic ground
PLA	Plantation
POS	Public Open Space
PPA	Public parkland
PRS	Prison site
PUT	Public Utility
QUA	Quarry
RAD	Radio Station
RAC	Racecourse
REC	Recreation
REH	Rehabilitation
RNP	Re-establish Native Plants
RRE	Railway Reserve
RUB	Rubbish
SAN	Sand
SCH	School-site
SET	Settlers requirements
SHI	Shire Requirements
SHO	Showgrounds
SNN	Sanitary
STO	Stopping place
TIM	Timber
TOU	Tourism
TOW	Town-site
TRA	Training Ground
TRI	Trig station
TVT	Television transmitting
UNK	Unknown
UTI	Utilities
VCL	Vacant Crown Land
VER	Road Verge
VPF	Vermin Proof Fence
WAT	Water
WCO	Water & Conservation of F & F
WOO	Firewood

* Please note that LFC now comes under the Conservation Commission.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
30 June 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
Acacia forrestiana	R	MW	Dandaragan, Jurien Bay	Oct-Dec
Asterolasia drummondii	4	MW	Dandaragan-Jurien	Jul-Sep
Conostylis pauciflora subsp. euryrhipis	3	SW	Yanchep, Lancelin, Seabird, Wilbinga	Jul
Eucalyptus argutifolia	R	MW,SW	Yanchep, Lancelin, Seabird, Jurien, Yalgorup	Mar-Apr
Eucalyptus crispata	R	MW	Three Springs-Jurien	Apr-Jun
Eucalyptus lateritica	R	MW	Jurien	Apr-Sep
Eucalyptus leprophloia	R	MW	Jurien	Aug-Dec
Eucalyptus suberea	R	MW	Jurien	Dec-Mar
Eucalyptus zopherophloia	4	MW	Dongara, Cliff Head, Illawong, Jurien Bay	Nov-Jan
Georgeantha hexandra ms	4	MW,SW	Jurien, Greenhead, Moore River	
Gompholobium gairdnerianum ms	3	MW	Gairdner Range, Mt Lesueur, Badgingarra, Hill River, Jurien Bay, Minyulo NR, Mt Peron	Sep-Nov
Grevillea humifusa	R	MW	Eragilga Hills, Jurien	May-Sep
Grevillea thyrsoides subsp. thyrsoides	3	MW	Dandaragan, Jurien, Cataby, Badgingarra	All
Hypocalymma tetrapterum	3	MW	Dandaragan, Jurien Bay, Cataby, Dinner Hill, Minyulo NR	Aug
Hypolaena robusta	4	MW	Badgingarra, Gingin, Jurien	Sep-Oct
Marianthus paralius	R	SW	Seabird	Sep
Persoonia rudis	3	MW,SW	Gairdner Range, Muchea, Jurien, Alexander Morrison NP, Lesueur N.P., Eneabba	Sep-Nov
Petrophile biternata	3	MW	Jurien, Moora, Marchagee, Mogumber, Coorow	Sep
Phlebocarya pilosissima subsp. pilosissima	3	MW	Jurien, Badgingarra, Warradarge Hill, Eneabba	Aug-Sep
Sarcozona bicarinata	3	SW,SC,*	Hepburn Heights, Burns Beach, Wanneroo, Yanchep, Seabird, Esperance, S. Aust	
Thelymitra stellata	R	MW,SW, WB	Perth-Three Springs, Pinjarra, Dumbleyung, Corrigin, Boonanaring, Bungendore Park, Unnamed Shire Reserve 34155, Hartfield Rd, Mt Peron, Jurien Bay, Mt Lesueur NP	Oct-Dec
Thryptomene sp. Lancelin (ME Trudgen 14000)	2	MW	Leeman, Lancelin, Jurien	Sep
Tricoryne sp. Eneabba (EA Griffin 1200)	2	MW,SW	Jurien, Cataby, Gingin, Eneabba, Mt Adams	Sep-Oct

Total No. of Records = 9

Species Name	Cons. Code	Status	Pop ID	No. Plants	Latitude	Longitude	Purpose	Vest
Eucalyptus argutifolia	R		7A	4	31^37'50.6"	115^45'41.3"	State Forest	LFC
			7B	44	31^38'02.6"	115^45'43.3"	State Forest	LFC
			10	34	31^38'31.6"	115^45'59.3"	Quarry	NON
			13	8	31^41'50.6"	115^42'32.3"		PRI
			14A	35	31^39'04.6"	115^46'35.3"	Mining lease	NON
			14B	4	31^38'55.6"	115^46'24.3"	Mining lease	NON
			15	20	31^40'55.6"	115^42'40.3"		PRI
			17A	1	31^38'45.6"	115^45'36.3"		PRI
			17B	1	31^38'43.6"	115^45'33.3"		PRI

Nowergup

WAHERB SPECIMEN DATABASE
GENERAL ENQUIRY

NOWERGUP

Eucalyptus argutifolia
Grayling & Brooker (Myrtaceae)
CONSERVATION STATUS:R
Coll.: J.L. Robson s.n. Date: 15 11 1991 (PERTH 2160765)
LOCALITY Quarry Reserve 5204, 250 m from junction of Myrtle road and 380 m at 195 deg. WA
LAT 31 Deg 39 Min 10.000 Sec S LONG 115 Deg 46 Min 25.000 Sec E
Slight gully situation nestles between two limestone ridges.
Sand/boulder/brown/ yellow/dry/limestone.
Completely open and treeless with dense scrubland. Dryandra's nivea/
sessilus, Hakea trifurcata, Melaleuca huegelii, Blackboys (Xanthorrhoea preissii), Templetonia retusa.
Abundance: 32 clumps
Previous det.: Eucalyptus argutifolia Grayling & Brooker

Eucalyptus argutifolia
Grayling & Brooker (Myrtaceae)
CONSERVATION STATUS:R
Coll.: J.L. Robson s.n. Date: 15 11 1991 (PERTH 2117223)
LOCALITY Quarry Reserve 5204, 250 m from the junction of Myrtle road and 380 m at 195 deg. to rare mallees WA
LAT 31 Deg 39 Min 10.000 Sec S LONG 115 Deg 46 Min 25.000 Sec E
Slight gully situation nestled between two limestone ridges. Limestone/boulder/ sand/brown/yellow/dry.
Completely open & treeless with dense scrubland. Dryandra's nivea/
sessilus, Hakea trifurcata, Melaleuca huegelii, Blackboys (Xanthorrhoea preissii), Templetonia retusa.
Abundance: 32 clumps, undisturbed

Eucalyptus argutifolia
Grayling & Brooker (Myrtaceae)
CONSERVATION STATUS:R
Coll.: Robson J.L. s.n. Date: 06 08 1990 (PERTH 1123661)
LOCALITY Ridge State Forest, 260 metres along Hopkins Road, from junction of Wesco Road [Near Lake Pinjar]. WA
LAT 31 Deg 38 Min 10.200 Sec S LONG 115 Deg 45 Min 42.000 Sec E
ESE aspect. Lower ridgetop slope. Sheet sand/brown boulder. Completely open to treeless site.
Melaleuca huegelii, Xanthorrhoea preissii, Dryandra sessilis/nivea,
Hakea trifurcata, Hibbertia hypericoides, Native wisteria.
Previous det.: Eucalyptus argutifolia

Eucalyptus argutifolia
Grayling & Brooker (Myrtaceae)
CONSERVATION STATUS:R

Coll.: G.J. Keighery 13177 Date: 22 04 1991 (PERTH 04110544)
LOCALITY Mindarie South, 30 km N of Perth WA
LAT 31 Deg 41 Min 59.000 Sec S LONG 115 Deg 44 Min 0.000 Sec E
Mallee to 3 m. Dune slope, grey sand over limestone. Mallee, Eucalyptus petrensis over heath.
Frequency:rare in area.

Grevillea thelemanniana
Endl. (Proteaceae)
CONSERVATION STATUS:P4
Coll.: V. Clarke VC 16 Date: 24 04 2001 (PERTH 07400152)
LOCALITY Small remnant of Wanneroo road near Lake Neerabup WA
LAT 31 Deg 39 Min 38.300 Sec S LONG 115 Deg 45 Min 0.200 Sec E
Shrub.

Jacksonia sericea
Benth. (Papilionaceae)
CONSERVATION STATUS:P4
Coll.: E.M. Bennett s.n. Date: 07 2001 (PERTH 06410731)
LOCALITY Lot 21, Flynn Drive, Neerabup, Shire of Wanneroo WA
LAT 31 Deg 41 Min Sec S LONG 115 Deg 46 Min Sec E
Slope/flat. Dry grey sand over limestone.
Eucalyptus marginata, Banksia attenuata, B. menziesii Woodland. Associated species: Banksia attenuata, B. grandis, Allocasuarina fraseriana, Dryandra sessilis, Calothamnus sp.
Condition of population: healthy.

Jacksonia sericea
Benth. (Papilionaceae)
CONSERVATION STATUS:P4
Coll.: V. Clarke VC 20 Date: 24 04 2001 (PERTH 07400160)
LOCALITY Small remnant of Wanneroo road near Lake Neerabup WA
LAT 31 Deg 39 Min 38.300 Sec S LONG 115 Deg 45 Min 0.200 Sec E
Low shrub.

Stylidium maritimum
Lowrie, Coates & Kenneally (Stylidiaceae)
CONSERVATION STATUS:P3
Coll.: A. Lowrie 1358 Date: 22 10 1995 (PERTH 04430921)
LOCALITY Just N of the tavern on Wanneroo Road, Carabooda, WA
LAT 31 Deg 37 Min Sec S LONG 115 Deg 44 Min Sec E
Flowers pink-mauve, throat white, outer petal surface white to pale pink, upper winged throat appendages pink, lower throat appendages white-red tipped, leaves 3 per papery sheath.
On limestone outcrops in crater-like depressions filled with black sandy soil. Area surrounded by low coastal heath and open Banksia menziesii woodland.
Previous det.: Stylidium maritimum Lowrie,Coates & Kenneally

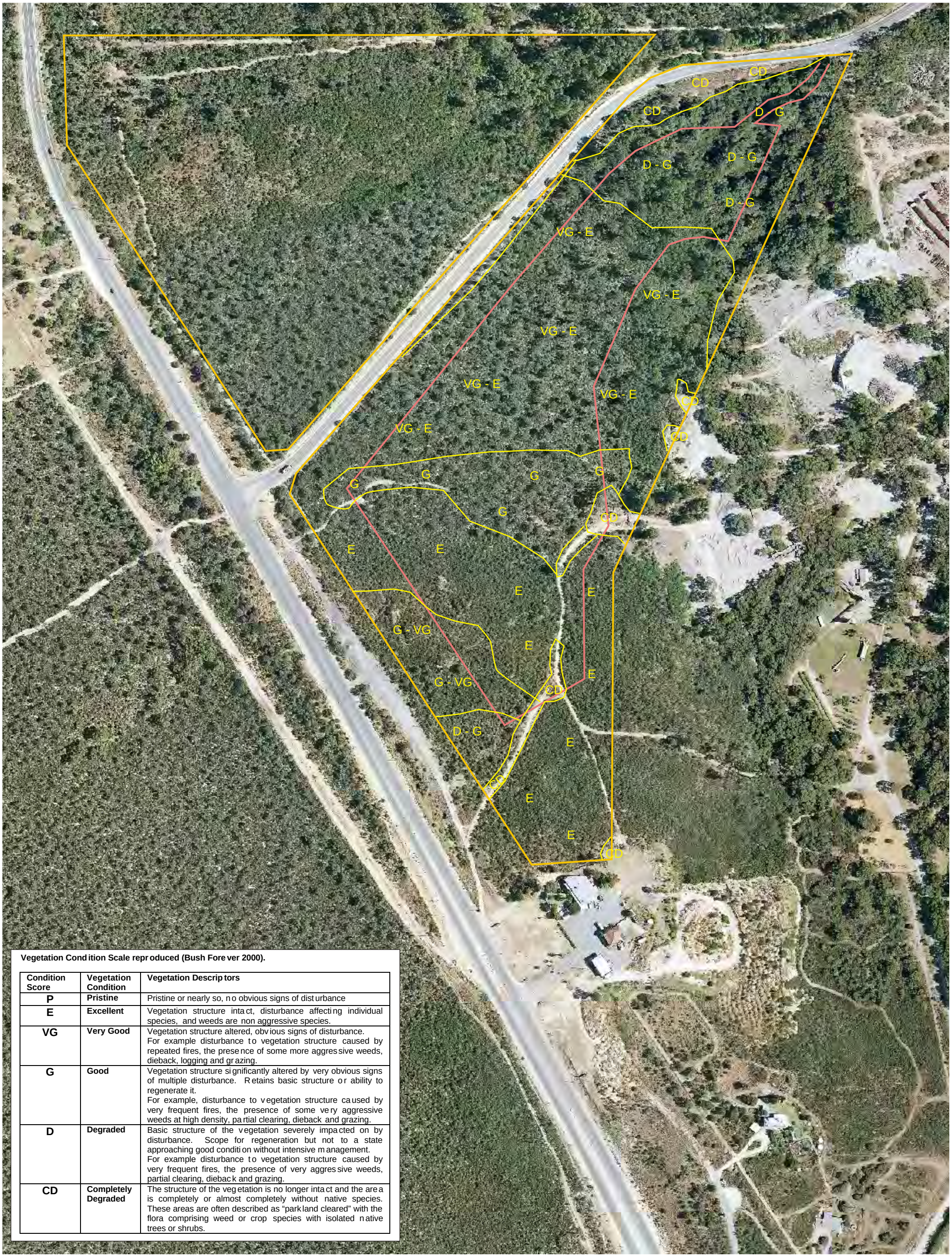
0 60m

Extent of proposed excavation

KEY	VEGETATION COMMUNITY
TW	Tuart Woodland
BW	Banksia Woodland
LH	Limestone Closed Shrubland
MH	*Melaleuca* Shrubland A Classified as Endangerd Community 26a
Mha	*Melaleuca* Shrubland B Probable Endangerd Community 26a

Figure 1

LOT 1 NOWERGUP ROAD	
VEGETATION COMMUNITIES	
Landform Research	June 2008
Base LANDGATE	Scale 1 : 3 000 at A3



Vegetation Condition Scale reproduced (Bush Forever 2000).

Condition Score	Vegetation Condition	Vegetation Descriptors
P	Pristine	Pristine or nearly so, no obvious signs of disturbance
E	Excellent	Vegetation structure intact, disturbance affecting individual species, and weeds are non aggressive species.
VG	Very Good	Vegetation structure altered, obvious signs of disturbance. For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
G	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
D	Degraded	Basic structure of the vegetation severely impacted on by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
CD	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

0 60m

Extent of proposed excavation

LOT 1 NOWERGUP ROAD	
VEGETATION CONDITION	
Landform Research	June 2008
Base LANDGATE	Scale 1 : 3 000 at A3

Figure 2

Melaleuca Shrubland, A in the south, Community Type 26a, excluded from excavation

Melaleuca Shrubland,B in the east, probable Community Type 26a, excluded from excavation

Limestone Closed Shrubland

Limestone Closed Shrubland with degraded vegetation in the foreground, showing previous clearing

Banksia Woodland

Banksia Woodland

Tuart Woodland

Banksia Woodland

Banksia Woodland

Figure 3

0 60m

Extent of proposed excavation

Mha Community Type 26a

Mapping control point

LOCATION OF TUART TREES

> 1000 mm

500 - 1000 mm

350 - 500 mm

< 350 mm

Clump of 2 or more trees

Single tree

NOTE
The photography was taken in early morning and the shadows therefore form a significant dark area on the west of each tree.

There may have been some drift in handheld GPS co-ordinates, under heavy cloud and trees, although the co-ordinates do appear to match on ground conditions. The accuracy appears to +/- 2 - 5 metres. Significant Tuart trees will be marked at the time of survey of the footprint. The access road will be located to minimise clearing of Tuart trees, and the northern footprint will be narrowed slightly to minimise impact on Tuart trees.

WA LIMESTONE	
LOT 1 NOWERGUP ROAD, NOWERGUP	
LOCATION OF TUART TREES	
Landform Research	May 2010
Basemap LANDGATE	Scale 1 : 3 000

Appendix 3

Lot 1, Nowergup Road:

A Fauna Assessment

Ms J.A. Wilcox and Mr R. King

Bushland on Lot 1 Nowergup Rd

Prepared for: WA Limestone
41 Spearwood Ave
Bibra Lake WA 6163

Prepared by: Western Wildlife
8 Ridgeway Pl
Mahogany Creek WA 6072

12th January 2007

Introduction

WA Limestone proposes to clear 7.17ha area of native vegetation on Lot 1 Nowergup Road, Nowergup for a limestone quarry. The Department of Environment and Conservation (DEC) has asked WA Limestone for a flora and fauna assessment of the site as part of the application to clear the vegetation. WA Limestone has commissioned Western Wildlife to undertake a fauna assessment of the proposed quarry area.

The aim of the fauna assessment was to characterise the fauna habitats available in the area, prepare lists of vertebrate fauna expected to occur in the area and identify species of conservation significance that may occur in the area.

Methods

This report is classified as a Level 1 survey (a background research or 'desk-top' study with a site visit) according to the EPA Position Statement No.3 (Environmental Protection Authority 2002). This was the level of assessment commissioned by the client. The site was visited on the 31st August 2006 and the area surveyed on foot.

Personnel

Ms Jenny Wilcox of Western Wildlife (*BSc.Biol./Env.Sci., Hons.Biol.*) and Mr Richard King (*BSc.Env.Biol.*) carried out the site visit. Ms Jenny Wilcox and Mr Richard King prepared the report.

Sources of Information

Lists of fauna expected to occur in the study area were produced using information from a number of sources. These included publications that provide information on general patterns of distribution of frogs (Tyler *et al.* 2000), reptiles (Storr *et al.* 1983, 1990, 1999 and 2002), birds (Barrett *et al.* 2003; Johnstone and Storr 1998; Johnstone and Storr 2004), and mammals (Menkhorst and Knight 2001; Strahan 1995). In addition, the databases listed below in Table 1 were searched for specimen or observational records.

These sources of information were used to create lists of species expected to occur in the study area. As far as possible, expected species are those that are likely to utilise the study area, or be affected by changes to the study area. The lists exclude species that have been recorded in the general region as vagrants or for which suitable habitat is absent.

Introduction

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Table 1. Databases used in the preparation of the fauna lists in Table 2 – 5.

Database	Type of records held on database	Area searched
Faunabase (WA Museum)	Records of specimens held in the WA Museum. Includes historical data.	31°37' to 31°40'S and 115°42' to 115°46'E
DEC's Threatened and Priority Fauna Database	Information and records on Threatened and Priority species in Western Australia	31°37' to 31°40'S and 115°42' to 115°46'E
Birds Australia Atlas Database	Records of bird observations in Australia, 1998-1995.	31°37' to 31°40'S and 115°42' to 115°46'E
EPBC Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species.	31°37' to 31°40'S and 115°42' to 115°46'E

Taxonomy and nomenclature for fauna species used in this report generally follow the WA Museum (2001) with alternative bird taxonomy from Christidis and Boles (1994) given in parentheses.

Assessment of conservation significance

Three levels of conservation significance are recognised in this report:

Conservation Significance 1:
- Species listed under State or Commonwealth Acts.

Conservation Significance 2:
- Species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by CALM.

Conservation Significance 3:
- Species not listed under State or Commonwealth Acts or in publications on threatened fauna or as Priority species by CALM, but considered of local significance because of their pattern of distribution.

At the highest level of conservation significance (Conservation Significance 1) are those species that are protected under State or Commonwealth legislation.

