Excavation and Rehabilitation Management Plan

Lot 1002
Preston Beach Road North
Preston Beach

DOYLES LIME SERVICE

May 2016

Excavation and Rehabilitation Management Plan, Doyles Lime Service, Proposed Preston Beach Pit

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SUMMARY

Doyles Lime Service proposes to open a limestone quarry on 13 hectares of a limestone ridge on Lot 1002, Preston Beach North Road, Preston Beach.

The limestone on Lots 1001 and 1002 is highly suitable for lime for agriculture and neutralisation of acidity.

A proposal to extract limestone and sand from two small parts of Lot 1002 was prepared in May 2013 and submitted to the Shire of Waroona.

An application was made for a limestone resource on Lot 1001 but that was determined by the Minister for the Environment and then the Environmental Protection Authority to have some potential issues relating to groundwater and the proximity to Lake Pollard. Groundwater flow from that resource flowed towards Lake Pollard.

The proposed pit near lake Pollard has been removed and an amended limestone extraction area proposed.

The changes in the proposal are summarised below

1. A new limestone pit south west from Lake Pollard is now proposed with a disturbance footprint of 13.0 hectares in four stages.

2. The proposed pit lies 600 metres south west from Lake Pollard compared to 200 metres west.

3. Groundwater flow flows east to the south of Lake Pollard rather than directly to Lake Pollard.

4. Groundwater flows to a vegetated area to the south of Lake Pollard and between Lake Pollard and Martin's Tank Lake and not to a lake or open body of water. The groundwater flows more than 1 km before it intersects the areas between Lake Pollard and Martin's Tank Lake.

5. The limestone resource is lower in the landscape at a maximum of around 15 metres AHD compared to 30 metres AHD.

6. The limestone resource lies west of the main 30 metre limestone ridge that now separates the excavation from the Lake Pollard – Martin's Lake chain.

7. The vegetation on the new limestone excvavation area is regrowth vegetation with densely scattered *Xanthorrhoea preissii* or smaller scattered regrowth young Tuart trees.

8. The sand resource area is unchanged but enlarged slightly to 3.0 hectares.

9. The proposed extraction is now 600 from the Lake Pollard walk Trail and 500 metres from the lookout. (increased from 75 metres). The walk trail now lies on the other side of a large limestone ridge to 30 metres AHD.

10. The main limestone ridge will now remain intact and not be excavated.

A limestone and sand resource lie on part of Lot 1002, Preston Beach North Road, Preston Beach.

The resource has been identified by the Geological Survey of Western Australia as a Regionally Significant Basic Raw Material – Limestone.

The material is of high grade and is suitable for the supply of agricultural lime and road bases.

This proposal seeks Development Approval and an Extractive Industries Licence for the extraction of material from 13 hectares of Lot 1002, which represents a very small proportion of Lots 1001 and 1002.

The limestone will be used to prevent soil acidification, which is a well recognised major environmental issue, highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand and Tamala Coastal Limestone.

The proposal seeks to provide a continued resource of strategically located limestone, suited to a variety of end products. The majority of the lime from this pit will be used in the agricultural industry with lime being transported as far as Hyden in the east through Brookton - Wagin and Collie in the south. The northern limit of the limestone supply is north of Perth where the northern supplies of limesand have a transport cost advantage.

A small sand resource is proposed to be excavated to provide fill sand for local projects such as Preston Beach.

The quarry is proposed to provide additional limestone materials for a stable long term supply of limestone products in the Mandurah - Bunbury and Peel Regions. It will help keep the prices of local limestone products at the lowest possible levels, by maintaining small transport distances and competition. This benefits the whole community. It will also comply with State Planning Policy No 2.5 which requires that basic raw materials should be taken prior to sterilisation of the area by development.

The resource has been identified by the Geological Survey of Western Australia as a Regionally Significant Basic Raw Material – Limestone. Figure 1.

The Western Australian Planning Commission in *WAPC 2012, Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*, determined that limestone is in short supply and that all the limestone available including that in the Lake Pollard area was just sufficient to satisfy the grow the demands of the region for the next 30 years. The demand for the next 30 years was listed in Table 7 of WAPC 2012 as requiring 30 359 000 m^3 of limestone within the next 30 years. Lime for agriculture was assessed as being 21 891 000 tonnes.

The Geological Survey estimated that the total limestone available, if all resources are taken is 35 460 000 m^3 (WAPC 2012).

The resource on lots 1001 and 1002 is included as the southern portion of Resource 61 in (WAPC 2012 Map 6). This resource is listed as having a total area of 126 hectares with a nominal thickness of 11 metres and a total nominal volume of 13 860 000 m^3, with a recovery factor of 5 540 000 m^3. That represents 15.6% of the total limestone resources available to the growth and agriculture in the south west of Western Australia.

The extraction of limestone from this location is therefore very important to the State. Of the total volume of limestone in Resource 61 the proposed excavation represents only around 800 000 m^3.

The *Environmental Protection Authority, 2015, Perth and Peel @3.5 million, Environmental Risks and remedies; - Interim strategic advice of the Environmental Pr4otection Authority to the Minister for Environment under section 16(e) of the Environmental Protection Act 1986* recognises that Basic Raw Materials are essential to the future of Perth – Peel. - under *Class of action: Basic raw material extraction.*

The use of the limestone for the correction of agricultural soil acidity and the continued cropping of legumes and the use of nitrogenous fertilisers is also essential and recognised by the EPA for example in the State of Environment Reports.

The proposed limestone extraction is proposed to be used for agricultural lime as it is of sufficiently high grade. This is particularly significant because the State has recently acquired all the limestone resource to the north as part of the conservation estate and thereby sterilising almost all the "Regionally Significant Limestone Resource" identified by the Geological Survey of Western Australia. Limestone in the Myalup pine plantations is small discontinuous and of generally low grade, making it unsuitable for use in agriculture.

See Appendix 7. Notice how the use of this resource on Lot 1002 is capable of reducing truck travel distances and greenhouse gas emissions. All other limestone south of Perth has been sterilised by Government Policy and Conservation.

The use of the resource can be completed with minimal and manageable impacts on the environmental values of the areas=.

Rehabilitation is planned to progressively follow excavation to minimise the amount of land open at any time.

Excavation will take place on the floor of the quarry and will lower the hill to form a gentle rise at an elevation of around 6.0 metres AHD

The planned end use of the site is to restore a natural soil and return the ridge to native vegetation along the buffer to the access road along the eastern boundary of Lot 1002, with pasture in the west, so there is no net loss of native vegetation and the buffer to Lake Pollard will be enhanced. Lake Pollard and the surrounding vegetation are included as part of the Yalgorup National Park. Setback to Lake Pollard edge is 600 metres.

50 000 tonnes of limestone could be extracted in one year, but when the number of contracts is less, smaller amounts of material can be expected to be taken. Actual quantities will depend on the type and size of contracts won, and it is possible that when supplying large contracts tonnages in excess of these figures will be removed from the site.

Perimeter fences and locked gates will be maintained by the landholder and quarry operator.

The quarry is not visible from any road and, with the landform and trees between the quarry and public areas, is not expected to be visible.

The excavation footprint has been determined from Landgate contour mapping and detailed aerial photography. Prior to excavation commencing the site will be ground surveyed, the excavation footprint marked out and a 1 mete contour plan developed.

Whilst there will be some clearing of vegetation, that vegetation is Degraded to Completely Degraded and this needs to be balanced against the community need for limestone.

Without this limestone deposit being developed, the State will not have sufficient limestone for its needs for the next 30 years which is a significant impediment to the State which has large limestone reserves sterilised by dwellings and Conservation.

A 20 year Planning Consent and Extractive Industries Licence is requested.

The Excavation and Rehabilitation Management Plan addresses;

- Groundwater quality and quantity protection;
- Land surface stabilisation and interim rehabilitation, including erosion mitigation and topsoil management
- Waste management
- Dust management
- Dieback management
- Contours and final ground surface levels;
- Fire management;
- Site security
- Provision of high grade agricultural lime and the protection of soil acidification.

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. 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.

Overall the proposed pit is well isolated from any sensitive premises, with none within 1 km.

Project Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Area of proposed new excavation	Proposed Pit – 13.0 hectares in four stages of around 3.0 hectares
Limestone extraction	50 000 tonnes per year
Sand Extraction	10 000 tonnes per year
Total estimated resource	Limestone - approximately 500 000 tonnes Sand 150 000 tonnes but with potential to expand
Life of project	20 years
Area cleared per year	Initially about 2 hectares and then 0.5 – 1.0 per year depending on the elevation of the ridge. Sand excavation can occur for the most part without the need to clear native vegetation.
Total area to be cleared	13 hectares in four stages.
Area mined per year	0.5 – 1.0 hectares total
Dewatering requirements	None
Maximum depth of excavations	16 metres
PROCESSING	
Limestone	50 000 tonnes per year
Water requirements	Only required for dust suppression on road transport.
Water supply source	Existing sump for which application will be made to use 5 000 kL per year for commercial purposes.
INFRASTRUCTURE	
Total area of plant and stock	Located within excavation footprint or on adjoining cleared land. 2.0 ha
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	
Truck movements	Variable but approximately 10 laden trucks per day maximum
Access	Existing limestone Preston Beach North Road from the sealed Preston Beach Road.
WORKFORCE	
Construction	2 –3
Operation	2 - 3
Hours of operation	Monday - Friday 6.30 am to 5.00 pm excluding public holidays.

An Environmental Risk Assessment has been completed and follows.

Environmental Factor	EPA Objective	Identified Issues and Commitments	Proposed Management	References	Residual Environmental Risk
LAND					
Flora and Vegetation	To maintain representation, diversity, viability and ecological function at the species, population and community level.	Vegetation communities and/or biodiversity may be significantly impacted by clearing, and degradation by weeds and dieback.	The area of the proposed limestone pit has been restricted to 13.0 hectares excavated in stages not exceeding 3.0 hectares. The proposed sand pit has a potential area of 3.0 hectares. These extraction areas have been selected as being the most disturbed land available on Lots 1002 away from Lake Pollard. Weston 2014 and the current assessment of flora found the vegetation units in the survey area to be too degraded, floristically, and too reduced in numbers of species to be confidently assigned by meaningful analysis to a floristic community type (SWAFCT).	Flora and Vegetation Report included in Appendix 1 attached. Management Plan Sections 2.5 Flora and 5.6.1 Vegetation and Flora. Figures 3, and 4.	Low
		Threatened Communities may be impacted by inadvertent impacts.	Weston 2014 did not find any Threatened Ecological Communities on either excavation area of Lot 1001 or Lot 1002. Weston 2014 found the vegetation too degraded to ascribe definitive SWAFCT community names.	Flora and Vegetation Report included in Appendix 1.	Very Low
		Priority species may be affected by clearing, disturbance, weeds	Weston 2014 did not find any Priority species on either excavation area of Lot 1001 or Lot 1002.	Flora and Vegetation Report included in Appendix 1.	Very Low
		Threatened Species may be impacted by inadvertent impacts.	No Threatened species were recorded by Weston 2014.	Appendix 1 of the Management Plan.	Very Low
		The developments may fragment communities, biodiversity and ecological linkages.	The extraction areas have been selected on the disturbed and previously cleared land.	Flora and Vegetation Report included in Appendix 1 attached. Management Plan Sections 2.5 Flora and 5.6.1 Vegetation and Flora. Figures 3, and 4.	Low

Environmental Factor	EPA Objective	Identified Issues and Commitments	Proposed Management	References	Residual Environmental Risk
Subterranean Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The development may have an impact on an isolated population of subterranean fauna.	The Lake Preston North area consists of belts of limestone running north south for approximately 6.5 km. The location of the proposed limestone quarry is not an isolated limestone remnant or feature and not part of the main ridge.	Figure 1 of the Management Plan Management Plan Section 2.6 Fauna.	Low
		The development may fragment subterranean communities.	The proposed limestone extraction is restricted to an area west of the main limestone ridge.	Figures 5, 8, 11A and 11B.	Low
		The diversity of subterranean fauna may be reduced at a population or assemblage level.	An assessment of the impacts on karst was conducted by Lindsay Stephens of Landform Research in May 2014 and 2016 and is attached as Appendix 3. The proposal will impact only a relatively small area of limestone as noted above. The limestone is geologically young and has low potential for the development of widespread karst features. The soils are sand based between limestone outcrops which infills any potential cavities at the surface reducing the potential habitats for karst dependent fauna. The groundwater flows and age of the limestone suggest that cave development is unlikely. The cave development in the area is very low as also identified by Lex Bastian for the Lake Clifton limestone pit in similar but slightly older limestone in the local area. The excavation will be limited in depth to an elevation 4 metres above the highest known groundwater which will eliminate the risk of impact on subterranean karst if any existed at the water table.	Appendix 3 of the Management Plan Figures 5, 8, 11A and 11B.	Low
		The final formed structures may not support continued subterranean fauna and their ecological functions.	The pit will bottom on limestone, which will be deep ripped and planted to a combination of pasture and local native vegetation. This will replicate the pre-excavation soils and landform and will provide similar near surface habitat to that currently existing.	Appendix 3 of the Management Plan of July 2014 and attached. Figure 11 attached	Low

Environmental Factor	EPA Objective	Identified Issues and Commitments	Proposed Management	References	Residual Environmental Risk
WATER					
Hydrological Processes	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	Excavation and development may impact on surface water flow paths and streams.	There are no surface water flows or watercourses on site.	Water Management Plan in Appendix 6 attached. *Management Plan Sections 2.4 Hydrogeology and 5.5 Water Quality and Appendix 6.*	Low
		The ecological functions of watercourses are to be maintained.	Thee are no surface water flows or watercourses on site.	Figures 11 and 12 attached.	Low
		Groundwater may be impacted by changes to recharge, over-pumping, alterations to flow paths or lead to significant evaporation and water loss.	There will be no changes to recharge of site. The site has previously been cleared and will be returned to a mixture of pasture and local native vegetation.	Water Management Plan in Appendix 6 attached.	Low
		Wetlands may be altered by draining or flooding, potentially changing their ecological functions and biodiversity.	A significant amount of investigations were conducted for the Cape Bouvard Investments land adjoining to the north. A line of drill holes and bores were installed at the southern end of that property only 20 metres north of the proposed limestone quarry. This information has been combined with an assessment of the hydrogeology by Lindsay Stephens of Landform Research and attached as Appendix 6. Lake Clifton is some 2 km from the proposed excavation. Lot 1002 lies outside the Lake Clifton catchment*, (EPA Guidance No 28, Protection of the Lake Clifton Catchment 1998).* Groundwater flows are towards Lake Pollard, but the recharge and alteration to the land surface will not be significant nor lead to significant changes to the groundwater flows or	Section 5.6.4 Wetlands Water Management Plan in Appendix 6 attached. Page 53 shows the classification of the wetlands. Figures 1, 2, 7 and 8 and Page 53.	Low