The *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) is the Commonwealth Government's primary piece of environmental legislation. Listed under Part 3 of the EPBC Act are 'matters of National Environmental Significance' that include threatened species and ecological communities and migratory species, among others. IUCN categories are used to categorise threatened species as 'extinct', 'extinct in the wild', 'critically endangered', 'endangered', 'vulnerable' and 'conservation dependent', with all categories except 'extinct' and 'conservation

dependent' listed as matters of National Environmental Significance. A list of migratory species is also maintained, containing mostly bird and marine species. The migratory species listed are those recognised under China-Australia Migratory Bird Agreement (CAMBA), the Japan-Australia Migratory Bird Agreement (JAMBA) or species listed under the Bonn Convention for which Australia is a range state. Species listed in JAMBA are also protected under Schedule 3 of the *Western Australian Wildlife Conservation Act* 1950.

The *Western Australian Wildlife Conservation Act* 1950 (WA Wildlife Conservation Act) is State legislation for fauna protection administered by the Department of Environment and Conservation (DEC). The WA Wildlife Conservation Act lists species under a set of Schedules, where threatened species are listed as Schedule 1. Schedule 1 species are further categorised by DEC into the IUCN categories 'extinct', 'extinct in the wild', 'critically endangered', 'endangered', 'vulnerable' and 'conservation dependent' species. The schedules and categories are further described in Appendix 1.

At the second-highest level of conservation significance (Conservation Significance 2) are species that are listed under publications on threatened species, or are listed as Priority species by DEC.

Reports on the conservation status of most vertebrate fauna species have been produced by the Department of the Environment and Heritage (DEH) in the form of Action Plans. An Action Plan is a review of the conservation status of a taxonomic group against IUCN categories. Action Plans have been prepared for amphibians (Tyler 1997), reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al.* 1996), rodents (Lee 1995) and bats (Duncan *et al.* 1999). These publications also use categories similar to those used by the EPBC Act. The information presented in some of the earlier Action Plans may be out of date due to changes since publication.

In Western Australia, DEC has also produced a list of Priority Fauna made up of species that are not considered Threatened under the *WA Wildlife Conservation Act*, but for which DEC feels there is cause for concern. Levels of Priority are described in Appendix One.

At the third-highest level of conservation significance (Conservation Significance 3) are species that are not recognised under Federal or State legislation, listed in publications by DEH or listed as Priority species by DEC. These are species considered to be of local significance in the study area because they are at the limit of their distribution in the area, they have a very restricted range or they occur in breeding colonies (e.g. some waterbirds). This level of significance has no legislative or published recognition and is based on interpretation of information on the species patterns of distribution. The WA Department of Environmental Protection (Government of Western Australia 2000) used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Bush Forever. Recognition of such species is consistent with the aim of preserving regional biodiversity.

Site description

Lot 1 Nowergup Rd consists of 24.7 ha area of native vegetation, which is split into two sections by Nowergup Rd. The southern section is 14.53ha, of which 7.17ha is proposed to be cleared. The southern section is referred to as 'the site' in this report. The site is bounded by Wanneroo Rd to the west, Nowergup Road to the north and developed land (farmland) to the east and south. Neerabup National Park is adjacent to the site to the west and Lake Nowergup is adjacent to the site to the north. The northern section of Lot 1 Nowergup Rd, Neerabup National Park and Lake Nowergup constitute part of Bush Forever Site 383.

Three main habitats were present on the site, as described below.

1. Tuart (*Eucalyptus gomphocephala*) over open Banksia woodland was present on the eastern section of the site. Most Tuarts were too small to contain large potential cockatoo nesting hollows, but trees did have small hollows suitable for other hollow nesting species.

2. Dense mixed heath, which included Parrotbush (*Dryandra sessilis*), *Hakea*, *Grevillea* and *Acacia* species, occurred over outcroppings of limestone in the central and some of the southern parts of the site.

3. Banksia woodland composed mostly of *Banksia menziesii* and *B. attenuata* was present in the western section of the site. The understorey was generally of low mixed species with some open patches.

Generally the vegetation on the site appeared to be in good condition. Weeds were present in only in open areas and along tracks and edges of native vegetation.

Results

The amphibians, reptiles, birds and mammals that may occur in the study area are listed in Tables 2-5. In each table the species recorded in the area by the WA Museum (all taxa) and Birds Australia (birds only) are indicated. The results of the EPBC database search and the DEC Threatened and Priority Fauna Database search are given in Appendices 2 and 3 respectively.

Amphibians

There are eight species of frog that have the potential to occur in the study area (Table 2). No frogs were recorded during the site visit and there are no wetlands on the site. However, there are wetlands nearby (e.g. Lake Nowergup to the north). The frog species listed in Table 2 are those that use terrestrial habitats in addition to wetland habitats.

The Turtle Frog (*Myobatrachus gouldii*) inhabits sandy soil and has the potential to occur anywhere on the site, particularly in *Banskia* woodland. This species is entirely terrestrial and does not require open water for breeding. Other species of frog, such as the Moaning Frog (*Heleioporus eyrei*) and Pobblebonk Frog (*Limnodynastes*

There are no frogs of conservation significance expected to occur on the site.

Reptiles

There are 48 species of reptile that have the potential to occur in the study area, and one species was observed during the site visit; the Spiny-tailed Gecko (*Strophurus spinigerus*) (Table 3). Most of the reptiles listed in Table 3 are common and widespread in the south-west of Western Australia, and many of them would occur in a variety of habitats including degraded areas. Some species have more restricted habitat preferences, including the Long-necked Tortoise (*Chelodina oblonga*), Tiger Snake (*Notechis scutatus*), and Cool Skink (*Acritoscincus trilineatum*), all of which prefer wetland habitats. There are seven reptiles of conservation significance that may occur in the study area, as described below.

Conservation Significance 1

- **Carpet Python** *Morelia spilota imbricata*

The south-west population of this python is listed under Schedule 4 (other specially protected fauna) of the WA Wildlife Conservation Act, and as Priority 4 by DEC.

The Carpet Python is known to occur in Neerabup National Park (Government of Western Australia 2000), where Bush *et al.* (1995) state it is moderately common. On the Swan Coastal Plain, the Carpet Python favours areas of heath over limestone (Bush *et al.* 1995). This species is likely to be present on the site.

Conservation Significance 2

- **Black-striped Snake** *Neelaps calanotus*

This snake is listed as Priority 3 by DEC.

The Black-striped Snake is restricted to the coastal plain between Mandurah and Lancelin, and as such is vulnerable to habitat loss due to urban developments (Bush *et al.* 1995). The Black-striped Snake snake prefers sandy soils and occurs in Banksia and Eucalypt woodlands (Bush *et al.* 1995). This species may occur in sandy parts of the site.

Conservation Significance 3

- **Speckled Stone Gecko** *Diplodactylus polyophthalmus*
- **Wheatbelt Stone Gecko** *Diplodactylus granariensis*
- **White-spotted Ground Gecko** *Diplodactylus alboguttatus*
- **Black-tailed Monitor** *Varanus tristis*
- **Yellow-faced Whipsnake** *Demansia psammophis*

There are three geckos of conservation significance 3 listed above, all of which are uncommon on the Swan Coastal Plain. All three species are known from the northern suburbs of Perth, with records of the Spectacled Stone Gecko and Wheatbelt Stone Gecko from Wanneroo (Bush *et al.* 1995).

The Black-tailed Monitor is uncommon on the Swan Coastal Plain, although it is moderately common in the Darling Range (Bush *et al.* 1995). As a large reptile, this species is probably restricted to larger remnants of native vegetation, and has been recorded at the Woodvale Nature Reserve (Government of Western Australia 2000). The Yellow-faced Whipsnake is uncommon in the Perth area, and is not tolerant of disturbance (Bush *et al.* 1995) so is probably only present in large areas of remnant vegetation. As the site is relatively small, it may only support a small number of individuals of large species such as the Black-tailed Monitor or Yellow-faced Whipsnake.

Birds

There are 94 species of bird that have the potential to occur in the study area, of which 23 were observed during site visit (Table 4). Except for ducks that use tree hollows for breeding, water birds have been excluded from the list. The list in Table 4 is extensive, however not all species are likely to occur on the site, as the site is relatively small. It is difficult to say with certainty which species will and will not occur on the site as they all occur in the general area.

Conservation Significance 1

- **Carnaby's Black-Cockatoo** *Calyptorhynchus latirostris*

This cockatoo is listed under Schedule 1 (Endangered) of the WA Wildlife Conservation Act and as Endangered under the EPBC Act.

- **Peregrine Falcon** *Falco peregrinus*

This falcon is listed under Schedule 4 (other specially protected fauna) of the WA Wildlife Conservation Act and is also listed as a significant species on the Swan Coastal Plain by Bush Forever (Government of Western Australia 2000).

Carnaby's Black-Cockatoo has declined due to loss of breeding habitat in the wheatbelt and of non-breeding habitat along the west coast, mainly due to urban expansion. While small areas of foraging habitat around the metropolitan area support only small numbers of birds for short periods of time, the progressive loss of these small areas is an ongoing concern for this species. Carnaby's Black-Cockatoo is likely to forage in the Tuart woodland, Banksia woodland and *Dryandra sessilis* patches on the site. Carnaby's Black-Cockatoo has been recorded breeding nearby at Yanchep National Park (Johnstone *et al.* 2005). Although no suitable hollows were observed during the site visit, Carnaby's Black-Cockatoo may breed in the local area.

The Peregrine Falcon is a wide-ranging bird of prey that may be a visitor to the site, or may use the site as part of a larger territory. The site would only be highly significant for this falcon if they were breeding on the site. Evidence of breeding activity was not observed during the site visit.

Conservation Significance 1 – Species listed as migratory under the EPBC Act

- **Rainbow Bee-eater** *Merops ornatus*
- **Fork-tailed Swift** *Apus pacificus*
- **White-bellied Sea-Eagle** *Haliaeetus leucogaster*

The Rainbow Bee-eater is a common summer visitor to Perth, where it breeds in sandy banks. This species will forage and breed in relatively degraded areas, and may nest alongside sandy tracks or easements. The Rainbow Bee-eater may forage or nest on the site.

The Fork-tailed Swift is a largely aerial species and development of the site is unlikely to affect this species.

The White-bellied Sea-Eagle may overfly the area, but due to the lack of suitable tall trees is unlikely to nest at the development site.

Conservation Significance 2

- **Masked Owl** *Tyto novaehollandiae novaehollandiae*

This owl is listed as Priority 3 by DEC and as 'near threatened' by Garnett and Crowley (2000).

- **Barking Owl** *Ninox connivens*

This owl is listed as Priority 2 by DEC and as 'near threatened' by Garnett and Crowley (2000).

Both the Masked Owl and the Barking Owl rely on large hollows in mature eucalypts for breeding. There did not appear to be any hollows large enough for either species on the site. It is highly unlikely that either owl breeds on the site, but it is possible they may forage over the site if there is a nesting pair nearby.

Conservation Significance 3

- **See the 29 species listed in Table 4.**

There are 29 birds of conservation significance 3 listed in Table 4. These are species that are listed as having a reduced population on the Swan Coastal Plain in Bush Forever (Government of Western Australia 2000), although many of them are common outside of the metropolitan area. These include habitat specialists such as the Painted Button-Quail, Splendid Fairy-wren and Golden Whistler.

Many locally significant species (those of conservation significance 3) occur in nearby Neerabup National Park (Bush Forever Site 383), as the Park is a relatively large area of native vegetation. These species are likely to also use the site due to its proximity to the National Park. Significant species observed at the site during the site inspection include Splendid Fairy-wren, Weebill, Grey Shrike-thrush, Western Wattlebird, New Holland Honeyeater and Whistling Kite (Table 4).

Mammals

There are 22 species of mammal that have the potential to occur in the study area (Table 5). As the area is small and near the metropolitan area, and the surrounding areas are relatively developed, few native species of mammal are likely to occur. Many of the native species likely to occur are bats.

There are six species of conservation significance that may occur on the study area, as described below.

Conservation Significance 2	
• **Quenda (Southern Brown Bandicoot)**	*Isoodon obesulus*
The Quenda is listed as Priority 5 by DEC.	
• **Brush Wallaby**	*Macropus irma*
This wallaby is listed as Priority 4 by DEC.	
• **Western False Pipistrelle**	*Falsistrellus mackenziei*
This bat is listed as Priority 4 by DEC.	

The Brush Wallaby is likely to occur in areas of forest or woodland where there is a dense, shrubby understorey. The Brush Wallaby has been recorded near the study area, in Neerabup National Park (DEC's Threatened and Priority Fauna Database) and in Yellagonga Regional Park (DEC 2003). The Quenda also favours areas with dense understorey, and is often particularly common in dense wetland vegetation. The Quenda has been recorded in the area in Neerabup National Park (DEC's Threatened and Priority Fauna Database).

The Western False Pipistrelle is a small insectivorous bat that inhabits forests and woodlands, including Tuart forest, Jarrah forest and Banksia woodland. These bats roost in groups in tree hollows (Churchill 1998). This bat may forage or roost in the parts of the study area.

Conservation Significance 3	
• **Honey Possum**	*Tarsipes rostratus*
• **Western Pygmy Possum**	*Cercartetus concinnus*
• **Bush Rat**	*Rattus fuscipes*

Three mammal species have been listed as conservation significance 3; the Honey Possum, Western Pygmy Possum and Bush Rat. While these species are relatively common and widespread in the south-west of Western Australia, in the Perth metropolitan area they are extremely uncommon and the Western Pygmy Possum and Bush Rat may be locally extinct.

The Honey Possum is a small marsupial that feeds on nectar and pollen, and occurs in areas that provide sufficient flowers all year round including floristically diverse heath and Banksia woodland. The Honey Possum has been recorded from Neerabup National Park (Government of Western Australia 2000). Individuals present in the National Park may also use the site on a seasonal basis.

The Western Pygmy Possum occurs in eucalypt woodlands, generally where there is dense understorey but has been recorded from banskia woodlands associated with wetlands (R. Davis, pers. obs.).

Three mammals are listed on DEC's Threatened and Priority Fauna Database, that have occurred in the area in the past (Appendix 3). These are the Black-flanked Rock-wallaby, Woylie and Chuditch. These species are locally exinct.

Threatened Invertebrates

Although this report is concerned mainly with vertebrate species, three invertebrates of conservation concern were listed on DEC's Threatened and Priority Fauna Database for the area (Appendix 3).

Conservation Significance 1

- **Graceful Sunmoth** *Synemon gratiosa*

This moth is listed as Schedule 1 (Endangered) under the WA Wildlife Protection Act.

The Graceful Sunmoth is known from a few locations between Wanneroo and Mandurah (CALM's Threatened and Priority Fauna Database). This area coincides with high levels of urban development, threatening its remaining habitat. The Graceful Sunmoth has been recorded near to the study area, at Neerabup (DEC's Threatened and Priority Fauna Database).

Conservation Significance 2

- **cricket** *Austrosaga spinifer*

This cricket is listed as Priority 3 by CALM.

- **native bee** *Hylaeus globuliferus*

The native bee is listed as Priority 3 by CALM.

This cricket species is known from heath habitats near Perth and Cervantes, and has been recorded near to the study site at Neerabup National Park (DEC's Threatened and Priority Fauna Database). The native bee species has also been recorded near the study site at Neerabup National Park (DEC's Threatened and Priority Fauna Database). This native bee is thought to favour flowers of *Adenanthos cygnorum* for feeding, but has also been recorded on *Banksia attenuata* (DEC's Threatened and Priority Fauna Database).

As the three invertebrates listed above have been recorded in the Neerabup area (DEC's Threatened and Priority Fauna Database), it is possible that one or more of them may occur on the site.

Discussion

The site has three main habitats for fauna; Tuarts over Banksia woodland, areas of dense heath and Banksia woodland with a low mixed understorey. These habitats are generally in good condition and likely to support a relatively intact community of native fauna species, as listed in Tables 2-5. This includes up to 8 species of amphibian, 48 species of reptile, 94 species of bird and 22 species of mammal. The site may support a number of species of Conservation Significance 1; the Carpet Python, Carnaby's Black-Cockatoo, Peregrine Falcon, Rainbow Bee-eater, Fork-tailed Swift and White-bellied Sea-Eagle. The site may also support species of Conservation Significance 2; Black-striped Snake, Barking Owl, Masked Owl, Quenda (Southern Brown Bandicoot), Brush Wallaby and Western False Pipistrelle.

The development of the site will probably result in the loss of a large part of the site's fauna habitats, including feeding habitat for Carnaby's Black-Cockatoo. Although the site performs some linkage functions, the development of the site is not likely to isolate other local areas of native vegetation. However, it will reduce linkage between areas of native vegetation to the east of Neerabup National Park and the south of Lake Nowergup, and increase distances that fauna may have to negotiate.

In order to maintain or enhance some of the fauna values of the site, the following are recommended.

- The area of native vegetation to be cleared is minimised as much as possible and disturbance to surrounding areas of native vegetation minimised during development.

- Any hollow logs or trees removed during development could be placed in some surrounding areas of woodland to enhance the fauna habitats available.

- Appropriate re-vegetation of the site should be undertaken after mining has finished. This should include plant species currently present on the site, particularly those that provide food for Carnaby's Black-Cockatoo.

Table 2. Amphibians that are expected to occur in the study area.
+ = species recorded during the 2006 site visit
WAM = species recorded in the area by the WA Museum

Species		Status	Recorded
Hylidae (tree frogs and water-holding frogs)			
Motorbike Frog	*Litoria moorei*		
Myobatrachidae (ground frogs)			
Moaning Frog	*Heleioporus eyrei*		WAM
Marbled Burrowing Frog	*Heleioporus psammophilus*		
Banjo Frog	*Limnodynastes dorsalis*		WAM
Glauert's Frog	*Crinia glauerti*		
Squelching Froglet	*Crinia insignifera*		
Turtle Frog	*Myobatrachus gouldii*		
Gunther's Toadlet	*Pseudophryne guentheri*		WAM
	Number of frogs expected:		8

Table 3. Reptiles that are expected to occur in the study area.
= species recorded during the 2006 site visit
WAM = species recorded in the area by the WA Museum

Species		Status	Recorded
Cheluidae			
Long-necked Tortoise	*Chelodina oblonga*		WAM
Agamidae (dragon lizards)			
Bearded Dragon	*Pogona minor*		WAM
Western Heath Dragon	*Rankinia adelaidensis*		
Gekkonidae (geckoes)			
Marbled Gecko	*Christinus marmoratus*		WAM
Clawless Gecko	*Crenadactylus ocellatus*		
White-spotted Ground Gecko	*Diplodactylus alboguttatus*	CS3	
Wheatbelt Stone Gecko	*Diplodactylus granariensis*	CS3	
Speckled Stone Gecko	*Diplodactylus polyophthalmus*	CS3	WAM
Spiny-tailed Gecko	*Strophurus spinigerus*		+
Barking Gecko	*Underwoodisaurus milii*		
Pygopodidae (legless lizards)			
Javelin Legless Lizard	*Aclys concinna*		
Sandplain Worm Lizard	*Aprasia repens*		WAM
Fraser's Legless Lizard	*Delma fraseri*		
Gray's Legless Lizard	*Delma grayii*		
Burton's Legless Lizard	*Lialis burtonis*		WAM
Keeled Legless Lizard	*Pletholax gracilis*		
Common Scaly-foot	*Pygopus lepidopodus*		

Table 3. (cont.)

Species		Status	Recorded
Scincidae (skink lizards)			
Cool Skink	*Acritoscincus trilineatum*		
Fence Skink	*Cryptoblepharus plagiocephalus*		WAM
Western Limestone Ctenotus	*Ctenotus australis*		
West Coast Ctenotus	*Ctenotus fallens*		WAM
Western Slender Bluetongue	*Cyclodomorphus branchialis*		
King's Skink	*Egernia kingii*		
Salmon-bellied Skink	*Egernia napoleonis*		WAM
Two-toed Earless Skink	*Hemiergis quadrilineata*		WAM
West Coast Four-toed Lerista	*Lerista elegans*		WAM
West Coast Line-spotted Lerista	*Lerista lineopunctulata*		
Western Worm Lerista	*Lerista praepedita*		WAM
Dwarf Skink	*Menetia greyii*		WAM
West Coast Morethia	*Morethia lineoocellata*		
Dusky Morethia	*Morethia obscura*		
Western Blue-tongue	*Tiliqua occipitalis*		
Bobtail	*Tiliqua rugosa*		
Varanidae (goanna or monitor lizards)			
Gould's Goanna	*Varanus gouldii*		
Black-tailed Monitor	*Varanus tristis*	CS3	WAM
Typhlopidae (blind snakes)			
Southern Blind Snake	*Ramphotyphlops australis*		WAM
Boidae (pythons)			
Carpet Python (south-west)	*Morelia spilota imbricata*	CS1	WAM
Elapidae (front-fanged snakes)			
Narrow-banded Shovel-nosed Snake	*Brachyurophis fasciolata*		
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*		WAM
Yellow-faced Whipsnake	*Demansia psammophis*	CS3	
Bardick	*Echiopsis curta*		
Crowned Snake	*Elapognathus coronatus*		
Black-naped Snake	*Neelaps bimaculatus*		WAM
Black-striped Snake	*Neelaps calonotos*	CS2	
Tiger Snake	*Notechis scutatus*		
Gould's Hooded Snake	*Parasuta gouldii*		WAM
Dugite	*Pseudonaja affinis*		WAM
Jan's Banded Snake	*Simoselaps bertholdi*		WAM
	Number of reptile species expected:		**48**

Table 4. Birds that are expected to occur in the study area.
+ = species recorded during the 2006 site visit
WAM = species recorded in the area by the WA Museum
BA = species recorded in the area by Birds Australia
Int. = introduced species

Species		Status	Recorded
Casuariidae (emu)			
Emu	*Dromaius novaehollandiae*	CS3	
Phasianidae (quails)			
Stubble Quail	*Coturnix pectoralis*		
Anatidae (ducks and swans)			
Australian Shelduck	*Tadorna tadornoides*		BA
Australian Wood Duck	*Chenonetta jubata*		BA
Grey Teal	*Anas gracilis*		BA
Pacific Black Duck	*Anas superciliosa*		BA
Accipitridae (osprey, hawks, eagles and harriers)			
Black-shouldered Kite	*Elanus caeruleus (axillaris)*		BA
Square-tailed Kite	*Hamirostra (Lophoictinia) isura*	CS3	
Whistling Kite	*Haliastur sphenurus*	CS3	+ BA
Brown Goshawk	*Accipiter fasciatus*	CS3	BA
Collared Sparrowhawk	*Accipiter cirrocephalus*	CS3	BA
Little Eagle	*Aquila (Hieraaetus) morphnoides*	CS3	BA
Wedge-tailed Eagle	*Aquila audax*	CS3	BA
White-breasted Sea-Eagle	*Haliaeetus leucogaster*		
Swamp Harrier	*Circus approximans*		BA
Falconidae (falcons)			
Brown Falcon	*Falco berigora*	CS3	
Nankeen Kestrel	*Falco cenchroides*		BA
Australian Hobby	*Falco longipennis*		BA
Peregrine Falcon	*Falco peregrinus*	CS1	
Turnicidae (button-quails)			
Painted Button-Quail	*Turnix varia*	CS3	
Charadriidae (plovers, dotterels and lapwings)			
Banded Lapwing	*Vanellus tricolor*		
Columbidae (pigeons and doves)			
Feral Pigeon (Rock Dove)	*Columba livia*		BA
Laughing Turtle-Dove	*Streptopelia senegalensis*		BA
Spotted Turtle-Dove	*Streptopelia chinensis*		BA
Common Bronzewing	*Phaps chalcoptera*	CS3	BA
Crested Pigeon	*Ocyphaps lophotes*		BA
Cacatuidae (cockatoos and corellas)			
Carnaby's Black-Cockatoo	*Calyptorhynchus latirostris*	CS1	+ BA WAM
Galah	*Cacatua roseicapilla*		+ BA
Little Corella	*Cacatua sanguinea*		BA
Western Corella	*Cacatua pastinator*		BA

Table 4. (cont.)

Species		Status	Recorded
Psittacidae (parrots, lorikeets and rosellas)			
Rainbow Lorikeet	*Trichoglossus haematodus*	Int.	BA
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*		BA
Regent Parrot	*Polytelis anthopeplus*		BA
Australian Ringneck	*Barnardius zonarius*		+ BA WAM
Red-capped Parrot	*Platycercus (Purpureicephalus) spurius*		+ BA WAM
Elegant Parrot	*Neophema elegans*		BA
Cuculidae (cuckoos)			
Pallid Cuckoo	*Cuculus pallidus*		+ BA
Fan-tailed Cuckoo	*Cacomantis flabelliformis*		BA
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		+ BA
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*		+ BA
Strigidae (hawk owls)			
Barking Owl (southern)	*Ninox connivens connivens*	CS2	
Southern Boobook	*Ninox novaeseelandiae*		BA WAM
Tytonidae (barn owls)			
Masked Owl	*Tyto novaehollandiae novaehollandiae*	CS2	
Barn Owl	*Tyto alba*		BA .
Podargidae (frogmouths)			
Tawny Frogmouth	*Podargus strigoides*		BA .
Aegothelidae (owlet-nightjars)			
Australian Owlet-Nightjar	*Aegotheles cristatus*		
Apodidae (swifts)			
Fork-tailed Swift	*Apus pacificus*	CS1	BA
Halcyonidae (kingfishers)			
Laughing Kookaburra	*Dacelo novaeguineae*	Int.	BA .
Sacred Kingfisher	*Todiramphus sanctus*		BA
Meropidae (bee-eaters)			
Rainbow Bee-eater	*Merops ornatus*	CS1	BA
Maluridae (fairy-wrens, grasswrens and emu-wrens)			
Splendid Fairy-wren	*Malurus splendens*	CS3	+ BA
Pardalotidae (pardalotes, thornbills, gerygones & allies)			
Spotted Pardalote	*Pardalotus punctatus*		BA
Striated Pardalote	*Pardalotus striatus*		+ BA WAM
White-browed Scrubwren	*Sericornis frontalis*	CS3	BA
Weebill	*Smicrornis brevirostris*	CS3	+ BA
Western Gerygone	*Gerygone fusca*		+ BA
Inland Thornbill	*Acanthiza apicalis*	CS3	BA
Western Thornbill	*Acanthiza inornata*	CS3	BA
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	CS3	BA

Table 4. (cont.)

Species		Status	Recorded
Meliphagidae (honeyeaters and chats)			
Brown Honeyeater	*Lichmera indistincta*		+ BA
Singing Honeyeater	*Lichenostomus virescens*		+ BA
White-naped Honeyeater	*Melithreptus chloropsis (lunatus)*	CS3	
New Holland Honeyeater	*Phylidonyris novaehollandiae*	CS3	+ BA
White-cheeked Honeyeater	*Phylidonyris nigra*	CS3	BA
Tawny-crowned Honeyeater	*Phylidonyris melanops*	CS3	BA
Western Spinebill	*Acanthorhynchus superciliosus*		BA
Yellow-throated Miner	*Manorina flavigula*	CS3	BA
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		BA
Western Wattlebird	*Anthochaera lunulata*	CS3	+ BA
Red Wattlebird	*Anthochaera carunculata*		BA
Petroicidae (robins)			
Jacky Winter	*Microeca fascinans*		BA
Scarlet Robin	*Petroica multicolor*	CS3	BA
Red-capped Robin	*Petroica goodenovii*		BA
Neosittidae (sittellas)			
Varied Sittella	*Daphoenositta chrysoptera*	CS3	BA
Pachycephalidae (shrike-tits, whistlers and allies)			
Golden Whistler	*Pachycephala pectoralis*	CS3	BA
Rufous Whistler	*Pachycephala rufiventris*		+ BA
Grey Shrike-thrush	*Colluricincla harmonica*	CS3	+ BA
Dicruridae (flycatchers, magpie-larks and fantails)			
Grey Fantail	*Rhipidura fuliginosa*		+ BA
Willie Wagtail	*Rhipidura leucophrys*		BA
Magpie-Lark	*Grallina cyanoleuca*		BA
Campephagidae (cuckoo-shrikes and trillers)			
Black-faced Cuckoo-Shrike	*Coracina novaehollandiae*		+ BA
White-winged Triller	*Lalage tricolour (sueurii)*		BA
Artamidae (woodswallows, butcherbirds, magpies)			
Black-faced Woodswallow	*Artamus cinereus*	CS3	BA
Dusky Woodswallow	*Artamus cyanopterus*	CS3	BA
Grey Butcherbird	*Cracticus torquatus*		BA
Australian Magpie	*Cracticus (Gymnorhina) tibicen*		BA
Grey Currawong	*Strepera versicolor*	CS3	BA
Corvidae (ravens and crows)			
Australian Raven	*Corvus coronoides*		+ BA
Motacillidae (pipits and wagtails)			
Richard's Pipit	*Anthus australis (novaeseelandiae)*		BA

Table 4. (cont.)

Species		Status	Recorded
Dicaeidae (flowerpeckers)			
Mistletoebird	*Dicaeum hirundinaceum*		BA
Hirundinidae (swallows and martins)			
White-backed Swallow	*Cheramoeca leucosternus*		BA
Welcome Swallow	*Hirundo neoxena*		BA
Tree Martin	*Hirundo nigricans*		+ BA
Sylviidae (old world warblers)			
Rufous Songlark	*Cincloramphus mathewsi*		BA
Zosteropidae (white-eyes)			
Silvereye	*Zosterops lateralis*		+ BA WAM
	Number of bird species expected:		**94**

Table 5. Mammals that are expected to occur in the study area.
+ = species recorded during the 2006 site visit
WAM = species recorded in the area by the WA Museum
BA = species recorded in the area by Birds Australia
Int. = introduced species

Species		Status	Recorded
Tachyglossidae (echidnas)			
Echidna	*Tachyglossus aculeatus*		
Peramelidae (bandicoots)			
Southern Brown Bandicoot	*Isoodon obesulus*	CS2	
Macropodidae (kangaroos and wallabies)			
Western Grey Kangaroo	*Macropus fuliginosus*		
Western Brush Wallaby	*Macropus irma*	CS2	
Phalangeridae (possums)			
Brushtail Possum	*Trichosurus vulpecula*		
Burramyidae (pygmy possums)			
Western Pygmy Possum	*Cercartetus concinnus*	CS3	
Tarsipedidae (honey possums)			
Honey Possum	*Tarsipes rostratus*	CS3	WAM
Vespertilionidae (ordinary bats)			
Gould's Wattled Bat	*Chalinolobus gouldii*		
Chocolate Wattled Bat	*Chalinolobus morio*		
Western False Pipistrelle	*Falsistrellus mackenziei*	CS2	
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		
Gould's Long-eared Bat	*Nyctophilus gouldi*		
Greater Long-eared Bat	*Nyctophilus timoriensis*		
Southern Forest Bat	*Vespadelus regulus*		
Molossidae (freetail bats)			
Southern Freetail Bat	*Mormopterus planiceps*		
White-striped Freetail Bat	*Tadarida australis*		
Muridae (rats and mice)			
House Mouse	*Mus musculus*	Int.	
Bush Rat	*Rattus fuscipes*	CS3	
Black Rat	*Rattus rattus*	Int.	
Leporidae (rabbits and hares)			
Rabbit	*Oryctolagus cuniculus*	Int.	
Canidae (dogs and foxes)			
Fox	*Vulpes vulpes*	Int.	
Felidae (cats)			
Feral/House Cat	*Felis catus*	Int.	
	Number of mammals expected:		**22**

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Appendix 1. Categories used in the assessment of conservation status.

Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act [categories from IUCN]

Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the wild	Taxa known to survive only in captivity.
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	Taxa facing a very high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not Threatened.

WA Department of Environment and Conservation Priority species (species not listed under the Conservation Act, but for which there is some concern).

Priority 1.	**Taxa with few, poorly known populations on threatened lands.** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 2.	**Taxa with few, poorly known populations on conservation lands.** Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 3.	**Taxa with several, poorly known populations, some on conservation lands.** Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 4.	**Taxa in need of monitoring.** Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority 5.	**Taxa in need of monitoring.** Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Appendix 2. Species listed for the area 31°37' to 31°40'S and 115°42' to 115°46'E on the EPBC Protected Matters Search Tool, excluding marine species.

Species	Status	Author's Comment
Baudin's Black-Cockatoo *Calyptorhynchus baudinii*	Vulnerable	Unlikely to occur as the site is too far north-west.
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	Endangered	Likely to occur.
Chuditch *Dasyurus geoffroii*	Vulnerable	Unlikely to occur at site.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Migratory	Likely to overfly area, but unlikely to breed on site.
Fork-tailed Swift *Apus pacificus*	Migratory	May overfly site.
Rainbow Bee-eater *Merops ornatus*	Migratory	Likely to occur.

Appendix 3. Species listed for the area 31°37' to 31°40'S and 115°42' to 115°46'E on the DEC's Threatened and Priority Fauna Database, excluding marine species.

Species	Status	Author's Comment
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	Schedule 1: (Endangered)	Likely to occur.
Peregrine Falcon *Falco peregrinus*	Schedule 4	Likely to occur.
Chuditch *Dasyurus geoffroii*	Schedule 1: (Vulnerable)	Locally extinct.
Black-flanked Rock-wallaby *Petrogale lateralis lateralis*	Schedule 1: (Vulnerable)	Locally extinct.
Graceful Sunmoth *Synemon gratiosa*	Schedule 1; (Endangered)	May occur.
Cricket *Austrosaga spinifer*	Priority 3	May occur.
Native bee *Hylaeus globuliferus*	Priority 3	May occur.
Brush Wallaby *Macropus irma*	Priority 4	May possibly occur.
Carpet Python *Morelia spilota imbricata*	Schedule 4 & Priority 4	Likely to occur.
Woylie *Bettongia penicillata ogilbyi*	Priority 5	Locally extinct.
Quenda *Isoodon obesulus*	Priority 5	May occur.

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Invertebrate Fauna

30 November 2007

The site is predominantly native vegetation.

The survival and disturbance to fauna depends on the end use of the site. The site is to be cleared progressively and returned progressively to local native vegetation in order to minimise impacts on fauna.

The re-establishment of local native flora species and habitats, with the various commitments to that achievement, will provide a mechanism for a return of fauna.

A search was made by the Department of Environment and Conservation database.

A number of significant invertebrate taxa have been recorded near Lot 1 as noted in the report prepared by Western Wildlife.

Several invertebrate taxa have been recorded within 10 km of the site; a cricket *Austrosaga spinifer:* two records in 1981-82. BSD/Meinhardt Joint Venture, 2004, notes that this species occurs in coastal communities from Neerabup to Cervantes and "is probably more common than the present results suggest".

There are four records of native bees *Hylaeus globuliferus;* four records from Neerabup 1995-96. BSD/Meinhardt Joint Venture, 2004 note that the species "is also widely in the south-west". The Commonwealth Department of Environment and Water Resources shows the species as occurring across the south west of Western Australia (south west coastal).

The native bee *Leiptroctus contrarius*, is listed by DEC database as 1 record at Gnangara which is "more widespread than previously thought".

The Graceful Sunmoth *Synemon gratiosa* has 5 records from 1984 to 1996 in the surrounding 10 km and is known to extend to Mandurah, being "under pressure from development, occurring in Spearwood and Bassendean dunes east through Whiteman Park", (BSD/Meinhardt Joint Venture, 2004).

The best means of minimising impact on fauna is to allow for progressive clearing and a return to local native vegetation, which is proposed. It should be noted that the only reason that this site is to be quarried is to help satisfy the community needs for basic raw materials. Only 32.2% of Lot 1 is to be affected by excavation, which is a major concession by WA Limestone considering Lot 1 is owned by WA Limestone for the express purpose of limestone extraction.

On the basis of published information and the relatively small proportion of Lot 1 to be cleared it is believed that WA Limestone has made a significant contribution to minimising potential impacts on invertebrate fauna on Lot 1.

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16 October 2007

Potential for Invertebrate – Stygofauna - Troglofauna Assessment

The geology of Lot 1 was assessed by Lindsay Stephens of Landform Research during the field investigations on 30 November 2006. Lindsay Stephens holds a BSc with majors in Geology and Geomorphology and is a Member of the Australian Geomechanics Society, which has produced the Australian guidelines for landform stability and landslip.

The caves and general area was also inspected by Lex Bastian on 28 May 2007 in company with Lindsay Stephens of Landform Research and Denis Hill representing WA Limestone.

The assessment for stygofauna and troglofauna is based on a risks basis. The potential for suitable habitats and the likely potential impacts was made as a result of the examinations of karst, gelology, geomorphology and vegetation communities.

The adjoining Lot 52 to the east has been excavated for limestone, and some worked faces are visible near the boundary between Lot 1 and Lot 52.

These faces, and the edges of the excavation in that area, show rifts and karst development. A cave is exposed on the boundary of Lot 1 and Lot 52. A small depression occurs in the central east near the boundary with Lot 52.

The north eastern corner of Lot 1 looks "cavey" as does the small scarp in the north east.

The pattern of development matches other cave development in the local area and appears to be related to an old wetland at a higher elevation than the current wetland north of Wesco Road. The current wetland is at an elevation of 16 to 20 meters AHD, whereas the level ground that extends south across Nowergup Road, and appears to be an ancient wetland, is at a natural elevation of 28 metres or thereabouts, with some excavation below the base level.

There is potential for karst development at the small scarp in the north east of the 10 hectares north of Nowergup Road.

Lex Bastian provided data on karst in the local area which was published in Csaky 2003, *Review of Karst Hazards in the Wanneroo Area, Perth, Western Australia.* Figure 3.1 from Csaky is reproduced here to show the karst Hazard Zone mapped by Lex Bastian. The data for Lot 1 matches the geological mapping of Lot 1 conducted at the time of the site inspection.

A report prepared by Lex Bastian on his investigations which is attached as Appendix 1. The caves on site do not have water in them due to climatic or human factors such as pumping of groundwater locally.

Lex Bastian noted that in the old lime kiln quarry to the east of and outside Lot 1 there is evidence of a former cave with several dried out stalictites and shawl.

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A large rift 6 – 7 metres deep was recorded on the ridge on the eastern boundary of Lot 1, with a further smaller rift to the north. Following an internal inspection of the deepest rift Lex Bastian concluded that these rifts were typical of a ridge undermined by solution weathering which then allowed a partial eastern collapse to form the rifts. See Appendix 1 of the main report.

The cave was inspected by Lex Bastian who noted that this is a common type of cave in the Yanchep-Wanneroo region and developed as a consequence of subsidence of solution cavities at the water table. The cave lies on the edge of Lot 1 extending under the ridge on the eastern boundary.

Lex Bastian also noted that there was the potential for caves under the Tuart Woodland but that they were likely to be filled by sand and soil.

He concluded that the caves are restricted to the eastern edge of Lot 1 and will not be impacted on by the excavation. The excavation is not proposed to intersect the water table and will have a separation of 4 metres to the water table, which provides an allowance for seasonal changes.