			volumes. Lake Pollard is a Conservation Category Lake (UFI 3100) and is listed under the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 as an environmentally sensitive area under the Environment Projection (Clearing of Native Vegetation) Regulations 2004. The local lakes are shown on page 53 of the Management Plan. The RAMSAR boundary has been extended to cover all of the Yalgorup National Park but that does not change to buffers to the actual wetlands. There will be no significant changes to the water balance. Lake Pollard accepts fresh water inflows from the west, including from Lot 1001 predominantly with very minor to no inflows from Lot 1002 because Lot 1002 lies to the south of Lot 1001 and the eastwards flow of water predominantly flows to soils south of Lake Pollard. The amended limestone quarry is now 600 metres from Lake Pollard and Lake Pollard is not downstream of the quarry. The groundwater from the quarry travels to a vegetated area between Lake Pollard and Martin's Tank Lake and therefore will not influence the water in the lake. Limestone such as this is crushed to increase the surface area and potential for soil acids to dissolve the calcium carbonate slowly over a number of years. The crushing of the limestone floor may slightly increase the HCO_3^- content of water infiltrating under the floor of the pit, but like all limestone areas the water becomes saturated with respect		

			to HCO_3^- and no further dissolution is possible. The maximum dissolution will occur in winter as a result of the winter rainfall. It is noted that Lake Pollard is saturated in calcium carbonate which can lead to precipitation in summer as a result of water chemistry changes due to evaporation. If there is any change to the calcium carbonate content of the groundwater as a result of the pit the groundwater logically will reach saturation with respect to HCO_3^- closer to the pit and then travel as saturated carbonate water in the same manner as currently exists. Once saturated no further dissolution can occur. Therefore with the saturation of HCO_3^-, dilution factors, distance to the lakes and the water not directly entering the lakes from groundwater from under the pit there would not seem to be any significant mechanism for changes to the calcium carbonate content of the local groundwater and no impacts on the lake system Extractive Industries are well known for their minimal potential impact on groundwater with DOW policy requiring a vertical separation of only 2 – 3 metres to the highest known groundwater. The proposed limestone extraction has a 4 metre separation. *(WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004)* *WQPN 15 Extractive Industries near sensitive water resources).*		

Environmental Factor	EPA Objective	Identified Issues and Commitments	Proposed Management	References	Residual Environmental Risk
Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Hydrocarbons, fuels and other chemicals are stored in a manner that they pose no risk to the environment.	Extractive Industries are well known for their minimal potential impact on groundwater with DOW policy requiring a vertical separation of only 2 – 3 metres to the highest known groundwater. The proposed limestone extraction has a 10 metre separation. *(WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004) WQPN 15 Extractive Industries near sensitive water resources).* Extensive water management protection procedures are proposed to manage fuels, lubricants and operations.	Water Management Plan in Appendix 6 attached. *Management Plan Sections 2.4 Hydrogeology and 5.5 Water Quality and Appendix 6.*	Low
		Runoff from operations is contained and all water is either retained or treated to removed sediment and any deleterious materials.	The pit will be internally draining. Being highly porous limestone there will be no runoff and all water will be retained where it will have to soak through 10 metres of limestone and sand to intersect the water table.	Water Management Plan in Appendix 6 attached. Figures 5 and 8.	Low
		Water quality during and after development and operations is not adversely affected or altered.	Extractive Industries are well known for their minimal potential impact on groundwater with DOW policy requiring a vertical separation of only 2 – 3 metres to the highest known groundwater. The proposed limestone extraction has a 10 metre separation. *(WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004) WQPN 15 Extractive Industries near sensitive water resources).*	Water Management Plan in Appendix 6 attached.	Low

Environmental Factor	EPA Objective	Identified Issues and Commitments	Proposed Management	References	Residual Environmental Risk
INTEGRATING FACTORS					
Rehabilitation and Closure	To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State	All infrastructure, roads, hardstand, non natural materials are to be removed from site progressively when not required and all removed at the end of the project.	An extensive closure and rehabilitation plan is proposed.	Management Plan Section 5.9 Figures 3, 4, 5, 9, 11A and 11B. *Management Plan Sections 5.6.5 Dieback Management Plan, 5.6.6 Weed Management Plan and 5.9 Rehabilitation.*	Low
		No materials are to be left on site that may cause long term detrimental outcomes in terms of impacts to soils, water, heritage, vegetation health or other factors.	Commitments are made to remove all foreign and deleterious materials from site. Doyles Limestone Service, which has operated at Myalup for many years, has demonstrated a willingness and ability to undertake rehabilitation.	Management Plan Section 5.9.	Low
		All contaminated materials are to be removed from site prior to closure.	This is committed to in the management Plan with additional information in the attached Water Management Plan in Appendix 6 of the Management Plan (attached).	Management Plan Section 5.9. and Water Management Plan attached as Appendix 6.	Low
		Landforms and other geomorphological features are to be compatible with the local area and end use and be sustainable in the long term.	The proposed pit has been designed to minimise landscape impact and will maintain a ridge along the western side of Lake Pollard.	Management Plan Section 5.9. Figures 3, 4, 5, 9, 11A and 11B.	Low
		Soils are reconstructed to be able to sustain an ecological sustainable vegetation or other cover consistent with the end use and long term proposal for the site.	This is committed to and explained in the Management Plan.	Management Plan Section 5.9. Figures 3, 4, 5, 9, 11A and 11B	Low
		Weed levels are not to cause significant impacts revegetation.	Weed and Dieback Management is proposed, as outlined in Sections 5.6.5 Dieback Management Plan and 5.6.6 Weed Management Plan. Both management plans are committed to.		

		Ongoing monitoring of the rehabilitation will be conducted to ensure that any areas not meeting completion criteria are added to or replaced as necessary to enable the relevant criteria to be met.	Monitoring of the rehabilitation is proposed and will be undertaken for a period of three years or until completion criteria of; • *Stable post-mining landscape, and the minimisation of wind erosion.* • *Provide for the protection of the local groundwater resource in terms of both quality and quantity.* • *Achieve weed species at levels not likely to threaten the vegetation.* • *Provide a self sustaining cover of local native plants at a minimum of 1200 native plant stems per hectare at 3 years for the eastern 20 metre strip of land close to Lake Pollard and on the steeper northern and southern slopes. (Figure 10).* • *Sustainable pasture for the remainder of the excavated area with a minimum of 200 trees in clumps. (Figure 10).*	Management Plan Section 5.9. Figures 3, 4, 5, 9, 11A and 11B	Low

CONTENTS

APPENDICIES

1.0 INTRODUCTION

1.1 Background and Proposal

Doyles Lime Service proposes to open a limestone quarry on 13 hectares of a limestone ridge on Lot 1002, Preston Beach North Road, Preston Beach.

The limestone on Lots 1001 and 1002 is highly suitable for lime for agriculture and neutralisation of acidity.

A proposal to extract limestone and sand from two small parts of Lot 1002 was prepared in May 2013 and submitted to the Shire of Waroona.