His map shows that there is possible deep karst under the central and western portion of Lot 1 in the area nominated as Limestone Heath by Lex Bastian (Appendix 1). In reference to these areas Lex states *"Experience has shown that such caves become progressively smaller due to increasing saturation of dissolved calcium carbonate westwards in cave streams. Thus although they may be present they are likely to be deep, at the water table as well as not of significant size, such as would preclude the proposed operations"*.

Potential for Stygofauna

- **EPA Guidance**

EPA Guidance 54, concentrates on Stygofauna, which occur in caves and "are aquatic subterranean animals, found in a variety of groundwater systems".

"Troglofauna occur in air chambers in underground caves or smaller voids".

The issues of these organisms is best addressed on a risks basis, because the water table is not proposed to be impacted on. As the issue of stygofauna relates to the groundwater system, it is understood that groundwater management is of significance in order to minimise any risk to stygofauna if they occurred.

The risks approach is used in Guidance 54, on page 4, for proposals that are likely to have a potentially significant impact, and relate to;

- "lowering the water table",
- "artificially changing water tables",
- "changing water quality"
- "destroying or damaging caves."

These factors apply to root mat communities as well as stygofauna. None of the risk factors listed in Guidance 54 are likely to occur on site, as outlined below.

Comments of Stygofauna Risk

Stygofauna relate particularly to Root Mat Communities, which are listed as Endangered Communities.

Dr Brenton Knott at the University of Western Australia was contacted and discussed the issues with regard to other projects. At that time the company I was working for offered to commission Dr Knott to visit that site, but he declined, on the grounds that the conditions for root mat communities are well known and covered by Jasinke E J, 1997.

The requirements for Root Mat Communities are discussed in Jasinke 1997; a copy of the relevant pages supplied by Dr Knott are attached.

This documentation lists all of the following criteria to be necessary for the development of root mat communities;

- cavities in limestone or other rocks at the water table,
- presence of underground stream systems,
- permanent water in streams or pools,
- an arid cave environment,
- a land surface with Eucalypts and the water table at relatively shallow depth but less than a maximum of 30 metres,
- or a land surface of shrubs and the water table within 3.5 metres of the surface.

Dr Knott made the point that the known communities all relate to stream caves and this is also stated in Australian Government, Department of Environment and Heritage, 2000 under Critical Habitat. (Document attached).

Reading Australian Government, Department of Environment and Heritage, 2000, shows that the Root Mat Communities in the northern Perth area appear to be well known and restricted to the Yanchep area because dot point 11 recommends surveying of other land in the Yanchep area.

Excavation has occurred in the general area for many years, adjoining to the east.

The requirements from Jasinke E J, 1997 are taken in turn here and considered in the light of the conditions on Lot 1 on a risk basis.

- cavities in limestone or other rocks at the water table,

  The water table is not proposed to be intersected. The water table is currently listed as dropping from 17 metres AHD on the eastern boundary to 15 metres AHD on the western boundary, in the Perth Groundwater Atlas. The Concept Final Contour plan will be 4 – 7 metres above the groundwater elevation. If the maximum groundwater elevation is slightly higher, at up to 1 metres AHD, the separation would still be 3 metres.

  This final separation to the water table will be in the order of 3 - 6 metres; in compliance with EPA Guidelines.

From discussions with Lex Bastion and Dr Brenton Knott, and my observations, it appears that significant cave development occurs where there are significant flows of subterranean water, for example where the water table dips quickly or where there is an impermeable basement that concentrates the groundwater flows. There can also be edge effects and notching at the edges of wetlands. It appears that the caves on site are edge effects. See Appendix 1. A discussion of the formation of caves is also provided in Jennings (undated), who also noted that the presence of caves rapidly decreases west from the edge of the water in contact with the air, unless a stream is present, which does not appear to be the case on this site. Appendix 1.

The potential for caves at the water table under the quarry are therefore reduced, and as there will be a separation of undisturbed ground to the water table of 3 – 6 metres, the risk to stygofauna from quarrying is low based on the discussion of caves by Lex Bastian in Appendix 1.

- presence of underground stream systems,

  The issue of potential for underground streams is covered in Appendix 1. Lex Bastian did not consider stream flows to be present under the site, but rather the caves were edge rift caves.

  Again Dr Knott made the point that the known communities all relate to stream caves and this is also stated in Australian Government, Department of Environment and Heritage, 2000 under Critical Habitat. (Document attached).

- have permanent water in streams or pools

  The presence of permanent streams and pools and other underground systems, described above, which are less likely to occur under this site, are not proposed to be disturbed during excavation. Lex Bastian, in Appendix 1, rated the potential for caves as being of low potential to occur under the quarry area.

- have an arid cave environment

  The site does not have an arid environment, although the limestone is free draining.

- have a land surface with Eucalypts and the water table at relatively shallow depth but less than a maximum of 30 metres.

  There are some *Eucalyptus gomphocephala* on site to the east of the excavation, and these do occur within 30 metres of the water table. The other criteria which require the presence of caves for root mat communities and stream caves to occur are of lower potential as stated above.

- or a land surface of shrubs and the water table within 3.5 metres of the surface

  The land surface is greater than this separation under the natural conditions.

With respect to the risk factors listed in EPA Guidance 54 the following comments are made.

- "lowering the water table",

  There will be no lowering of the water table as a result of excavation. Quarrying is one of the few clean industries and is able to be undertaken in Drinking Water Source Areas.

Any bore will be licensed by DEC. It is understood that there are currently market gardens in the local area. If no allocation is available WA Limestone will truck water to the site for dust suppression from Flynn Drive, a local quarry where they operate, which has a licensed bore.

- "artificially changing water tables",

  There are no proposals to change the groundwater elevations. The greatest changes are likely to occur as a result of groundwater pumping and climate changes.

- "changing water quality"

  The excavation of sand and limestone is one of the cleanest land uses. There are no pollutants used apart from fuels and lubricants. The operations carry low risk and are one of the few land uses permitted in Priority 1 Groundwater Areas. See Main Report.

  For example see the Water and Rivers Commission (now Department of Water and Department of Environment and Conservation) Statewide Policy No 1, Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas. This document, although relating to sand excavation, has the same issues but applies to a much more sensitive environmental situation.

  The greatest risk of pollution or alteration to the groundwater quality will occur as a result of limestone batching. The cement products used and produced are calcareous and slightly alkaline, similar to the existing limestone on site. Management of the water reuse within the limestone batching will be thorough, to minimise loss to the ground. See main report. As noted previously the potential for caves under the excavation, and consequently limestone batching area, is regarded as low. Groundwater flow is to the west away from the caves on the east of the site.

- "destroying or damaging caves."

  From the discussions above, the likelihood of finding caves at the water table is low. The Concept Final Contours provide for a separation of 3 - 6 metres in the Concept Plan.

  In neither case will the water table be intersected. If any caves existed at the water table they would not be interfered with. Management plans will be used to manage water quality from limestone batching.

None of the risk factors listed in Guidance 54 are likely to occur. As Guidance 54 states that Stygofauna are aquatic they are unlikely to occur under this site, and even if they did they will not be impacted on.

For Troglofauna, which may occur in air chambers in underground caves or smaller voids, it will be difficult to undertake any meaningful sampling of these. Any crevices or fissures in the adjoining quarries will probably have been contaminated by surface or near surface invertebrate fauna.

These fauna will be protected by leaving some limestone in place, which is the intention of the concept final floor plan. Risk to troglofauna is probably more related to potential impacts by limestone batching rather than from quarrying because of the greater use of water and cement products. A management plan and the Guidelines for Concrete Batching provide guidance and management potential of these risks if small cavities occur under the site. All known caves are to be retained within vegetation conservation areas and therefore troglofauna in these systems, which are dry, will not be impacted on.

Conclusions

The potential for stygofauna or troglofauna to exist under the quarry and limestone batching area is regarded as low.

Even if some small cavities did occur the potential for stygofauna is regarded as low.

Troglofauna will occur in the known caves which will be protected within vegetation retention areas. These are up slope and up water table gradient from the proposed excavations and limestone batching.

References – Further Reading

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Appendix 4

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ALLAN HERRING M.I.E. AUST. M.A.A.S.
LYNTON STORER M.A.I.E.A., M.A.A.S.
TIM REYNOLDS M.I.E. AUST. M.A.A.S.

NOISE ASSESSMENT

LOT 1 NOWERGUP ROAD, NOWERGUP

FOR

WA LIMESTONE

BY

HERRING STORER ACOUSTICS

SEPTEMBER 2006

OUR REF: 6593-1-06125-05

CONTENTS

APPENDICES

1.0 INTRODUCTION

Herring Storer Acoustics was commissioned by WA Limestone to carry out an acoustical assessment of emissions of the proposed quarry located at Lot 1 Nowergup Road, Nowergup. The objectives of the study were to:

- Determine, by modelling, noise propagation from the quarry.
- Assess the predicted noise levels received at the closest noise sensitive premises, for compliance with the *Environmental Protection (Noise) Regulations 1997*.
- If exceedances are predicted, investigate possible noise control options that will reduce noise emissions to achieve compliance with the regulations.

2.0 SUMMARY

Noise emissions received at the closest noise sensitive premises from the quarry located at Lot 1 Nowergup Road, Nowergup would be deemed to comply with the *Environmental Protection (Noise) Regulations 1997* at all times and no noise amelioration is required.

3.0 CRITERIA

The *Environmental Protection (Noise) Regulations 1997* stipulate the allowable noise levels that can be received at a premise from another premises. The allowable noise level when received at a residence is determined by the calculations of an influencing factor, which is then added to base noise levels. In this case the influencing factor for closest noise sensitive premises located around the quarry has been calculated at 0.

The assigned noise levels for the neighbouring noise sensitive premises are listed in Table 1.

TABLE 1 - ASSIGNED NOISE LEVEL

Time of Day	Type of Assigned Noise Level		
	L_{A10}	L_{A1}	L_{max}
0700 - 1900 hours - Monday to Saturday (Day Period)	45	55	65
0900 - 1900 hours - Sunday & Public Holidays (Evening Period)	40	50	65
1900 - 2200 hours - All Days (Evening Period)	40	50	55
2200 - 0700 hours - Monday to Saturday (Night Period)	35	45	55
2200 - 0900 hours - Sunday & Public Holidays (Night Period)	35	45	55

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

The assigned noise levels are also conditional on no annoying characteristics existing such as tonal components etc. If such characteristics exist, then any measured level is adjusted accordingly. The adjustments that apply are shown in Table 2.

TABLE 2 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: these adjustments are cumulative to a maximum of 15 dB.

4.0 QUARRY ACTIVITIES

Operations at the quarry can be summarised as follows:

1) Normal quarry operations during the day period (i.e. from 0700 to 1800 hours Monday to Saturday), excluding Sundays and Public Holidays.

2) Loading of trucks can occur from 0630 to 1700 hours Monday to Saturday.

Truck loading occurs before 0700 hours in order for deliveries to occur on sites at 0700 hours.

It is also understood that operations of the quarry would be separated in the following stages:

1) Limestone excavation

2) Limestone batch plant

3) Concrete batching plant

To comply with the regulations, noise emissions from all quarry activities during the day period requires to comply with an L_{A10} noise level of 45 dB(A). Although, we believe that the noise emissions from the loading of trucks before 0700 hours would occur for less than 10% of the time, to be conservative, the assessment of this activity has been carried out with respect to the assigned L_{A10} night period noise level of 35dB(A).

5.0 MODELLING

Modelling of the noise emission propagation was carried out using "SoundPlan". Both single point and noise contour calculations were used to determine the noise level that would be received at noise sensitive premises located around the proposed facility. Noise contours show the overall noise level that would be received at a location due to the various activities carried out, where as single point calculations show the influence of individual items on the overall noise resulting at a specific location.

SoundPlan uses the theoretical sound power levels determined from measured sound pressure levels to calculate the noise level received at a specific location.

The calculations used the following input data:

a) Ground contours.

b) Sound power levels used in the model were from measured data of similar equipment operated by WA Limestone at another quarry. The sound power data is summarised in Table 4.

c) The ground contours within the quarry were supplied by the client.

Weather conditions for the modelling were as stipulated within the Environmental Protection Authority's *"Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise"* for the day and night periods was as listed in Table 3.

TABLE 3 - WEATHER CONDITIONS

Condition	Day Period	Night Period
Temperature	20 °C	15 °C
Relative Humidity	50%	50%
Pasquill Stability Class	A	E
Wind Speed	4m/s*	3 m/s*

* From sources, towards receivers.

TABLE 4 - SOUND POWER LEVELS dB(A)

Item	Sound Power Level dB(A)
Truck	105
Front End Loader	113
Dozer	113
Crushing Plant	112
Concrete Batch Plant	110

Modelling was carried out for the scenarios listed in Table 5.

TABLE 5 – MODELLING SCENARIOS

Stage	Scenario	Equipment Operating
1	1A – Day	Front end loader, dozer, crushing plant and truck.
	1B – Night	Front end Loader and Truck.
2	2 – Day	Front end loader, bobcat, fork tractor and trucks.
3	3 – Day/Night	Front end loader, concrete batch plant and trucks.

Note: Night period scenarios for stages 2 would be the same as for stage 1. Therefore, scenario 1B would be representative for both stages 1 and 2.

The above scenarios would be considered as the worst case.

The results of the single point calculations are listed in Table 6.

TABLE 6 - CALCULATED NOISE LEVELS AT CLOSEST RESIDENCES

Location	Senario/Calculated Noise Level dB(A)			
	1A	1B	2	3
Closest Residence to North East	37	32	37	35
Closest Residence to East	25	30	32	30
Closest Residence to South East	27	31	31	30

Receiver locations are shown on Figure 01.

Noise contours for each scenarios are attached in Appendix A.

At the calculated noise level, noise received at the neighbouring residences would not be tonal and no penalty would be applied, especially considering the noise emissions from Wannaroo Road.

6.0 DISCUSSION

Noise emissions received at the closest noise sensitive premises from the quarry located at Lot 1 Nowergup Road, Nowergup would be deemed to comply with the *Environmental Protection (Noise) Regulations 1997* at all times and no noise amelioration is required.

For: **HERRING STORER ACOUSTICS**

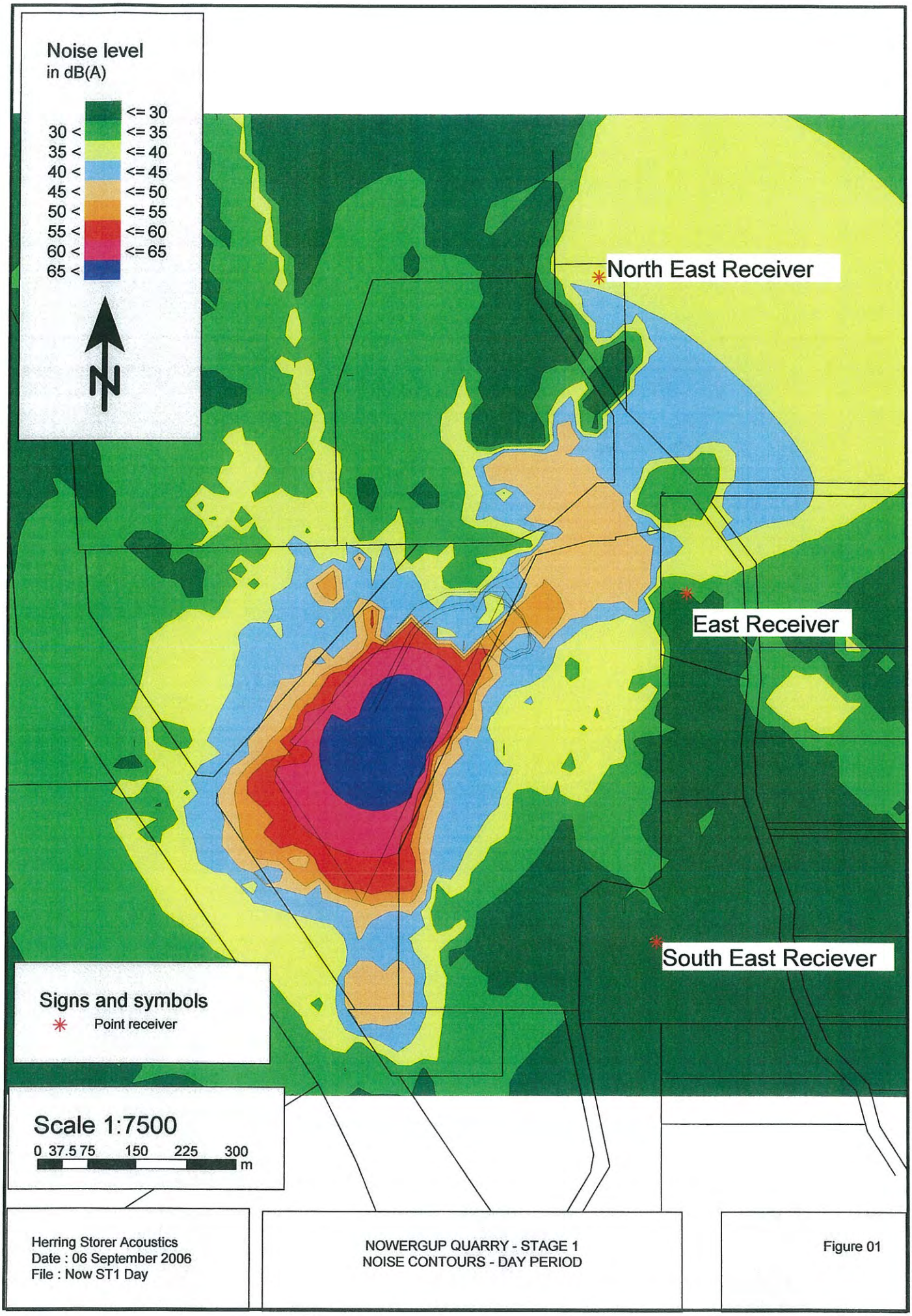
T.C. Reynolds.