An application was made for a limestone resource on Lot 1001 but that was determined by the Minister for the Environment and then the Environmental Protection Authority to have some potential issues relating to groundwater and the proximity to Lake Pollard. Groundwater flow from that resource flowed towards Lake Pollard.

Doyles Lime Service previously operated in Myalup but wishes to expand to another operation closer to potential alternative markets.

The Shire of Waroona received advice from the Department of Parks and Wildlife by way of letter dated 4 September 2013. Issues were raised with respect to flora surveys, Lake Pollard, the potential impacts and the potential impacts on road users. Each of the items raised have been considered within the separate sections of this report. It is noted that DPaW recommended for refusal. However the limestone is of State Significance and required by the community. The proposal has been designed as a compromise to enable some limestone to be extracted, whilst providing protection in the short term of the values outlined by DPaW.

The following has been carried out.

- A Flora and Vegetation Study has been completed in Spring 2013 by Arthur Weston.
- A Traffic Study has been completed by Michael Keane of Greenfields Technical Services.
- Additional research has been conducted.
- The additional information required or highlighted by the authorities has been included in this updated management plan.
- The issues raised by the various authorities have been addressed in the updated management plan.
- Additional plans and sections have been included.
- The additional studies have been included as appendices.

As a result of the EPA determining that the original limestone proposal may not be acceptable or may require formal assessment under *Part 4 of the Environmental Protection Act 1986* the project has been changed as follows;

The proposed pit near lake Pollard has been removed.

The changes in the proposal are summarised below

11. A new limestone pit south west from Lake Pollard is now proposed with a disturbance footprint of 13.0 hectares in four stages.

12. The proposed pit lies 600 metres south west from Lake Pollard compared to 200 metres west.

13. Groundwater flow flows east to the south of Lake Pollard rather than directly to Lake Pollard.

14. Groundwater flows to a vegetated area to the south of Lake Pollard and between Lake Pollard and Martin's Tank Lake and not to a lake or open body of water. The groundwater flows more than 1 km before it intersects the areas between Lake Pollard and Martin's Tank Lake.

15. The limestone resource is lower in the landscape at a maximum of around 15 metres AHD compared to 30 metres AHD.

16. The limestone resource lies west of the main 30 metre limestone ridge that now separates the excavation from the Lake Pollard – Martin's Lake chain.

17. The vegetation on the new limestone excvavation area is regrowth vegetation with densely scattered *Xanthorrhoea preissii* or smaller scattered regrowth young Tuart trees.

18. The sand resource area is unchanged but enlarged slightly to 3.0 hectares.

19. The proposed extraction is now 600 from the Lake Pollard walk Trail and 500 metres from the lookout. (increased from 75 metres). The walk trail now lies on the other side of a large limestone ridge to 30 metres AHD.

20. The main limestone ridge will now remain intact and not be excavated.

Existing Approvals

There are no current approvals.

Proposal

This proposal seeks Development Approval and an Extractive Industries Licence for extraction of limestone from Lot 1002.

1.2 Importance and Rationale

Need for Lime for Mitigating Soil Acidity

Crushed limestone and limesand is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone for use as agricultural lime is recognised by the *Department of Agriculture and Food (Bulletin 4784)*.

Acidification of soils is seen as one of the major impediments to continued viable farming in Western Australia. The *State Of the Environment Report Western Australia 2007* shows that about two thirds of the South West agricultural soils are at risk of acidification. When the acidity builds up essential nutrients become unavailable to plants, and the crops reduce in vigour and eventually fail. In addition some other elements such as aluminium become soluble and lead to toxicity in stock and plants.

The normal method of treatment of soil acidity is to add agricultural limesand and crushed limestone as explained in *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants.*

Abeysinghe, P B, 1998, *Limestone and Limesand Resources of Western Australia, Geological Survey of Western Australia,* Mineral Resources Bulletin 18, also summarises the uses for limestone and lime and the deposits, but does not list the limestone in this locality. See Attachment 2 of the Mining Proposal.

The need to mitigate soil acidity is also reiterated by the EPA. Acidification of soils is cited by the Environmental Protection Authority (EPA) in Section 3.3 of its *State of the Environment Report* as a serious threat to the sustainability of WA soils and agriculture. The report calls for the increased use of lime sand to combat soil acidification and to arrest the menace of sub-soil acidification and its effects on crops, water quality and native vegetation (EPA 2007).

Lime is also required for the remediation of acid sulphate conditions which occur on the Swan Coastal and Vasse Plains when deep soils are disturbed by development. Lime is also require for some industrial processes.

The draft *State Lime Supply Strategy (2008)* advocates the use of known lime resources especially from those sites which have minimal impact on the conservation values of native vegetation and are well-positioned in terms of existing infrastructure to serve the farming and rural communities (DMP 2008).

Doyles Limes Service supplies lime sand to local farmers to combat soil acidification to local farmers, vineyards and other agricultural activities as well as a source of calcium carbonate for use in other situations such as potential acid sulfate mitigation.

The limestone is essential to the local agricultural industry, but is restricted in distribution and grade south of Perth and the South West. Whilst limestone is more common a significant part lies within the Conservation Estate. Much of the limestone and calcareous dunes are located within coastal Crown land and Reserves.

To be most effective limestone has to be of the highest grade and, whilst coastal calcareous dunes and limestone do contain calcium carbonate the grades are often too low for efficient and economic use. For example using limestone at half the calcium carbonate content will require double the amount to be excavated, leading to additional land clearing, excavation and transport for no greater gain.

Uses of Limestone for Construction

The resource has been identified by the Geological Survey of Western Australia as a Regionally Significant Basic Raw Material – Limestone. Figure 1.

The Western Australian Planning Commission in *WAPC 2012, Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*, determined that limestone is in short supply and that all the limestone available including that in the Lake Pollard area was just sufficient to satisfy the grow the demands of the region for the next 30 years. The demand for the next 30 years was listed in Table 7 of WAPC 2012 as requiring 30 359 000 m^3 of limestone within the next 30 years. Lime for agriculture was assessed as being 21 891 000 tonnes.

The Geological Survey estimated that the total limestone available, if all resources are taken is 35 460 000 m^3 (WAPC 2012).

The resource on Lot 1002 is included as the southern portion of Resource 61 in (WAPC 2012 Map 6). This resource is listed as having a total area of 126 hectares with a nominal thickness of 11 metres and a total nominal volume of 13 860 000 m^3, with a recovery factor of 5 540 000 m^3. That represents 15.6% of the total limestone resources available to the growth and agriculture in the south west of Western Australia. It is proposed to excavate 13 hectares from the total area of limestone.

The extraction of limestone from this location is therefore very important to the State. Of the total volume of limestone in Resource 61 the proposed excavation represents only around 800 000 m^3.

The general geology and deposits have been reviewed by the Western Australian Geological Survey and summarised in Abeysinghe 1998, pages 48 – 50.

The significance of this resource is that there are only scattered deposits between Mandurah and Bunbury of very limited area and volume.

To be most effective limestone has to be of the highest grade and, whilst coastal calcareous dunes and limestone do contain calcium carbonate, the grades are often too low for efficient and economic use. For example using limestone at half the calcium carbonate content will require double the amount to be excavated, leading to additional land clearing, excavation and transport for no greater gain.

The other local factor is that much of the limestone and calcareous dunes are located within coastal Crown land and Reserves.

The importance of the local lime is recognised in the *Department of Agriculture and Food Bulletin 4660, Survey of Western Australia agricultural lime sources* which listed the limestone from this pit on page 70.

Crushed limestone and limesand is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertiliser and legume crops. The need for crushed limestone for use as agricultural lime is recognised by the *Department of Agriculture and Food (Bulletin 4784).*

Acidification of soils is seen as one of the major impediments to continued viable farming in Western Australia. The *State Of the Environment Report Western Australia 2007* shows that about two thirds of the South West agricultural soils are at risk of acidification. When the acidity builds up essential nutrients become unavailable to plants and the crops reduce in vigour and eventually fail. In addition some other elements such as aluminium become soluble and lead to toxicity in stock and plants.

Lime from limesand is also used for remediation of acid sulfate conditions and a source of $CaCO_3$ for some industrial processes.

Typically the limesand has a calcium carbonate content of over 70%.

Some consideration of the use of limestone for agricultural lime and other purposes is shown in the following documents.

See;

- Abeysinghe P B, 1998, *Limestone and Limesand Resources of Western Australia*, Geological Survey of Western Australia, Mineral Resources Bulletin 18.
- Geological Suvey of Western Australia, 2013, *Regionally Significant Basic Raw materials, _ Pinjarra Sheet.*
- Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5

- Western Australia, Western Australian Planning Commission*, State 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*.
- Fetherston J M, 2007, *Dimension Stone in Western Australia*, Volume 1, Department of Mines and Petroleum, Mineral Resources Bulletin 23.
- *WAPC 2012, Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*,

The reality is that the limestone is only extracted for the community benefit.

If there was no community demand for limestone as a building product and for agricultural use it would be unlikely that this natural resource would ever be utilised for any other purpose and would have no economic significance.

The resource is strategically located and has the potential to provide raw materials for 20 plus years.

The need for the resource is well known but is sometimes not given due weight in the assessment process.

Proposals such as this are often considered in isolation without reviewing the wider environmental impacts.

If the resource is not taken from this site it will have to be taken from another site where similar or more land clearing is required. The depth of sand on this site also minimises the area of farm land or vegetation that is likely to have to be cleared on an alternative site.

1.3 Proponent

The proponent is Moresreel Pty Ltd.

Contact can be made through the Manager

Mr Carlo Doyle
Doyles Lime Service
P 0 Box 133,
Capel WA 6271

1.4 Location and Ownership

E J Marchetti
PO Box 238
Waroona WA

Lots 1001 and 1002 lie on the western side of Lake Pollard and Martins Lake, Preston Beach, 6 km from Preston Beach townsite.

Lot	LOT 1001	LOT 1002
Volume	2515	2515
Folio	859	860
Plan	29652	29652
Area	56.811 plus 28.173	98.473 ha

1.5 Description of the Resource

The site covers part of a low limestone ridge with a peak along the west of around 15 plus metres AHD, way below the 30 plus metre high limestone ridges to the east.

The limestone ridge is the closest limestone to Mandurah, south of the Yalgorup National Park and therefore has regional value as a Basic Raw Material resource area. It is of such significance that it is identified by the Geological Survey of Western Australia as a Regionally Significant Basic Raw Material – Limestone. Figure 1 and Appendix 7.

The limestone ridges have harder, higher grade limestone near the surface, which is suitable for agricultural purposes, overlying softer limestone suitable for road making materials.

The limestone on site changes laterally and vertically through changes in the original dune morphology as does the degree of lithification (hardness). These changes determine the use to which each type of limestone can be put.

Although the resource extends to depth, extraction is likely to be limited to 5 metres AHD metres to provide an undulating and consistent final landform and to be consistent with the lower elevations available on site.

An estimated 20 plus years' limestone and sand resources are present, although this depends on the rate of community demand.

1.6 Aims of the Proposal

A major and increasing environmental issue within Western Australian agriculture is the gradual, widespread and increasing levels of acidic soils, created through the use of nitrogenous fertiliser and the growth of leguminous crops. The agricultural industry of Western Australia is one of the most important to our economy through direct value, value added and employment.

Soil Acidification is a well recognised major environmental issue and is highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The trend towards acidification of the soils is unavoidable, because legume rotations are best practise farming, and nitrogen is essential for crop growth.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand, Tamala Coastal Limestone, or other imported limestones, that have to be treated, or dredged lime/shell sand. Most coastal areas of Tamala Limestone are covered by remnant vegetation or are in areas where they are sterilised by increasing numbers of residents such as the Mandurah area.

The aims of the proposal are to;

- Provide reserves of strategically located limestone, suited to a variety of end products.
- Supply lime to the agricultural industry.
- Provide additional limestone materials for a stable long term supply of limestone products in the Mandurah - Bunbury and Peel Regions.

- Comply with State Planning Policy No 2.5 which requires that basic raw materials should be taken prior to sterilisation of the area by development.

2.0 EXISTING ENVIRONMENT

2.1 Climate

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

Temperatures are between those of Mandurah and Bunbury, where the maximum temperatures in the summer months are 27 to 30 degrees Celsius. In winter the maxima are near 18 degrees Celsius with the minima dropping to an average of 9.0 degrees C in July.

Rainfall for the area is approximately 900 mm with more than 90% of the rain falling during the winter months April to October inclusive. Evaporation exceeds rainfall in all but the wettest winter months.

The wind direction is predominantly from the east in the morning and from the southwest in the afternoon during the summer months. During the winter months the directions are more variable and lighter but with a predominance of east - northeast in the morning and south west in the afternoon due to the presence of winter lows.

2.2 Geology and Geomorphology

The site is a ridge of limestone rising to 15 metres AHD which is slightly above the surrounding plain. Figures 3, 4, 5 and 8.

The limestone of the low ridge was formed as limesand dunes behind beach deposits. The limestone is a calc-arenite made from beach sand containing predominantly shell fragments with minor and variable quartz. The limestone has been lithified and recrystallised on the ridge tops to lift the percentage of calcium carbonate to over 70%.

The geology is shown in;

- Geological Survey of Western Australia 1974, *Geological Map, Southern Part of the Perth Basin.* GSWA Bulletin 124.
- Geological Survey of Western Australia 1987, *Lake Clifton – Hamel 1 : 50 000 Environmental Geology Series.*

Within the local area, several lines of beach ridges formed along the coast, and when created slowed the groundwater flow to form a series of parallel lakes between the ridges. (Lake Clifton in the east, Martins Lake – Lake Pollard and Lake Preston in the west. See Figure 8.

The degree of lithification (hardness) changes over the property, and determines the use to which each type of limestone can be put.

The limestone is ascribed to the Tamala Limestone based on the type of limestone and the degree of litification, although it may well be a younger sequence than Tamala Limestone in some other locations. The degree of lithification can be due to the high calcium carbonate content and therefore the limestone may be part of the older Quindalup sequence which occurs as the coastal dunes to the west.

In other localities dates of between 25 000 and 100 000 years have been obtained for the Tamala Limestone.

The local Geology and geomorphology is expanded on in *Semeniuk V and C, 2009, Quaternary geology, landforms and wetlands between Dawesville and Binningup – Description, key features and geoheritage significance* prepared by the DER.

Borelogs from the Cape Bouvard Investments 2009 show that the site, including the northern boundary of Lot 1001, consists of limestone to depth with the limestone being intersected to depths of 18 – 25 metres and not bottomed. That would indicate some 4 metres at least of limestone beneath the site.