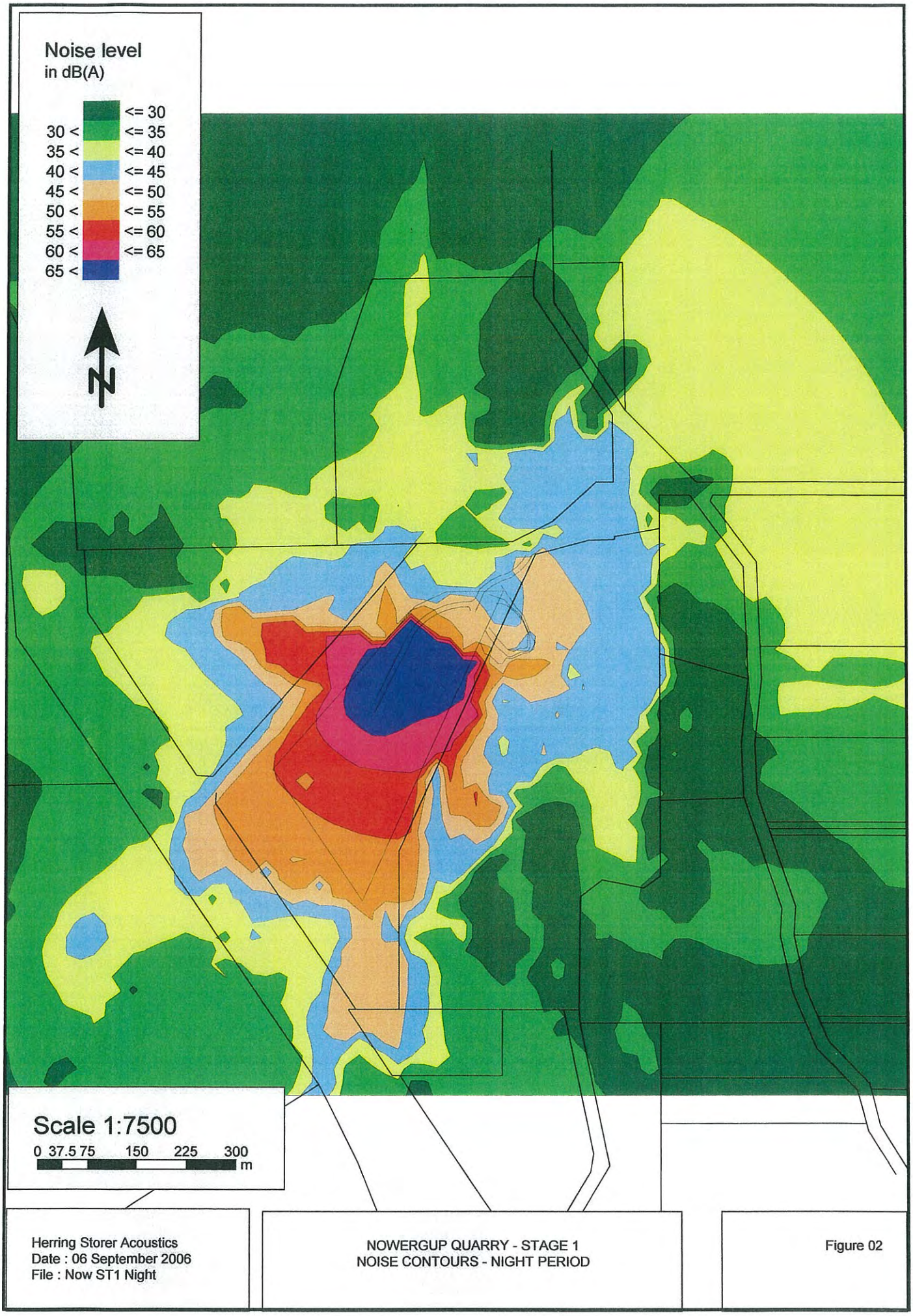
Tim Reynolds

15 September 2006

Appendix A

Contour Maps

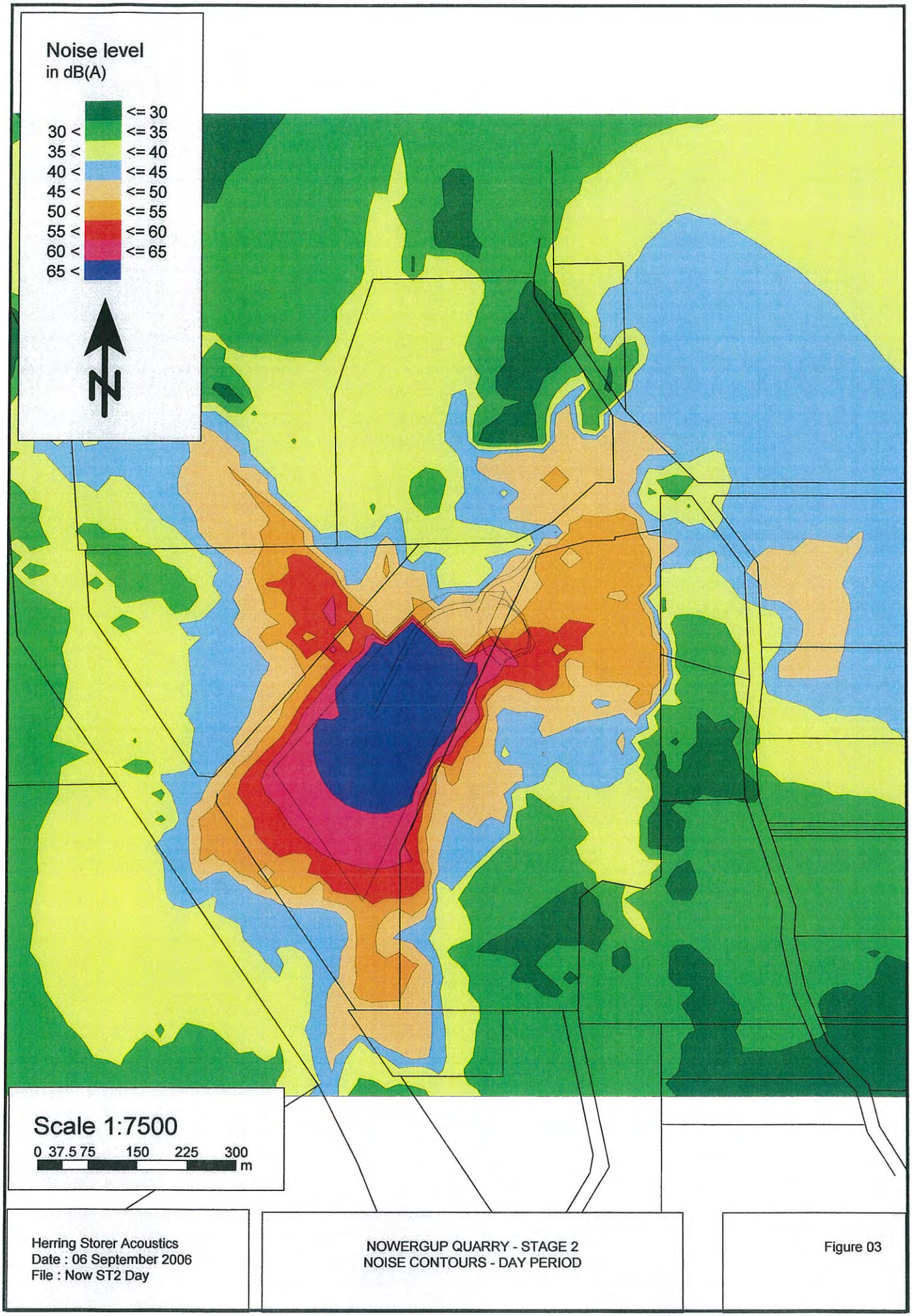

Noise level
in dB(A)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
N
North East Receiver
East Receiver
South East Reciever
Signs and symbols
Point receiver
Scale 1:7500
0 37.5 75 150 225 300
m
Herring Storer Acoustics
Date : 06 September 2006
File : Now ST1 Day
NOWERGUP QUARRY - STAGE 1
NOISE CONTOURS - DAY PERIOD
Figure 01



Herring Storer Acoustics
Date : 06 September 2006
File : Now ST1 Night

NOWERGUP QUARRY - STAGE 1
NOISE CONTOURS - NIGHT PERIOD

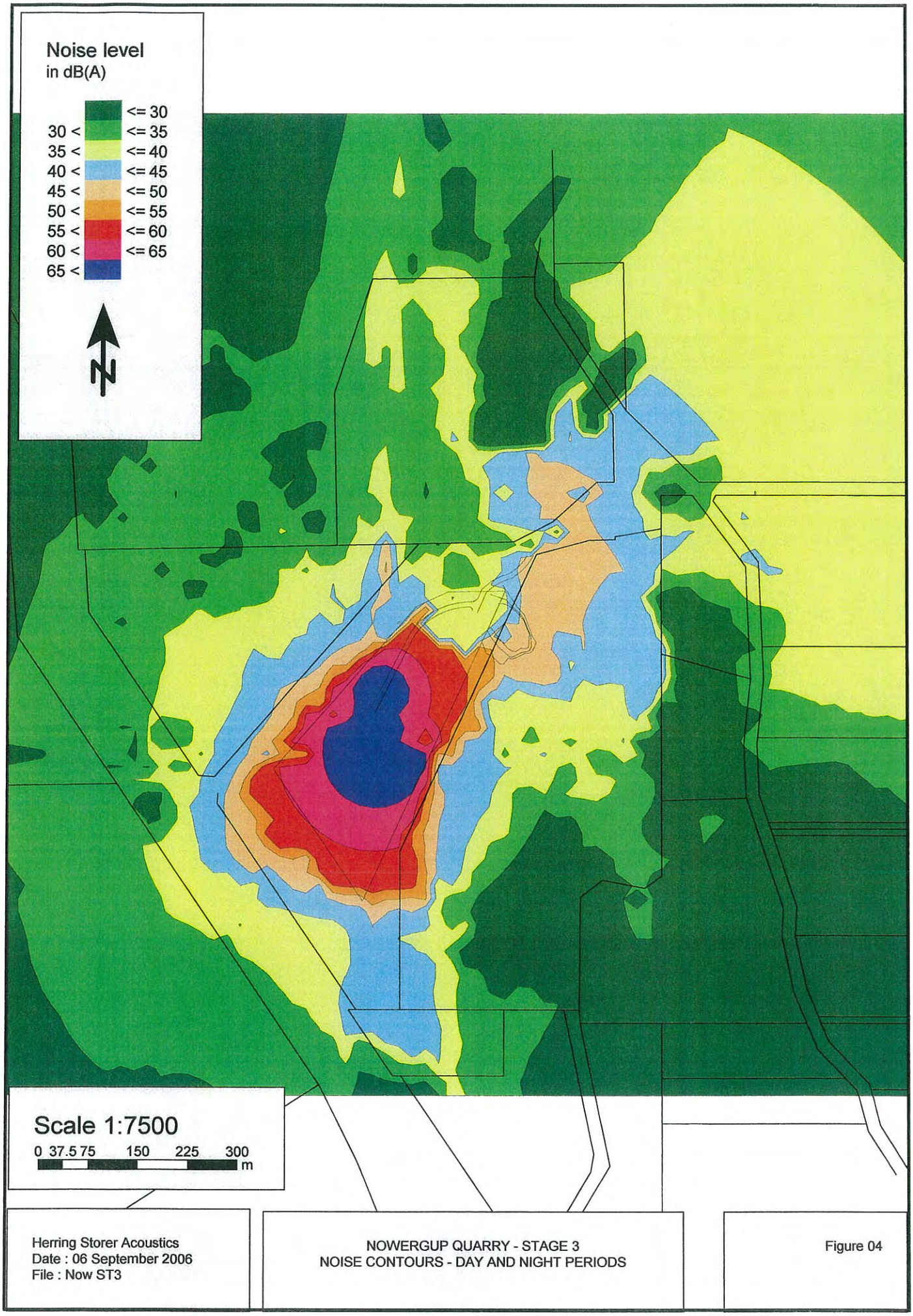
Figure 02



Herring Storer Acoustics
Date : 06 September 2006
File : Now ST2 Day

NOWERGUP QUARRY - STAGE 2
NOISE CONTOURS - DAY PERIOD

Figure 03



Herring Storer Acoustics
Date : 06 September 2006
File : Now ST3

NOWERGUP QUARRY - STAGE 3
NOISE CONTOURS - DAY AND NIGHT PERIODS

Figure 04

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EMAIL TRANSMITTAL

REF:	12397-1-06125-05		
TO:	Hardy Bowen Lawyers	**Cc:**	Landform Research
ATTENTION:	Ian Rogers	**ATTENTION:**	Lindsay Stevens
ADDRESS:	irogers@hardybowen.com	**ADDRESS:**	landform@iinet.net.au
FROM:	Tim Reynolds		
DATE:	29 September 2010		
SUBJECT:	**LOT 1 NOWERGUP ROAD, NOWERGUP ADDITIONAL INFORMATION**		

Ian,

As requested, we provide additional information regarding noise emissions from proposed limestone facility located at Lot 1 Nowergup Road, Nowergup. The following information is to answer queries raised by the City of Wanneroo.

QUERIES

We understand that the following queries have been raised by the City of Wanneroo :

1. *Please clarify the position and level at which the plant was assumed to be placed when calculating noise levels and impacts on residents. This query arises due to the following:*
    - *WA Limestone's management plan states that excavation is intended to be carried out 'from the floor of the pit behind the western face, which will assist noise screening' (page 19). This is a scenario which will not exist until after work has been carried out at the existing natural ground level. Noise impacts of works at ground level will need to be assessed if this has not already been carried out.*
    - *In respect of properties to the east of the proposed extraction area, the amount of shielding provided by the rock face will be critical. If crushing or loading occurs towards the western side of the pit, the amount of attenuation would be reduced and therefore may not achieve compliance with the* Environment Protection (Noise) Regulations 1997 *(**Regulations**).*
2. *Further to the previous question, if loading is carried out between 0630 and 0700 Monday to Saturday, will noise generated by such loading comply with the Regulations* even in the early stages of extraction, before operations are able to be carried out 'from the floor of the pit'*?*
3. *The report states that tonality, which attracts a penalty of +5 dB, is not going to occur. Can you please provide evidence to confirm this. Rock crushers, loaders and dozers all exhibit tonal noise characteristics.*

RESPONSE

In response to the above queries, we provide the following information.

Firstly, we note that as part of the 2006 acoustic study, noise modelling was undertaken with items of plant and equipment located at the floor of the pit. Therefore, we have undertaken additional noise modelling for the initial workings. With regards to the initial workings, we understand that there is some overburden that will be pushed up, which means that:

1. The actual initial workings will not be at the existing ground levels, but about 2-3 metres below existing ground levels.

2. The overburden pushed up would act as a barrier between the facility and the neighbouring residence.

3. The existing ground contours at the northern end of the facility are relatively low compared to those at the southern end of the facility (ie 23m at northern end compared to 40m at southern end).

Taking the above into account, additional noise modelling was undertaken and the results show that noise received at the 3 residential locations would be as listed in Table 1.

TABLE 1 - CALCULATED NOISE LEVELS AT CLOSEST RESIDENCES

Location	Calculated Noise Level dB(A)
Closest Residence to North East	39
Closest Residence to East	29
Closest Residence to South East	31

Regarding loading during the period before 0700 hours, which is considered part of the night period, with an assigned noise level of 35 dB(A). We have undertaken additional modelling for this scenario during the early period of extraction and have concluded that, although possible, it would be difficult to achieve compliance with the assigned night period noise levels at both residences to the east and the north. Therefore, it is recommended that for Stage 1 of the facility the operating hours be limited to the day period, this being between 0700 and 1900 hours Monday to Saturday. Given the shape of the pit and existing ground contours, loading before 0700 hours would not cause an exceedance of the Regulations during subsequent stages.

Additionally, although we agree that if the plant was located towards the western side of the pit and the attenuation provided by the face would be somewhat diminished, given the differential between the floor of the pit and the natural ground level, the actual location is not as critical as indicated in the above query. However, we still recommend that the plant be located as close to the eastern face as possible, thus obtaining the maximum attenuation and minimising the noise received at the neighbouring residence.

We believe that for this facility, noise received at the neighbouring residence would not be tonal, given:

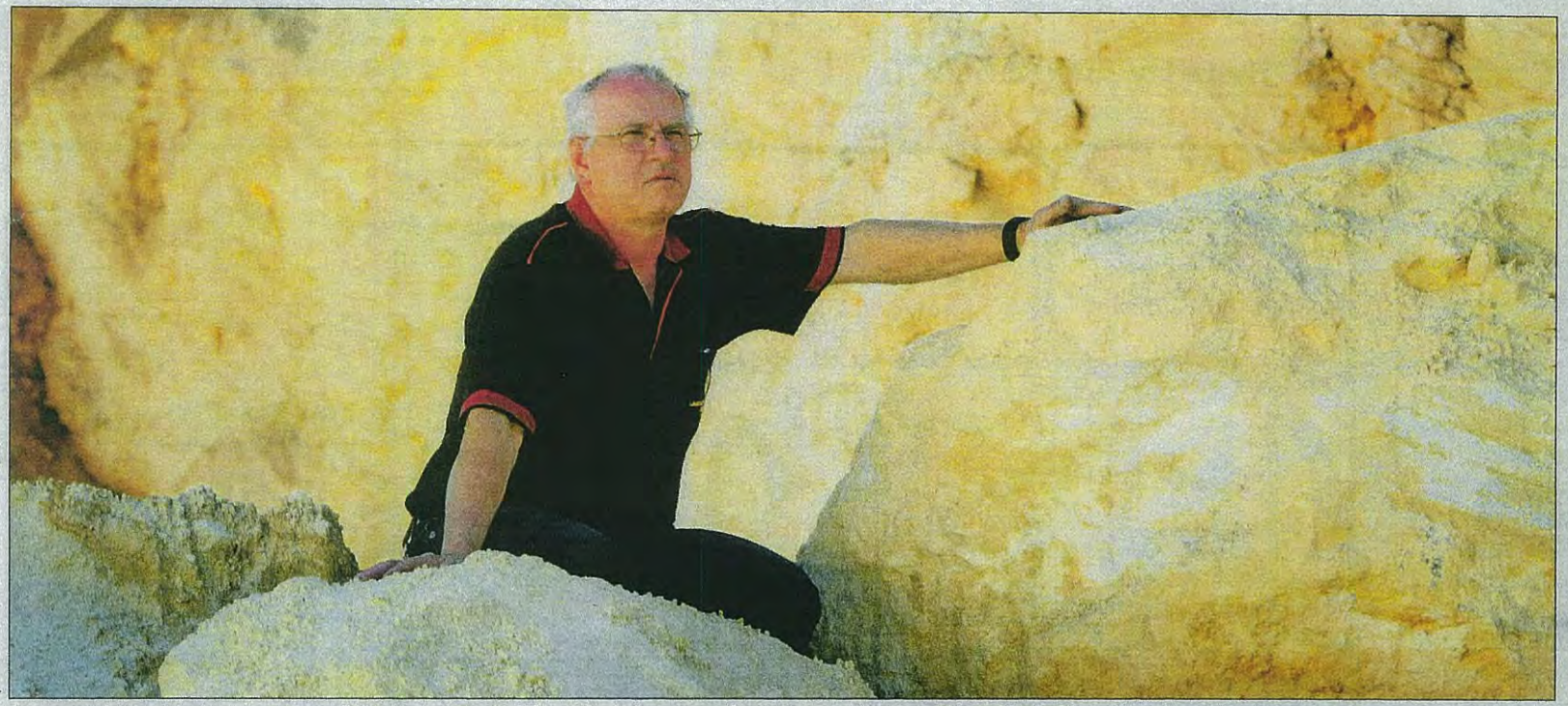
1. The calculated noise level at the neighbouring residence.
2. The probable background noise level in the area, considering the close proximity of Wanneroo Road.

In any case, the predicted noise levels are at least 5 dB(A) below the assigned noise levels. Therefore, noise received at the closest residence would comply with the assigned noise level, even if the +5 dB(A) penalty was applied for tonality.

Regards
For **Herring Storer Acoustics**

Tim Reynolds

Appendix 5



Concerned: Max Barton, manager of the Limestone Building Block Company, fears house prices could be affected by a limestone shortage. Picture: Steve Ferrier

Jobs at risk in quarry quandary

DANIEL MERCER

Hundreds of jobs will be put at risk and the cost of building a home will rise unless urgent action is taken to secure supplies of limestone around Perth, the industry has warned.

In a report commissioned by several of Perth's major limestone quarries and block makers, consultancy firm Landform Research found that new residential developments and conservation areas had made it increasingly difficult to access Perth's remaining limestone deposits.

It said that unless local, State and Federal governments corrected the situation, Perth's limestone quarries and the block makers they supplied would be "under threat immediately in the future".

The report also found that unless action was taken, development in Perth would be affected as many of the foundations of the city's roads and housing subdivisions are built using limestone.

Limestone Building Block Company spokesman Max Barton said limestone was available around Perth but bureaucratic red tape had made it too hard to access the deposits.

He blamed the policies of successive governments at all levels, saying there had been a failure to identify and safeguard future sources.

"You might have 100 or 200 people in Western Australia who are out of work," he said.

"If it does go down, it may also have an effect on the stonemason industry because they will be out of work as well."