Bores drilled by the Geological Survey of Western Australia at the south eastern corner of Lot 1002 show limestone with 20 metres thickness.

2.3 Soils

Soils on the site consist predominantly of brown to yellow brown sands over limestone at depth. The soils are classified as Cottesloe soils.

The soils have been mapped at a broad scale by Department of Agriculture and Food, 1990, *Land Resources in the Southern Section of the Peel-Harvey Catchment, Swan Coastal Plain,* Western Australia with the site being classified as S2a and S2b soils

S2a *"moderately deep to deep yellow brown sands or pale sands with yellow brown subsoils and minor limestone outcrop".*

S2b *"shallow to moderately deep yellow brown sands and common limestone outcrop".*

The Tamala Limestone is covered by shallow, yellow brown, calcareous loamy sands that have originated as a result of weathering of the limestone on the central ridge. Deeper sand occurs in the swale in the west and to the east.

Approximately 0 - 100 mm of brown sandy soils of the Cottesloe type overly the limestone, although on the ridge top there is very little soil material. Figure 4.

A typical soil profile from the limestone ridge is:

Soil Horizon	Depth	Description
O-A	0 -10 mm	Weakly developed, leaf litter and decomposing organic matter
B	10 - 500 mm	Dark brown siliceous sandy soils that become lighter with depth. In some locations the soils can be 2 metres deep but in others only 100 mm.
C	> 500	Cream recrystallised limestone

2.4 Hydrogeology

See the attached Water Management Plan.

There is no surface drainage due to the porosity and permeability of the limestone, with precipitation draining to the water table. It has been estimated that perhaps <10 - 20 % of the rainfall will reach the water table. Figures 2, 3, 4 and 8.

The amended limestone quarry site lies 600 metres south west from Lake Pollard much greater than the previous 200 metre separation and does not lie up groundwater gradient from Lake Pollard.

As part of the studies for proposed developments, Cape Bouvard Investments (2009) completed extensive hydrogeological studies of the southern portion of their land which abuts Lot 1001 and of the local hydrogeology, including Lake Pollard.

The line of drill holes was placed along the southern boundary of Lot 1000, Cape Bouvard Investments land and is very relevant to the subject site because it lies adjacent to the northern boundary of Lot 1001 and provides a good cross section of the groundwater across Lot 1002 just 500 metre south of the borehole line, on the same geological and geomorphological features.

The groundwater flow is in line with normal hydrogeological principles for a unconfined aquifer that spreads from a central ridge. In such situations the flow paths east and west are similar distances which places the western edge 0f the proposed limestone pit near groundwater divide.

This hydrogeological pattern is shown by the line of borehole monitoring on the Cape Bouvard development (by (Cape Bouvard Investments 2009) and for example *Jackson, J M, 2007, Hydrogeology and Groundwater Flow Model Central Catchment of Bribie Island, South East Queensland MSc Thesis, School of Natural Resource Sciences Queensland University of Technology, Brisbane.* The same pattern is shown by Deeney (undated) attached in the Water Management Plan.

See Cape Bouvard Investments MWS1, MWS2, MWS3, MWS4, MWS 5 and MWS6 and Figure 8.

Groundwater flow can therefore be assumed to flow east from under the proposed limestone excavation.

However groundwater flow from the amended limestone pit now flows east to a south of Lake Pollard rather than directly to Lake Pollard.

From evidence of the soils, the sump and vegetation, the water table lies at about 1 metre AHD. See Figure 3 in Deeney (undated). Figures 7 and 8.

Groundwater flows to a vegetated area to the south of Lake Pollard and between Lake Pollard and Martin's Tank Lake and not to a lake or open body of water. The groundwater flows more than 1 km before it intersects the areas between Lake Pollard and Martin's Tank Lake.

The shallow groundwater on the site is fresh, sitting as a layer overlying the saline ground water. The groundwater is exposed in a sump in the south western corner of Lot 1002. Figures 3 and 8.

The site lies at the south from the Cape Bouvard Investments Land, which was once owned by the landholder of Lots 1001 and 1002.

Lake Pollard is brackish as confirmed by (Cape Bouvard Investments 2009. Figure 8.

A fresh water lens overlays the subject land with water flow both to the east to Lake Pollard and west towards the coast. There is also a suggestion that there could be a connection in water flow between Lake Pollard and Lake Clifton because of the large surface area of Lake Clifton causing a small draw from Lake Pollard.

Cape Bouvard Investments 2009 found that the water elevation in Lake Pollard ranged from -0.4 metres AHD in February 2008 to +0.5 m AHD in July – September 2008 (Cape Bouvard Investments 2009 Figure 9) and Figure 8.

They also found that the ground water along the northern boundary of Lot 1001 was slightly elevated at between 0.2 – 0.3 m AHD with a groundwater divide near the western boundary of Lot 1001. The divide was around 100 metres west of the boundary in February 2008 and around 200 metres east of the western boundary in September 2008, that is well to the west of the proposed excavation. The variation being due to seasonal factors, most likely winter precipitation, evapotranspiration from vegetation and evaporation from Lake Pollard/Lake Clifton (Cape Bouvard Investments 2009 Figure 10).

The groundwater salinity was found by Cape Bouvard Investments, on Monitoring Bores MWS5 and MWS6 located near the western edge of the northern boundary of Lot 1001, to be fresh down to – 7.0 metres AHD where the interface of the saline groundwater occurred, with some reductions in salinity due to mixing from winter precipitation. At MWS1, located east of the eastern end of the northern boundary of Lot 1001, the salt water interface varied from -7.0 - -8.0 mAHD (Cape Bouvard Investments 2009 Figures 14 and 15). This indicates fresh water flows to Lake Pollard.

The same parameters are mapped and interpreted for the amended limestone excavation being in the same geological and geomorphological conditions 500 metres south.

Limestone excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Environment Regulation who permit extractive industries in Priority Groundwater areas such as Lake Gnangara where sand excavation occurs within 3 metres of the water table.

2.5 Flora

Regional vegetation and flora assessments were made by Freeman, K, B Keighery, G Keighery, V Longman, A Black and S Molloy, 2009, *Flora and Vegetation of the Dawesville to Binningup Region (Swan Coastal Plain)*, prepared for the DPAW.

The local vegetation is originally 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 (DPaW).

Extensive flora and vegetation studies were conducted for the land to the north and touching the northern boundary of Lot 1001 by Cape Bouvard Investments 2009 in support of proposed developments. Appendix 1.

All these studies provide background to the vegetation on site.

In order to provide additional information, a separate flora and vegetation study was completed by Arthur Weston on 1 November and 3 December 2013. The studies cover both the limestone ridge and the sand resource as separate studies and reports. Both reports are attached as Appendix 1 (Weston 2014).

The vegetation study of the limestone ridge assessed by Weston does not relate to the amended area of native vegetation, which is much reduced in area and quality.

There are only 11 species occurring on the amended limestone extraction area;

Acacia rostellifera
Agonis flexuosa
Banksia (Dryandra) sessilis
Dianella divaricata
Eucalyptus gomphocephala
Hakea prostrata

Hibbertia subvaginata
Melaleuca huegelii (about 20 scattered plants)
Melaleuca systena
Spyridium globulosum
Templetonia retusa

Limestone Ridge Vegetation

The excavation area has been strip cleared and then fully cleared in the past, intensively grazed and in part seeded with pasture species. The provisions of the Clearing regulations provide that land cleared for agricultural purposes from 1994 (20 years previously) can be recleared for agricultural purposes. This does not include for excavation purposes. See Figures 3 and 4 and below.

- ***Species***

On the limestone ridge, despite extensive searches, only 21 native species were found, and 17 exotic species. Weston 2014 noted that this is likely to include 60% of the taxa present. As such the reduced number of species indicates the current level of disturbance. The ground cover is dominated by *Trachyandra divaricata** an exotic species.

- ***Vegetation Communities***

The vegetation communities on Lots 1001 and 1002 were identifed by Weston 2014. The communities are listed below from that report.

Tuart Woodland, Peppermint Low Woodland & Balga Shrubland	**TXp**	CD(-D)	Title Page, Plate 1A
Chenille Honeymyrtle – Mixed Closed Heath *Melaleuca huegelii* – Mixed species Closed Heath	**Mhs**	D-(CD)	Title Page, Plates 1A, 2A, 2B,
***Melaleuca systena* Open to Closed Heath** *Melaleuca systena* Open to Closed Heath	**Ms**	D-CD	Plates 1A, 1B, 2A
Summer-scented Wattle Heath to Closed Tall Scrub *Acacia rostellifera* Closed to Open Heath	**Ar**	CD-D	Plate 2B
Balga Shrubland *Xanthorrhoea preissii* Shrubland	**Xp**	CD	Plates 1A, 1B, 2A

The low lying eastern area is likely to be Balga Shrubland.

The western ridge probably does not fit with any defined communities identified by Weston.

Weston 2014 also speculated what the original vegetation on site would have been and concluded that none should be listed as SWAFCT26a.

Weston could not assign any existing vegetation on site now to any SWAFCT community type and the description of the vegetation is as described by Weston 2014.

Lower elevation limestone with Balga regrowth on pasture

Lower elevation limestone with Balga regrowth on pasture

Limestone ridge vegetation with scattered regrowth on previously cleared and seeded limestone ridge

Limestone ridge vegetation with scattered regrowth on previously cleared and seeded limestone ridge

- ***Vegetation Condition***

Weston 2014 listed the vegetation condition of the site for each community in Section 5.1 of his report as the letter code CD (Completely Degraded) or D (Degraded) using Bush Forever 2000 descriptors. The Condition Codes are listed above under vegetation communities.

The vegetation was strip cleared and heavily grazed in the past. With the Prescribed Clearing Exemptions under the *Environmental Protection Act 1986 Section 51C* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004 Section 5* it is possible for the landholder to return the vegetation for agricultural purposes to its 1994 condition under Prescribed Clearing in the Regulations, Section 5 .14.

That Prescribed Clearing does not include clearing for extraction of limestone but if the limestone ridge was returned to its 1994 condition, the vegetation will be significantly more degraded than it currently is. See Figure 3.

- ***Rare and Priority Species***

No Declared Rare or Priority species were recorded. No Threatened Ecological Community was noted.

Weston 2014 did note that most of the 23 locally recorded Threatened and Priority taxa from the datbases were recorded in the Yalgorup National Park, six taxa may have been recorded within 5 km of the site and 4 occur ”nowhere near Yalgorup”.

Sand Resource

On the sand resource only 2 native species were recorded by Weston 2014.

Weston made some comments on what the vegetation may have originally been, but these are not relevant as the sand resource is now pasture.

Weston summarised the vegetation as below in addition to speculating what the original vegetation may have been.

> The only vegetation unit in the survey area is Completely Degraded Dune Onion Weed (**Trachyandra divaricata*) Herbland to Closed Herbland, with a species of Pygmyweed (**Crassula glomerata*) and an unidentified moss in some of the relatively small open areas.
>
> No rare flora plants were found. The only native species found in the survey area are *Xanthorrhoea preissii* and *Hibbertia cuneiformis.* Only a few plants of the former and one of the latter were found. Neither species is rare or uncommon.

The sand resource area has a vegetation condition of Completely Degraded.

Vegetation Representation

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.

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. The Quindalup System is listed as having 47% of the pre-European area still occurring and 5% in secure tenure.

Whilst there exists greater then 30% of this Complex it is not well reserved. The Clearing Regulations provide a higher level of protection than was previously available, and the same vegetation complex is included in the Yalgorup National Park.

NRM mapping shows the site as a number of potential vegetation types and Associations that do not quite match the actual vegetation on site but are similar.

The current method of assessing the status of the vegetation is to use Shepherd et al 2002, *Native Vegetation in Western Australia Extent, Type and Status*, Department of Agriculture and Food Resource Management Technical Report 249 which provides a measure of the current status of the Vegetation Associations.

The vegetation on the dune is listed as the following, which distorts the actual vegetation on the ridge because the classifications are so broad scale.

Shepherd et al 2002 lists the Vegetation Associations as having the following for Vegetation Association 998. The data does not list Association 998.1 separately.

	Pre European Extent hectares	Current vegetation remaining hectares	% remaining	% located in IUCN Class I-IV Reserves	% remaining in other Reserves	%i n pastoral leases managed by DEC
998 Medium Woodland Tuart	51,094	18,320	35.9%	32.9%	3.0%	0.0%

The vegetation associations are well represented and are above the 30% retention criteria.

On the other hand the data for the Cottesloe Complex Central South and Quindalup has above the 30% recommendation remaining but less than the 30% in secure tenure.

Considering all the potential impacts, level of degradation and with effective management of weeds and other potential issues, there will be no significant impact on vegetation and at the end of the exercise there will be a net increase in vegetation.

2.6 Fauna

A fauna study was not conducted because the resource area is quite degraded and will be returned to a combination of native vegetation and pasture in a ratio similar to the current vegetation.

Also the fauna has been studied in the assessments for the Dawesville - Binningup region on behalf of the DPaW, and extensively in support of the Cape Bouvard Investments proposal for the development of the land immediately to the north of Lot 1001 only 20 metres from the limestone resource, the limited size of the extraction areas, and the degraded nature of the vegetation.

The studies are

Dell and Hyder 2009, An Assessment of the Avifauna of the area between Dawesville and Binningup, Southern Swan Coastal Plain prepared for the DEC.

Dell and Hyder 2009, Summary of the Vertebrate Values of the area between Dawesville and Binningup, Southern Swan Coastal Plain prepared for the DEC (DPaW).

Dell and Hyder (1) 2009, An Assessment of the Non-Volant mammal Fauna of the area between Dawesville and Binningup, Southern Swan Coastal Plain prepared for the DEC (DPaW).

Bat Call 2009, *Echolochation Survey of Bat Activity in the Lake Clifton and Lake Preston Localities on the Swan Coastal Plain*.

Cape Bouvard Investments 2009, *Rural Subdivision, Lots 1000, 2240, 2275, 2675, and 3045 Preston Beach Road, Lake Clifton*, in support of EPA Assessment 1440, Unpublished Report.

The studies recorded 22 species of animals (not including bats) occurring in the Dawesville – Biningup area of which 6 species were exotic. There are many species of bird which range across the Dawesville Binningup area with 174 species listed by Dell and Hyder.

With the degraded nature of the vegetation and the species present it is unlikely that *Calyptorhynchus latirostris* and *Calyptorhynchus baudinii,* which are listed on State and EPBC conservation databases, would nest or use the site for feeding. The flora species are not regarded as significant habitat species. They are not used for roosting or nesting.