Mr Barton said house prices would probably be affected by the crisis because limestone was a key cement-making ingredient and cement producers would have to import the material if local suppliers went to the wall.

Master Builders Association of WA housing director Gavan Forster said the problem would not be felt immediately but local and State governments needed to ensure conservation areas did not "intrude" on limestone suppliers' ability to get the material.

Department of Mines and Petroleum mineral titles division director Ivor Roberts said the department shared the concerns of limestone quarries and was working with other government agencies to ensure that supplies were protected.

Worker on assault charge

A 32-year-old man has been charged over a workplace fight at a Bibra Lake trucking yard.

A worker died in an incident linked to the altercation — but homicide detectives believe the death was accidental.

Karl-Olof Agge, 32, has been accused of punching his 57-year-old boss, Cockburn Transport director Savo "Sam" Jevtic, on Tuesday morning during a dispute about wages.

As Mr Agge, of West Swan, jumped into a semi-trailer to leave the Quarimor Road industrial site, a colleague leapt on to the outside driver's step of the cabin to try to speak to him.

The 49-year-old father of two fell and hit his head as the truck departed.

Car stolen for crime spree

Police are hunting thieves who used a stolen car during a crime spree from Perth's northern suburbs to Mandurah this week.

A police spokesman said the thieves stole the black 1997 Nissan Skyline coupe from a home in Tarongo Way, City Beach about 6.40am on Tuesday.

An hour later, they used the car to flee the scene of a break-in at a home in Stirling. At 1pm, the thieves tried to enter homes in Success and then fled in the Nissan.

Two hours later, they were spotted trying to break into cars in Cockburn and Coogee. At 4.30am yesterday the thieves used the car to flee after they burgled a newsagency on Mandurah Terrace in Mandurah.

MINISTER FOR MINES
AND PETROLEUM;
FISHERIES;
ELECTORAL AFFAIRS;
LEADER OF THE
GOVERNMENT IN THE
LEGISLATIVE COUNCIL

Our Ref: **26-07454**

Mr Walter Lukic
General Manager
W.A. Limestone
PO Box 1404
BIBRA LAKE WA 6965

Dear Mr Lukic

SHORTAGE OF LIMESTONE RESOURCES IN THE PERTH METROPOLITAN AREA

Thank you for your letter dated 13 August 2010 and I share your concerns regarding the shortage of limestone in the Metropolitan area.

The Department of Mines and Petroleum (DMP) is already working with the Department of Planning to find a solution. The Geological Survey within DMP has recently mapped and identified significant geological supplies of limestone and other basic raw materials in the Perth Metropolitan area however agrees that there is a shortage in the Metropolitan area. It is anticipated that these significant geological supplies will be incorporated by the Department of Planning into its revised Statement of Planning Policy 2.4 on Basic Raw Materials.

DMP has also raised concerns with the Department of Planning about the East Wanneroo Structure Plan and the lack of buffers around priority resource locations and have been advised that the Structure Plan will be amended.

Yours sincerely

NORMAN MOORE MLC
MINISTER FOR MINES AND PETROLEUM
08 SEP 2010

4th Floor, 216 St Georges Terrace, Perth Western Australia 6000
Telephone: +61 8 9422 3000 Facsimile: +61 8 9422 3001 Email: Minister.Moore@dpc.wa.gov.au

Minister for Environment; Youth

Our ref: 40-11177

Mr Walter Lukic
General Manager
WA Limestone
PO Box 1404
BIBRA LAKE WA 6965

Dear Mr Lukic

Thank you for your letter dated 13 August 2010 regarding demand for limestone resources in the Perth metropolitan area.

As the Minister for Environment, I understand and appreciate the need for basic raw materials for building and construction and I support a whole-of-government approach to resource availability for extractive industries in the Perth and Peel regions.

The Department of Planning and the Department of Mines and Petroleum are the lead agencies for planning and policy with respect to the basic raw materials industry. The Department of Environment and Conservation is routinely involved in such planning, primarily in relation to advising on environmental values of specific areas. I note that you have copied your letter to the Minister for Planning and the Minister for Mines and Petroleum.

In reference to the relationship between SPP2.4 and SPP2.8, I understand that SPP2.4 is primarily intended to control the encroachment of inappropriate development into buffer areas surrounding raw material extraction sites. Also, I am advised that SPP2.4 does not imply primacy of extraction over environmental protection and that any proposed new extraction areas would be routinely subject to assessment of environmental impacts pursuant to the *Environmental Protection Act 1986*.

I can assure you that the Government is committed to sustainable development and is progressing with efforts to streamline development approvals, while also providing appropriate environmental protection.

Thank you for raising this matter with me.

Yours sincerely

Hon Donna Faragher JP MLC
MINISTER FOR ENVIRONMENT; YOUTH

cc Minister for Mines and Petroleum; Minister for Planning

15 SEP 2010

10th Floor, Dumas House, 2 Havelock Street, West Perth Western Australia 6005
Telephone: +61 8 9213 7250 Facsimile: +61 8 9213 7255 Email: Minister.Faragher@dpc.wa.gov.au

Minister for Planning; Culture & the Arts
Government of Western Australia

Our Ref: 33-08927

Mr W Lukic
General Manager
WA Limestone
PO Box 1404
BIBRA LAKE WA 6965

Dear Mr Lukic

Thank you for your letter of 13 August 2010 to the Hon John Day MLA, Minister for Planning; Culture and the Arts regarding shortage of limestone resources Perth Metropolitan Area.

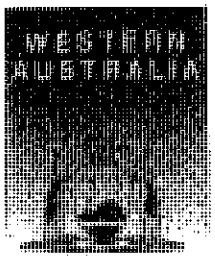
Your correspondence will be responded to in due course. Should you need to contact us concerning this matter, please quote the reference number above.

Yours sincerely

Sue Wood
Executive Officer for
MINISTER FOR PLANNING;
CULTURE AND THE ARTS

20 AUG 2010

13th Floor, 2 Havelock Street, West Perth, Western Australia 6005
Telephone: +61 8 9213 6600 Facsimile: +61 8 9213 6601 Email: Minister.Day@dpc.wa.gov.au



MINISTER FOR MINES
AND PETROLEUM;
FISHERIES;
ELECTORAL AFFAIRS;
LEADER OF THE
GOVERNMENT IN THE
LEGISLATIVE COUNCIL

Our ref: 26-07454
Enquiries: Ph (08) 9422 3000 Fax (08) 9422 3001

Mr Walter Lukic
General Manager
W.A. Limestone
PO Box 1404
BIBRA LAKE WA 6965

Dear Mr Lukic

On behalf of the Hon Norman Moore MLC, Minister for Mines & Petroleum; Fisheries; Electoral Affairs, I would like to thank you for your correspondence received in this office on 17 August 2010, regarding a shortage of limestone resources in the Perth metropolitan area.

The matter you have raised has been brought to the attention of the Minister and a response will be provided to you as soon as possible.

Yours sincerely

Bernadine D'Sa

BERNADINE D'SA
EXECUTIVE OFFICER

19 August 2010

4th Floor, 216 St Georges Terrace, Perth Western Australia 6000
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Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

30 OCTOBER 2010

LIMESTONE FOR PERTH'S DEVELOPMENT – CURRENT AND FUTURE

There are three parts to the problem facing Perth related to the availability of Limestone both south and north of Perth.

By way of illustration the resources north of Perth are considered.

The first is the restricted availability caused by sterilisation by the Conservation Estate and planning polices that have failed to provide for adequate resource protection. This is illustrated in the notes titled.

Attached are plans of the north of Perth area showing where limestone occurs in orange, with the existing and proposed conservation estates in yellow.

Also shown is a map from State Planning Policy 2.4 which highlights only one area and only a relatively small proportion of the limestone as a Priority Limestone Resource Area in the Nowergup – Neerabup localities.

The final plans show where the current quarries are located with respect to that a Priority Limestone Resource Area and the potential implications on limestone availability if the Priority resource area is reduced or buffers to proposed rural living are permitted to impinge on it.

The other issue is that much of the Priority Limestone is currently covered by native vegetation.

The gazetting of the National Parks, Bush Forever and conservation areas is not being used as a balance, to ensure that the Priority Limestone is preserved and able to be utilised by the community.

The locking up of the limestone in the conservation estate is generally ignored during the approval processes and any quarries are treated independently. That is the clearing of vegetation is treated as if little none of the same vegetation communities has been preserved.

The same applies to both the State and Commonwealth approval processes.

The only reason the limestone remains vegetated is that it was earmarked several decades ago for limestone extraction, but this earmarking is largely now ignored.

Without a change of Local and State Government policy and implementation there will be no more limestone for the development of Perth within a few years.

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We are at the point where all levels of government from LOCAL to STATE to COMMONWEALTH immediately need to make decisions on which point the limestone will be sterilised.

Apart from the policies it is the interpretation and implementation of the policies that presents the problems.

Limestone is used for a wide range of products.

- Limestone is used for all roads on the Swan Coastal Plain.
- Limestone is cut for dimension stone
- Limestone has been made into reconstituted blocks for use in most retaining walls in subdivisions in the last ten years.
- Limestone is used for lime manufacture for combating acidic soils conditions in agriculture, used in the mining and construction industries, used to neutralise acid sulfate conditions.
- Limestone is used for clinker/cement manufacture.
- Stopping limestone extraction will not help native vegetation or potentially threatened fauna.
- Stopping limestone extraction will just shift greater extraction onto the hard rock quarries on the Darling Scarp.
- Stopping limestone extraction will instantly impact on all development and housing availability in Perth.
- Stopping Limestone will lead to greatly increased costs of extraction and processing, increased transport costs and increased greenhouse emissions.
- **Stopping limestone extraction will cause a significant additional cost loading on all housing and development in Western Australia.**

Reasons for the Lack of Availability of Limestone

In spite of there being very large volumes of high grade limestone in the northern Perth Metropolitan area, it is almost at the stage where there will be no limestone available because it will all have been sterilised.

Unfortunately it has reached the point where decisions have to be made on whether limestone is retained for the future use of our community or is lost to Biodiversity

The Chamber of Commerce and Industry is to be commended on researching the Basic Raw Materials on a number of occasions in the past decade.

- Western Australia, Western Australian Planning Commission, *Statement of Planning Policy 2.4, Basic Raw Materials.*

- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.
- Chamber of Commerce and Industry, 2008, *Basic Raw Materials Access and Availability*.

The following points are made.

- There is a lack of understanding by all levels of Government and Government Departments of the serious situation in which Perth finds itself with respect to protecting limestone resources for the future.

- The issues have become so complex and so many departments are required to consider proposal that officers in Government Departments, often at a junior level, prepare reports and make decisions based without knowledge of all the policies. Once a decision is made even if incorrect it is difficult to get it changed.

- The reality is that all decisions depend on or are made under *the Environmental Protection Act 1984*, because this is the top act and therefore all projects ultimately rely on the expertise of and in many cases the kindness of the decider.

- Basically all the land west of Wanneroo Road is allocated to urban development and the limestone is effectively sterilised.

- Neerabup and Yanchep National Parks including the extensions, together with Bush Forever, sterilise a very large proportion of the limestone resources north of Perth.

- The small rural living lots which have low population densities, and currently share with limestone extraction and market gardens, are threatening to sterilise the remaining limestone, particularly in the nominated Priority Resource Area.

- The land currently under market gardens, limestone extraction and rural living is predominantly cleared and yet State Government Policies, such as the Future of East Wanneroo Structure Plan 2007, seek to remove the limestone extraction and market gardens from those areas and leave much of the land to rural living.

- The Future of East Wanneroo Structure Plan 2007, allocates limestone extraction to the east in State Forest where there is limited limestone available, or where the land is covered by remnant vegetation and where much of the resource is held by one large company.

- On the other hand the very land that the Western Australian Planning Commission is promoting for excavation in the Future of East Wanneroo Structure Plan 2007, is being increasingly nominated for conservation through various policies.

- While the limestone is subject to potential excavation the vegetation communities are increasingly being provided with ever increasing levels of protection as Threatened Ecological Communities and Priority Ecological Communities, and as containing significant fauna. For example, such communities as Community Type 26a (TEC), Community Type 22 (PEC 2), Community Type 23b (PEC 3), Community Type 24 (PEC 3). This covers most of the vegetation on the limestone resources.

- The limestone vegetation contains *Lomandra* spp that provide habitat for the Graceful Sun Moth that is now listed under State and Commonwealth Legislation.

- The limestone vegetation provides feeding resources for Black Cockatoos, which are listed under State and Commonwealth Legislation, and yet the largest food resource for Carnaby's Black Cockatoo is the Pine Plantation which is being clearing from the Gnangara Mound.

- The Commonwealth and State Governments want any vegetation cleared to be offset by securing remnant vegetation at ratios of 1 : 4 and 1 : 6 or higher. The cost of doing this is prohibitive to limestone extraction companies and, if available, any cost will be added directly to the cost of products produced as occurs when offsets are used for clearing for housing.

  It may be that with higher levels of protection afforded to those Communities their conservation ratings may need to be adjusted. This does not seem to happen; more land is added to the conservation estate and yet the revisions are not made.

- Bush Forever was placed over the top of approved limestone quarries and now these quarries have to fight to exist. Approval is difficult to obtain with the decision makers being restricted to the environmental agencies with no effective right of appeal. (see below).

- It is my understanding that the levels of representation of the various ecological communities was determined up to ten years ago and is in need of revision in the light of additions to the Conservation estate.

- The enactment of the Clearing Regulations has provided a mechanism to provide a greater control over clearing of native vegetation and this should be recognised.

- Even State Forest is not recognised as a level of secure protection. There are some good reasons for this but still recognition of a lower level of protection is warranted as it has higher protection than vegetation on private land although with the Clearing Regulations all vegetation now has higher levels of protection than ten years ago.

- Applications for limestone extraction in remnant vegetation usually come down to clearing of vegetation and the opinion of the assessing officer. Refusals on the clearing applications are appealed through the Appeal Convenor and then the Minister for the Environment. The Minister for the Environment has the protection of biodiversity and vegetation as the main brief. The same applies to appeals on the EPA level of Assessment.

- This differs from Planning decisions which can be appealed through the State Administrative Tribunal, independent of any Government Department or Minister.

Clearing

- DEC and Commonwealth officers generally do not have a good understanding of the competing needs and of course their briefs are to protect biodiversity.

- *Statement of Planning Policy 2.4 Basic Raw Materials* has not been always been successful in protecting resources except in situations where decisions are easy. Certainly Local Authorities as a general rule do not support the policy.

- There is a lack of recognition in Government Departments and the community that limestone quarries only exist to supply materials for the community.

- There is also a lack of recognition that limestone areas can and could be rehabilitated back to provide habitat for threatened species and communities. For example food resources and roosting sites could be planted for Carnaby's Cockatoo. *Lomandra* spp could be included in rehabilitation for the Graceful Sunmoth, and undertaking such actions should be seen as part of the offsets.

- It is my understanding that National Parks, reserves and Bush Forever are all to provide retention and protection of representative vegetation. In other words they are to be the offsets in the community and should be used by the State Government for that purpose. From what I see, the vegetation is locked up in the Conservation Estate and then additional offsets are required. This is the ideal situation, but with respect to limestone may not be possible, if the limestone is to be available for future community use.

- From a biodiversity point of view the best ground for limestone extraction is the market gardens and rural living areas east of Wanneroo Road, south of the Yanchep National Park extending south east to the urban front. Much of this land outside the market gardens is not highly productive and used as rural living. However to change this would be politically unpalatable from a Local and State Government point of view.

- The Yanchep National Park extensions contain large resources of high grade limestone, a percentage of which is under Mining tenement. The Management Plan for the Yanchep National Park is administered by the Department of Environment and Conservation.

  The management plan notes that limestone reserves are to be considered for use, however officers of the DEC will make the decision on whether a Mining Lease is granted or excavation can proceed. These officers have conservation as the primary consideration and it will only be through their goodwill that excavation can proceed.

  There needs to be a balance at the State level to ensure that the competing interests are met. In other words a panel from WAPC, DEC and DMP need to make determinations in such situations. There also needs to be a right of appeal independent of the environment portfolio.

What Should be Done?

- The Priority Resource Areas must be preserved for the community use of those resources such as limestone.

- The State must ensure that there is sufficient basic raw materials including limestone for the community needs.

- It must be recognised that preventing limestone extraction does not stop environmental impact or clearing. It just transfers the issue somewhere else such as the Darling Scarp where the issues are even greater.

- For quarries the decision to clear vegetation should be decided by a panel of persons representing the key stakeholders, Planning, Mines and Petroleum and Conservation, to ensure that a balanced decision is made. **Decisions of State importance such as the determination of Clearing Permits for quarries should not be left to the officers of one Government Department.**

- Currently when determining Clearing Permits, the other issues such as Planning Instruments, which must be taken into account in the determination of Clearing Permits, are often only given inadequate weighting particularly as the ultimate decision is left to officers of the DEC who have little understanding of the whole range of issues and have a Departmental Brief to protect biodiversity as should be their role. Unfortunately though, balanced decisions are not always made because the same officers are also often restricted by policies.

- An appeal process, in which joint approval by say the Ministers for the Environment, Planning and Mines, is recommended. The same should occur at the Commonwealth level.

Without urgent action at a State level there will be no more limestone for construction and road making and hard rock products from the Darling Scarp with the associated increased environmental and bodiversity impacts.

Lindsay Stephens
Landform Research

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Some leases were pegged in the Yanchep National Park extension prior to its nomination.
These remain unserolved.

Quarries occupy a relatively small area.
They are essential and provide the sand and limestone for the large urban developments.
Quarries are given a very hard time in the approval and clearing processes.
At the end of quarrying the land is to be used for industrial land.

The limestone resources in the local area are high grade limestone used for local and regional construction materials.
The resources are listed as Priority Limestone Resources and combined with the red area are the only 'remaining high grade limestone available.

Retain this area as Rural for a long term limestone resource to maintain a potential for future land aquisition or consolidation of lots, without sterilisation.

The area outlined in red is the high grade limestone listed as a Priority Resource for many years with industrial end use, and more recently overlain by conflicting conservation and planning policies.
Retain for short to medium and long term use.

STATE FOREST
PINE PLANTATION

Two Rocks

Yanchep National Park

Yanchep Beach

Eglington

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Much of these areas are sterilised by small rural living lots and relatively large numbers of dwellings

The area outlined in black is rural living, market gardens and some limestone quarries. This area is proposed to be converted to rural living by the East of Wanneroo structure Plan which proposes the market gardens to move to the Priority limestone areas outlined in red, the only limestone remaining.

Alkimos

Jindalee

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Much of these areas are sterilised by small rural living lots and relatively large numbers of dwellings

Quinns Rocks

Quarries occupy a relatively small area.
They are essential and provide the sand and limestone for the large urban developments.
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At the end of quarrying the land is to be used for industrial land.

Mindarie

Burns Beach

PERTH NORTHERN SUBURBS - URBAN LAND
LIMESTONE SUITABLE FOR CONSTRUCTION MATERIALS

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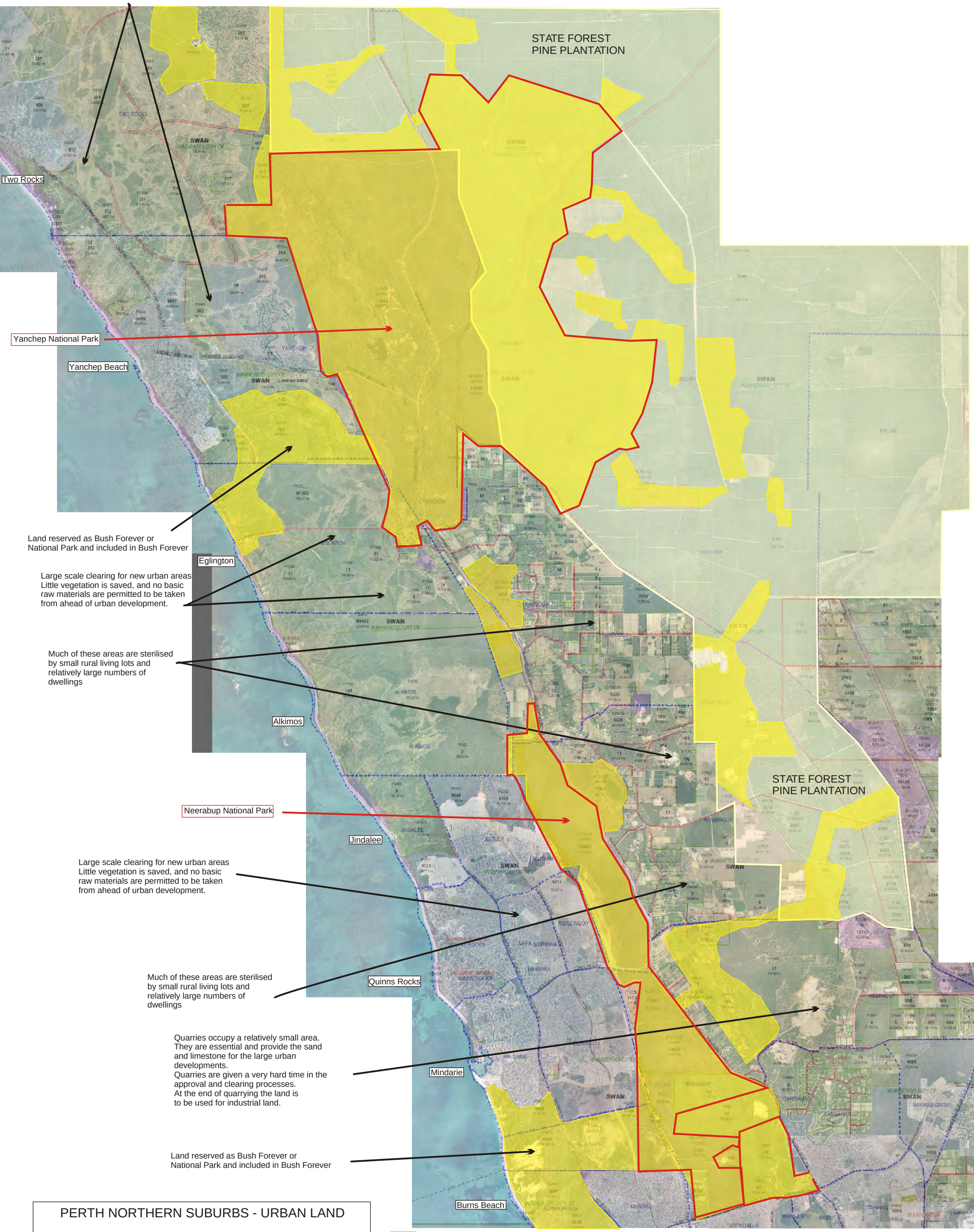
Tamala Limestone (DOIR 1 : 250 000 Geological Mapping)

Figure 3

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.



PERTH NORTHERN SUBURBS - URBAN LAND

BUSH FOREVER - STATE FOREST

Land reserved as Bush Forever or National Park and included in Bush Forever

State Forest

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

Figure 7

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Some leases were pegged in the Yanchep National Park extension prior to its nomination.
These remain unresolved.

Quarries occupy a relatively small area.
They are essential and provide the sand and limestone for the large urban developments.
Quarries are given a very hard time in the approval and clearing processes.
At the end of quarrying the land is to be used for industrial land.

The limestone resources in the local area are high grade limestone used for local and regional construction materials.
The resources are listed as Priority Limestone Resources and combined with the red area are the only 'remaining high grade limestone available.

Retain this area as Rural for a long term limestone resource to maintain a potential for future land aquisition or consolidation of lots, without sterilisation.

The area outlined in red is the high grade limestone listed as a Priority Resource for many years with industrial end use, and more recently overlain by conflicting conservation and planning policies.
Retain for short to medium and long term use.

STATE FOREST
PINE PLANTATION

Two Rocks

Yanchep National Park

Yanchep Beach

STATE FOREST
PINE PLANTATION

Land reserved as Bush Forever or National Park and included in Bush Forever

Eglington

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Much of these areas are sterilised by small rural living lots and relatively large numbers of dwellings

Alkimos

The area outlined in black is rural living, market gardens and some limestone quarries. This western portion of the area is proposed to be converted to rural living by the East of Wanneroo structure Plan which proposes the market gardens to move to the Priority limestone areas outlined in red, the only limestone remaining.

STATE FOREST
PINE PLANTATION

STATE FOREST
PINE PLANTATION

Jindalee

Large scale clearing for new urban areas
Little vegetation is saved, and no basic raw materials are permitted to be taken from ahead of urban development.

Land held by Adelaide Brighton

Much of these areas are sterilised by small rural living lots and relatively large numbers of dwellings

Quinns Rocks

Quarries occupy a relatively small area.
They are essential and provide the sand and limestone for the large urban developments.
Quarries are given a very hard time in the approval and clearing processes.
At the end of quarrying the land is to be used for industrial land.

Mindarie

Land reserved as Bush Forever or National Park and included in Bush Forever

Burns Beach

PERTH NORTHERN SUBURBS - URBAN LAND
LIMESTONE SUITABLE FOR CONSTRUCTION MATERIALS
BUSH FOREVER - STATE FOREST

Land reserved as Bush Forever or National Park and included in Bush Forever

State Forest

Tamala Limestone (DMP 1 : 250 000 Geological Mapping)

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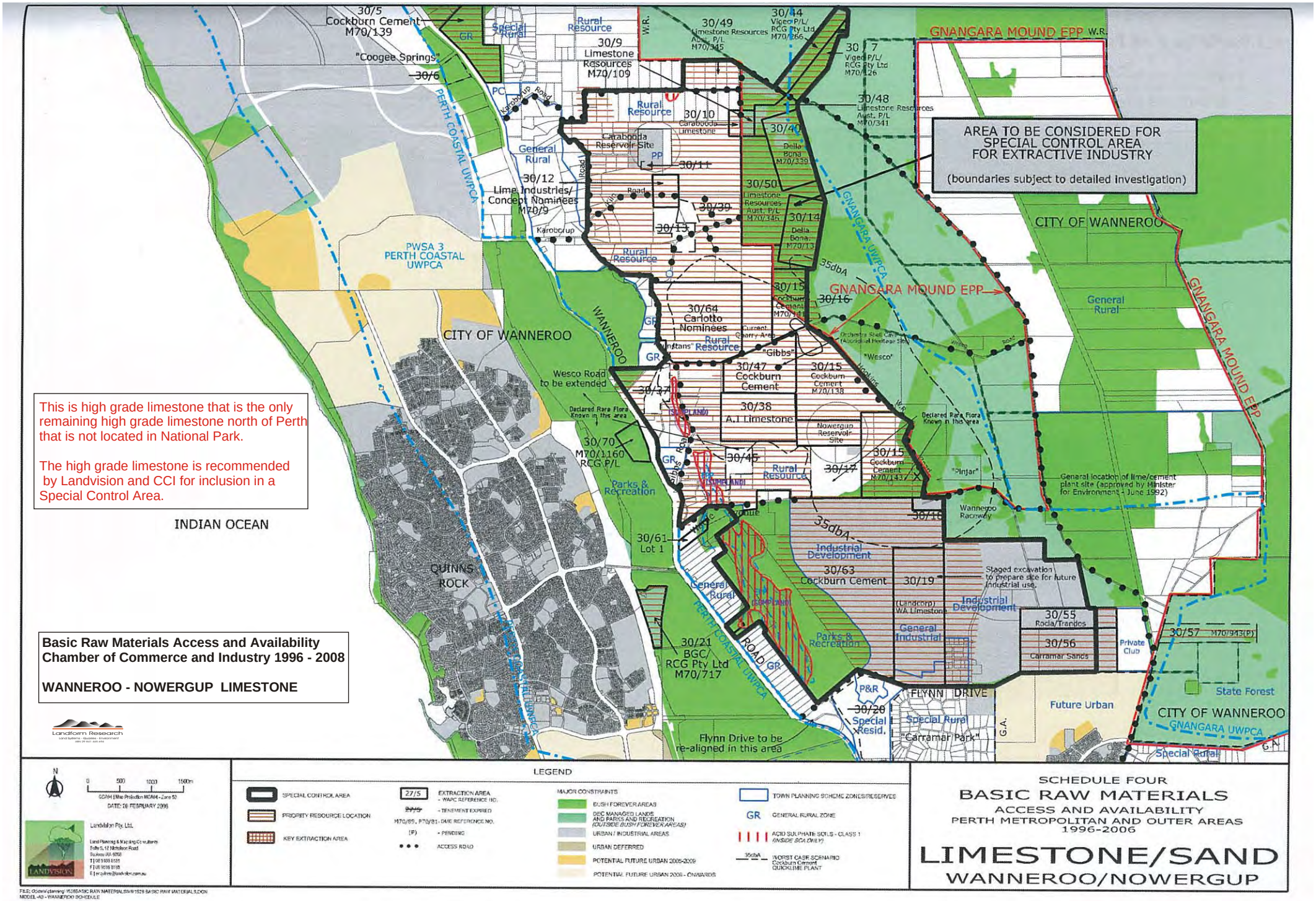
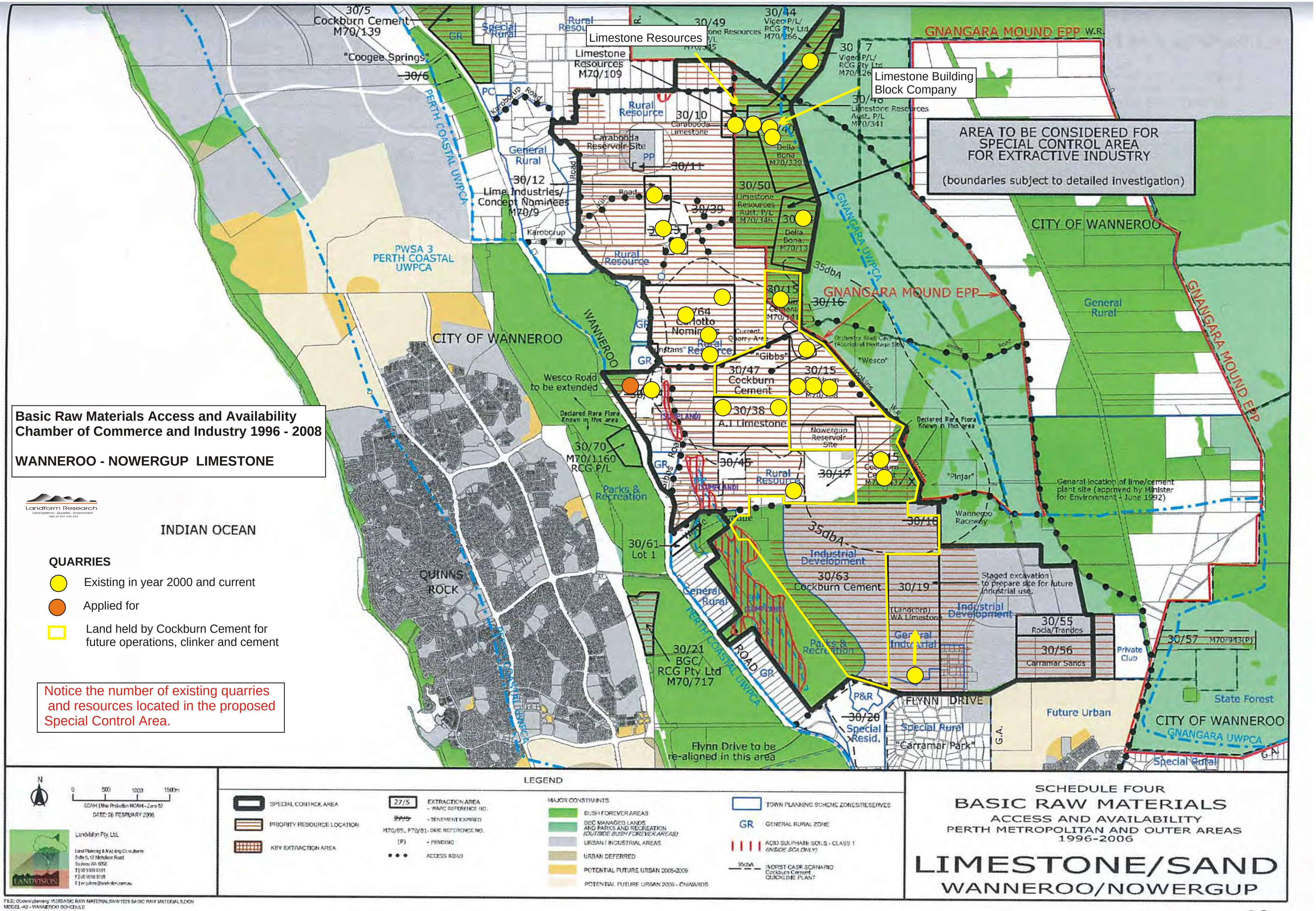
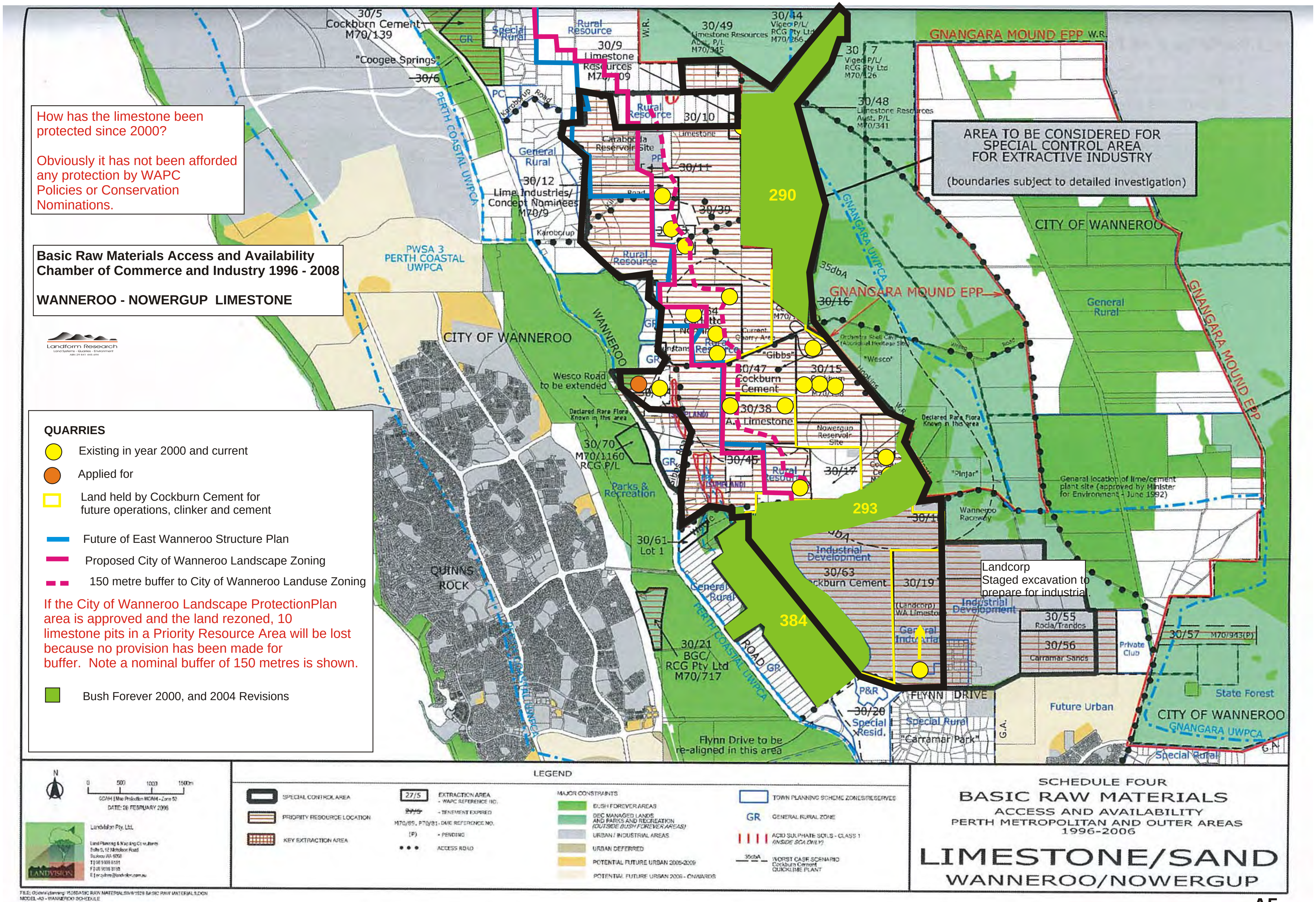
Figure 6


This is high grade limestone that is the only remaining high grade limestone north of Perth that is not located in National Park.
The high grade limestone is recommended by Landvision and CCI for inclusion in a Special Control Area.
INDIAN OCEAN
Basic Raw Materials Access and Availability
Chamber of Commerce and Industry 1996 - 2008
WANNEROO - NOWERGUP LIMESTONE
AREA TO BE CONSIDERED FOR SPECIAL CONTROL AREA FOR EXTRACTIVE INDUSTRY
(boundaries subject to detailed investigation)
CITY OF WANNEROO
GNANGARA MOUND EPP
PWSA 3 PERTH COASTAL UWPCA
GNANGARA UWPCA
WANNEROO
QUINNS ROCK
Wesco Road to be extended
Flynn Drive to be re-aligned in this area
Wanneroo Raceway
Carabooda Reservoir Site
Nowergup Reservoir Site
30/5 Cockburn Cement M70/139
30/6
30/9 Limestone Resources M70/109
30/10 Carabooda Limestone
30/11
30/12 Lime Industries/ Concept Nominees M70/9
30/13
30/14 Della Bona M70/13
30/15 Cockburn Cement M70/138
30/16
30/17
30/18
30/19
30/20 Special Residential "Carramar Park"
30/21 BGC/ RCG Pty Ltd M70/717
30/37
30/38 A.I Limestone
30/39
30/40 Della Bona M70/339
30/44 Vigeo P/L/ RCG Pty Ltd M70/266
30/45
30/47 Cockburn Cement
30/48 Limestone Resources Aust. P/L M70/341
30/49 Limestone Resources Aust. P/L M70/345
30/50 Limestone Resources Aust. P/L M70/345
30/55 Rocla/Trendos
30/56 Carramar Sands
30/57 M70/943(P)
30/61 Lot 1
30/63 Cockburn Cement
30/64 Carlotto Nominees
30/70 M70/1160 RCG P/L
Rural Resource
General Rural
General Industrial
Industrial Development
Parks & Recreation
Special Rural
Future Urban
State Forest
Private Club
P&R
FLYNN DRIVE
Staged excavation to prepare site for future industrial use.
General location of lime/cement plant site (approved by Minister for Environment - June 1992)
Declared Rare Flora Known in this area
35dbA
LEGEND
SPECIAL CONTROL AREA
PRIORITY RESOURCE LOCATION
KEY EXTRACTION AREA
EXTRACTION AREA - WAPC REFERENCE NO.
- TENEMENT EXPIRED
M70/85, P70/81 - DME REFERENCE NO.
(P) - PENDING
ACCESS ROAD
MAJOR CONSTRAINTS
BUSH FOREVER AREAS
DEC MANAGED LANDS AND PARKS AND RECREATION (OUTSIDE BUSH FOREVER AREAS)
URBAN / INDUSTRIAL AREAS
URBAN DEFERRED
POTENTIAL FUTURE URBAN 2005-2009
POTENTIAL FUTURE URBAN 2006 - ONWARDS
TOWN PLANNING SCHEME ZONES/RESERVES
GR GENERAL RURAL ZONE
ACID SULPHATE SOILS - CLASS 1 (INSIDE SCA ONLY)
35dbA WORST CASE SCENARIO Cockburn Cement QUICKLIME PLANT
SCHEDULE FOUR
BASIC RAW MATERIALS
ACCESS AND AVAILABILITY
PERTH METROPOLITAN AND OUTER AREAS
1996-2006
LIMESTONE/SAND
WANNEROO/NOWERGUP
Landform Research
Landvision Pty. Ltd.


Basic Raw Materials Access and Availability
Chamber of Commerce and Industry 1996 - 2008
WANNEROO - NOWERGUP LIMESTONE
Landform Research
INDIAN OCEAN
QUARRIES
Existing in year 2000 and current
Applied for
Land held by Cockburn Cement for future operations, clinker and cement
Notice the number of existing quarries and resources located in the proposed Special Control Area.
Limestone Resources
Limestone Building Block Company
AREA TO BE CONSIDERED FOR SPECIAL CONTROL AREA FOR EXTRACTIVE INDUSTRY
(boundaries subject to detailed investigation)
GNANGARA MOUND EPP
CITY OF WANNEROO
30/5 Cockburn Cement M70/139
"Coogee Springs"
PERTH COASTAL UWPCA
PWSA 3 PERTH COASTAL UWPCA
GNANGARA UWPCA
30/12 Lime Industries/ Concept Nominees M70/9
30/10
30/11
30/50 Limestone Resources Aust. P/L M70/346
30/47 Cockburn Cement
30/38 A.J Limestone
30/70 M70/1160 RCG P/L
30/61 Lot 1
30/63 Cockburn Cement
30/19
30/55 Rocla/Trandos
30/56 Carramar Sands
30/57
30/21 BGC/ RCG Pty Ltd M70/717
Wesco Road to be extended
QUINNS ROCK
General Rural
Rural Resource
Parks & Recreation
Industrial Development
Future Urban
State Forest
Private Club
FLYNN DRIVE
Flynn Drive to be re-aligned in this area
"Carramar Park"
Staged excavation to prepare site for future industrial use.
General location of lime/cement plant site (approved by Minister for Environment - June 1992)
Declared Rare Flora Known in this area
Nowergup Reservoir Site
Carabooda Reservoir Site
Wanneroo Raceway
35dbA
LEGEND
SPECIAL CONTROL AREA
PRIORITY RESOURCE LOCATION
KEY EXTRACTION AREA
EXTRACTION AREA - WAPC REFERENCE NO.
TENEMENT EXPIRED
DME REFERENCE NO.
PENDING
ACCESS ROAD
MAJOR CONSTRAINTS
BUSH FOREVER AREAS
DEC MANAGED LANDS AND PARKS AND RECREATION (OUTSIDE BUSH FOREVER AREAS)
URBAN / INDUSTRIAL AREAS
URBAN DEFERRED
POTENTIAL FUTURE URBAN 2005-2009
POTENTIAL FUTURE URBAN 2009 - ONWARDS
TOWN PLANNING SCHEME ZONES/RESERVES
GENERAL RURAL ZONE
ACID SULPHATE SOILS - CLASS 1 (INSIDE SCA ONLY)
WORST CASE SCENARIO Cockburn Cement QUICKLIME PLANT
DATE: 20 FEBRUARY 2006
Landvision Pty. Ltd.
SCHEDULE FOUR
BASIC RAW MATERIALS
ACCESS AND AVAILABILITY
PERTH METROPOLITAN AND OUTER AREAS
1996-2006
LIMESTONE/SAND
WANNEROO/NOWERGUP


How has the limestone been protected since 2000?
Obviously it has not been afforded any protection by WAPC Policies or Conservation Nominations.
Basic Raw Materials Access and Availability Chamber of Commerce and Industry 1996 - 2008
WANNEROO - NOWERGUP LIMESTONE
Landform Research
QUARRIES
Existing in year 2000 and current
Applied for
Land held by Cockburn Cement for future operations, clinker and cement
Future of East Wanneroo Structure Plan
Proposed City of Wanneroo Landscape Zoning
150 metre buffer to City of Wanneroo Landuse Zoning
If the City of Wanneroo Landscape ProtectionPlan area is approved and the land rezoned, 10 limestone pits in a Priority Resource Area will be lost because no provision has been made for buffer. Note a nominal buffer of 150 metres is shown.
Bush Forever 2000, and 2004 Revisions
AREA TO BE CONSIDERED FOR SPECIAL CONTROL AREA FOR EXTRACTIVE INDUSTRY
(boundaries subject to detailed investigation)
Landcorp Staged excavation to prepare for industrial.
290
293
384
GNANGARA MOUND EPP
CITY OF WANNEROO
PWSA 3 PERTH COASTAL UWPCA
PERTH COASTAL UWPCA
GNANGARA UWPCA
QUINNS ROCK
Wesco Road to be extended
Flynn Drive to be re-aligned in this area
FLYNN DRIVE
Future Urban
State Forest
30/5 Cockburn Cement M70/139
"Coogee Springs"
30/9 Limestone Resources M70/109
30/49 Limestone Resources
30/44
30/10
30/12 Lime Industries/ Concept Nominees M70/9
30/47 Cockburn Cement
30/38 A. Limestone
30/15
30/70 M70/1160 RCG P/L
30/61 Lot 1
30/63 Cockburn Cement
30/19
30/21 BGC/ RCG Pty Ltd M70/717
30/55 Rocla/Trandos
30/56 Carramar Sands
30/57
30/20 Special Resid.
Industrial Development
General Rural
Rural Resource
Parks & Recreation
Special Rural
Private Club
"Carramar Park"
LEGEND
SPECIAL CONTROL AREA
PRIORITY RESOURCE LOCATION
KEY EXTRACTION AREA
EXTRACTION AREA
MAJOR CONSTRAINTS
BUSH FOREVER AREAS
URBAN / INDUSTRIAL AREAS
URBAN DEFERRED
TOWN PLANNING SCHEME ZONES/RESERVES
GENERAL RURAL ZONE
ACCESS ROAD
SCHEDULE FOUR
BASIC RAW MATERIALS
ACCESS AND AVAILABILITY
PERTH METROPOLITAN AND OUTER AREAS
1996-2006
LIMESTONE/SAND
WANNEROO/NOWERGUP

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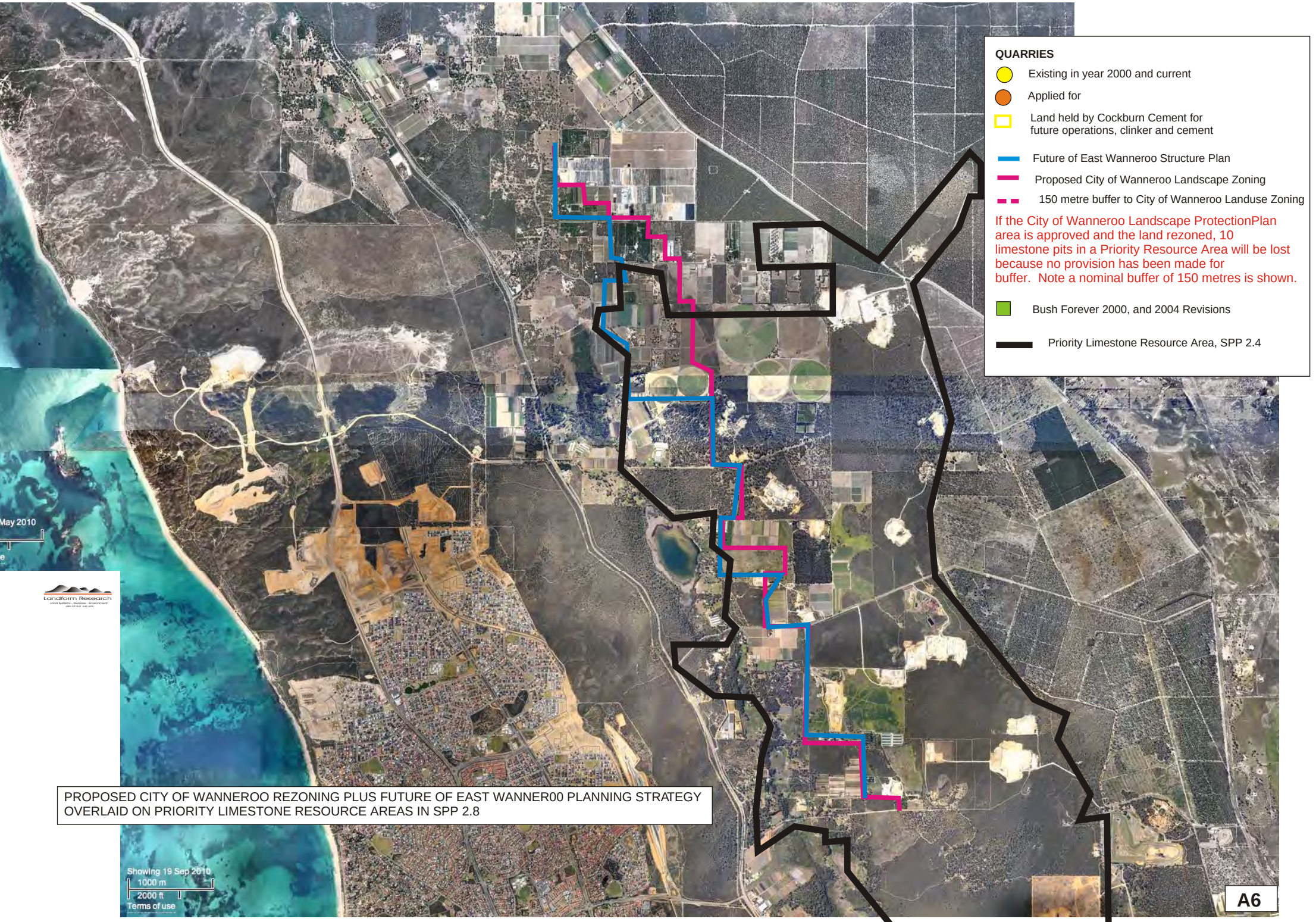
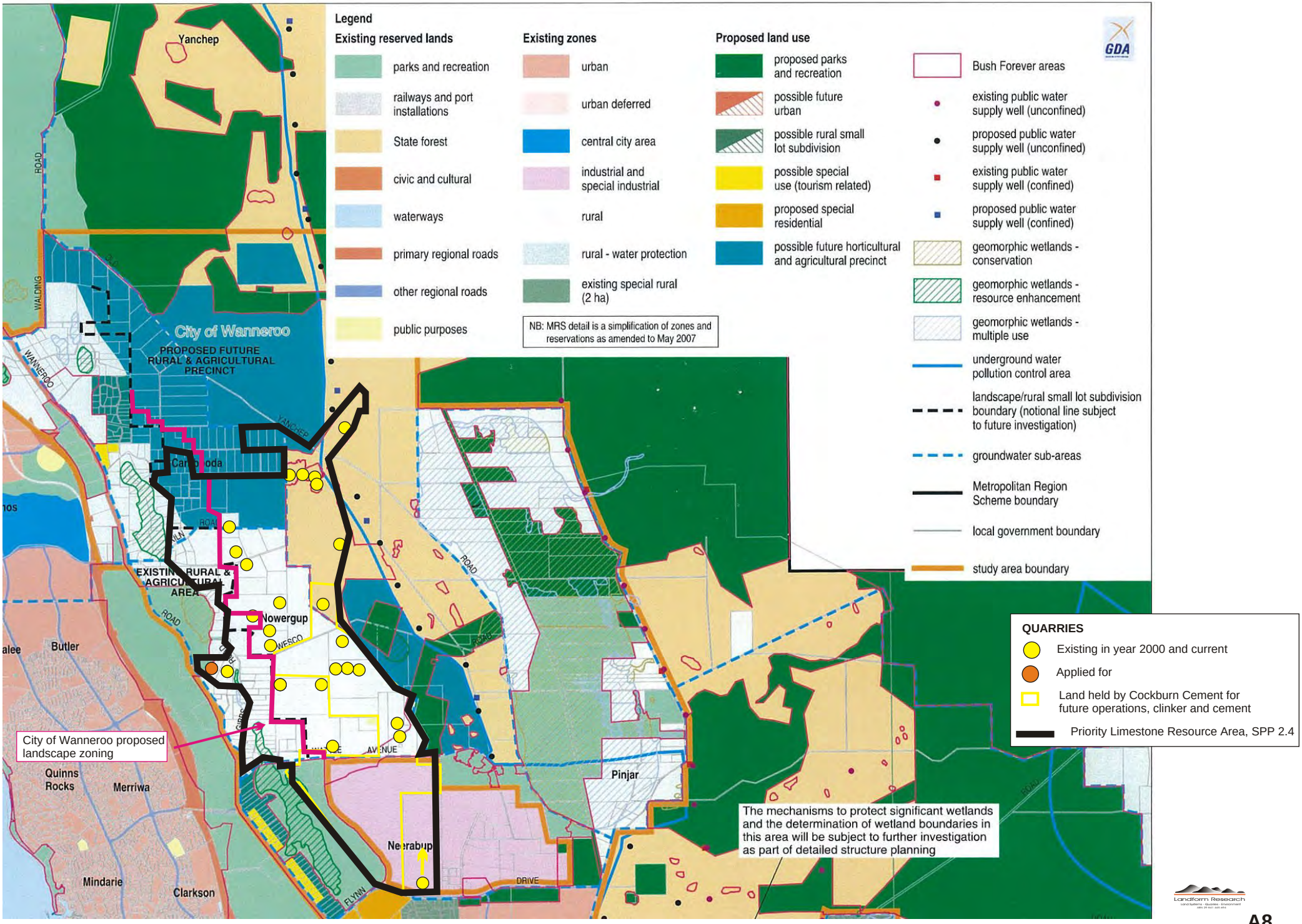


PROPOSED CITY OF WANNEROO REZONING PLUS FUTURE OF EAST WANNER00 PLANNING STRATEGY OVERLAID ON PRIORITY LIMESTONE RESOURCE AREAS IN SPP 2.8



PROPOSED CITY OF WANNEROO REZONING FOR LANDSCAPE AND EXISTING QUARRIES OVERLAID ON FUTURE OF EAST WANNER00 PLANNING STRATEGY

Landform Research

Appendix 6

SEQUENTIAL PLANNING

State Planning Policy 2.4 – Basic Raw Materials (SPP2.4) identifies the site as a 'Priority Resource' area. SPP2.4 states that Priority areas are *"the locations of regionally significant resources which should be recognised for future basic raw materials extraction and not be constrained by incompatible uses or development."*

Accordingly the site lies in an important area of limestone resources that is strategic to the development of the Perth Metropolitan Area, and specifically the rapidly expanding north western corridor. The protection of the resource should be a key requirement for the planning for the area. Given this, the City is obligated to support extractive industry applications unless it can be demonstrated that the application will have an impact to the environment or amenity. The management and operation measures including in this Management Plan will ensure that the quarrying operations complies with SPP2.4 and Council's Scheme.

State Planning Policy 2.4 – Basic Raw Materials requires that development applications for extractive industries include *"the ability to rehabilitate the land to a form or for a use which is compatible with the long-term planning for the site and surrounding area."*

The extraction of limestone is seen as an interim use of the land prior to utilisation of the area by the current land holder as a future rural residential and conservation subdivision.

The Future of East Wanneroo report, released in 2007, notes that subject to further investigations, the area adjacent to Wanneroo Road may be suitable for rural small lot subdivision. This report does not address any of the other potential constraints that might otherwise restrict rural small lot subdivision from occurring.

We note that the City has not commenced any specific discussions with WA Limestone or any other landowners regarding the detailed future planning for this area. We do note however that the City has initiated a Scheme Amendment that seeks to enable future subdivision and restrict the development of extractive industries. Accordingly we have taken the view that the City of Wanneroo maintain the preference for rural small lot subdivision or similar end use as suggested by the "Future of East Wanneroo Structure Plan".

The City's District Planning Scheme No.2 (DPS 2) currently zones the subject site as 'Rural Resource' zone. The objectives of the Rural Resource Zone are to:

"a) Protect from incompatible land uses or subdivision, intensive agriculture, horticulture and animal husbandry areas with the best prospects for continued or expanded use:

b) Protect from incompatible land uses or subdivision basic raw materials priority areas and basic raw materials key extraction areas."

3.17.2 (f) of DPS 2 includes a requirement for a restoration plan to accommodate future land uses.

> *"(f) There is a presumption in favour of applications for the extraction of basic raw materials in the basic raw materials resource areas identified in the Local Rural Strategy subject to the management of offsite impacts and an approved land restoration plan to a standard suitable for intended subsequent long term land uses."*

The City have not, in the past supported subdivision within the Rural area for rural living subdivisions. Accordingly the subdivision of Lot 1 could not occur without a change to the zoning of the site.

A poultry farm lies 400 metres to the north east across Nowergup Road. The adjoining property is used for lime manufacture. It is important to note that the intended long term use of the site will be dependant on the relocation of this nearby poultry farm and the ceasing of operations on the adjoining property. Given this, there is likely to be a considerable period between when the site could be used for another purpose or subdivided. Therefore the proposed operation period of 10-20 years is consistent with the likely operating period of the constraints to rural-residential development.

As stated previously, the landowner's long term intention for the site, after the completion of the extraction of the resource, is for it to be rezoned and subdivided to allow for rural living development. Given the above, this appears to be in accordance with the intent of the City.

As the land requires rezoning, with a subsequent subdivision application to follow, both which requires the approval of the Western Australian Planning Commission, it is only appropriate to prepare an indicative plan that demonstrates how the future subdivision might occur.

The indicative subdivision layout includes the creation of 6 lots.

This subdivision will be accessed via a cul-de-sac from Nowergup Road. An emergency fire escape, to Wanneroo Road, should also be included. Three of the lots have dual road frontage, but will access be from the nearly constructed cul-de-sac.

To facilitate the future subdivision of the property the final contour plan includes:

1. The avoidance of the portions of the site that might contain karst
2. Revised batters and base of quarry
3. Level building envelope areas (2,000m2)

The batter grades have been re-worked from the original application to limit the flat area at the base to only include the road and drainage basin. This will also minimise grades

throughout the remainder of the extraction area. Whilst there will be small areas that include some very steep grades this is in keeping with the surrounding area.

The staging plans allow for the retention of the quarry floor, which would accommodate stockpiling and the batching operations, as well as the ongoing re-contouring of the southern portions of the site.

A further reduction in batter grades could be achieved in some portions of the site by re-contouring between the excavation area and the property boundaries. The applicant is not proposing to do this at this point, but this option could be addressed as part of the ongoing reviews of the Management Plan.

SUMMARY

Given all this we are of the view that the proposed extraction is in accordance with the intent and requirements of both State Planning Policy 2.4 and the City's District Planning Scheme No.2, in that the proposal seeks to utilise the much needed resource found on the site but also allows for the future development for other uses.

The final outcome of the Future of East Wanneroo is not certain, with further planning studies required to determine the ultimate forms of development. The existing constraints and the need to preserve and use the limestone resource are likely to limit the extent of rural living development for the surrounding area and specifically on the subject site, particularly in the short to medium term.

However, the modified proposed final contours will allow for the future subdivision of the site when the other constraints have been resolved.