The few *Hakea* and *Dryandra* plants do provide some limited food supply but are not classified as a significant impact on the habitat of the Black Cockatoos or one that would trigger referral under the *EPBC Act 1999*.

The Graceful Sunmoth will not occur because of the lack of habitat, with no *Lomandra* spp being recorded.

Western Australian Museum (undated) lists *Calyptorhynchus latirostris* as visiting pine plantations, parks and gardens and Proteaceae shrubs, *especially Dryandra (Banksia) sessilis, Banksia menziesii, B. attenuata and B. grandis* in the area from March to September. These species are not present on site.

It may be possible for possums and even the Western Ringtail Possum *Pseudocheirus occidenalis* to occur in areas such as this. They are more likely to live in the peppermint trees on the eastern edge of the excavation. These will not generally be impacted on. Peppermint trees *Agonis flexuosa* will be included in the rehabilitation. Preston Beach was a release site for this species. Dell and Hyder (1) 2009. The Western Brushtail Possum is common.

Some other species of Conservation Sigificance have been recorded on some databases such as Chuditch which according to Dell and Hyder (1) 2009 has been recorded from north east of Lake Clifton and may occur locally. This is a mobile species that is unlikly to be impacted by a small limestone quarry.

The Short beaked Echidna has been recorded at Martins Tank and may occur. It is also unlikely to be impacted by a pit that is small in relation to the amount of habitat available.

The Brush Tailed Phascogale has been recorded at Lake Clifton in 1991. Its status is not currently known.

Dell and Hyder (1) 2009 list the Quokka as still possibly occurring associated with thickets around Lake Clifton. No low elevation thickets are to be impacted.

The Western Grey Kangaroo is common and is advantaged by pasture and additional water supply of pasture land.

Other species of conservation significance (Dell and Hyder (1) 2009) are the Quenda and Western Brush Wallaby.

The Quenda is likely to be present and is known to be thriving near human habitation which increases food and water supply. The Western Brush Wallaby may be present but is a relatively large and mobile animal that is unlikely to be affected by excavation.

Other fauna are related to the preservation of habitat. Returning the excavated surface to native vegetation will assist in providing long term habitat for fauna. Considering the relatively small size of the limestone pit in relation to the area of remant vegetation, the disturbed nature of the vegetation on site and the high quality habitat associated with the lake system it is unlikely that fauna species will be significantly impacted.

See Wetlands below for consideration of species associated with the lake systems.

Stygofauna and Troglofauna

The potential presence of cavities within the limestone has been considered by Lindsay Stephens of Landform Research in a summary attached as Appendix 3. Summary from the appendix is provided here.

EPA Guidance 54, concentrates on Stygofauna, which occur in caves and "are aquatic subterranean animals, found in a variety of groundwater systems". Environmental Protection Authority, 2013, *Consideration of subterranean fauna in environmental impact assessment in Western Australia* relates to the level of survey. On the limestone ridge a reconnaissance survey was completed by Lindsay Stephens of Landform Research during the site inspection.

The limestone ridge is not an isolated habitat, but joins similar limestone regolith north and south. The main change will be modification of the two ends of the ridge at an existing swale. Limestone will remain to depth at the end of excavation. The large ridge to 30 metres in elevation lies to the east of Lot 1002 and will be retained.

"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.

Stygofauna relate particularly to Root Mat Communities, which are listed as Endangered Communities. Root mat communities occur in locations where groundwater flows quickly and where Tuart Trees are present because their roots can access the water table. No Tuarts occur on the resource area of Lot 1001. The base of the excavation at 1 to 14 metres AHD is over 4 metres above the highest known water table. The low lying swales between the ridges on Lot 1001 and 1002 drop down to 3 – 4 metres AHD well below the proposed floor of the pit.

Root Mat Communities are briefly considered in Appendix 3 where the risk of caves and karst is discussed.

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. The existing soils are sands with occasional limestone pinnacles and not rocky outcrops.

The limestone ridge is joined to the north and south of Lot 1001 and is therefore not an isolated feature. Any troglofauna are therfore likely to inhabit the whole ridge and are unlikely to be locally rare. South of Lot 1001, and west and east of the ridge extension to the north, the limestone ridge lies within the Yalgorup National park and is therefore afforded protection.

Groundwater moves from west to east to Lake Pollard which is alkaline. As discussed in Appendix 3 there is little risk of karst or cavities occuring that will be impacted by excavation, and at the end of operations significant limestone vertical buffers of 4 metres to the water table will remain. See Figure 8.

2.7 Wetlands

Lake Pollard lies 600 metres in a north easterly direction from the proposed extraction area.

Lake Pollard, is a recognised EPP wetland with a simialr status to Lake Clifton to the east. It forms part of the Ramsar listed wetlands that have been classified as the boundary of the Yalgorup National Park.

The Ramsar wetlands including Lake Pollard are listed on the Commonwealth EPBC database.

The dune systems within Yalgorup National Park that adjoins Lots 1001 and 1002 are the result of coastal deposition at a time of sea level changes. The limestone rocks and soils that can be seen at the surface inland from the coast are derived from the older Spearwood system, superimposed over the Spearwood system, for up to two kilometres from the beach. These are the sand dunes of the Quindalup Dune System, which have been blown in from the sea or washed ashore over the last 10,000 years.

The lakes that characterise the area lie in the depressions between a series of coastal dunes within the Spearwood system. The lakes form three distinctive lines parallel to the coast. Lake Preston is extremely elongated and lies closest to the coast. The lakes behind the next ridge are far more broken, comprising (from north to south): Swan Pond, Duck Pond, Boundary Lake, Lake Pollard, Martins Tank Lake, Lake Yalgorup, Lake Hayward and Newnham Lake. Lake Clifton is the furthest from the coast and the nearest to the Old Coast Road. It too is extremely elongated. (Modified from DPaW website).

Lake Clifton is some 2 km up groundwater gradient from the proposed excavation. Lot 1001 lies outside the Lake Clifton catchment*, (EPA Guidance No 28, Protection of the Lake Clifton Catchment 1998).*

Rock-like structures known as thrombolites can be seen on the edge of Lake Clifton. The thrombolite-building micro-organisms of Lake Clifton appear to be associated with upwellings of fresh groundwater that are high in calcium carbonate entering from the east and therefore not related to, and environmentally/hydrogeologically isolated from, the proposed limestone pit because the groundwater flows to a vegetated area between Lake Pollard and Martin's Tank Lake, around 1 kilometre from the edge of the limestone pit.

The micro-organisms living in the shallow lake environment are able to precipitate calcium carbonate from the waters as they photosynthesise, forming the mineralised structure that is the thrombolite. (Modified from DPAW website). There do not appear to be any Thrombolites in Lake Pollard although DPaW notes that the lake contains relic microbialite structures.

The Yalgorup lake system is significant for waterbirds and is recognised under the international Ramsar Convention.

The lakes provide important habitat for the international transequatorial waders that migrate from the northern hemisphere. These waders include the bar-tailed godwit, red-necked stint, greenshank, red knot, whimbrel and three species of sandpiper. Other waterbirds that use the lakes include the banded and black-winged stilts, red-necked avocet, hooded and red-capped plovers, Australian pelican and coot.

The quacking frog, turtle frog and slender tree frog are among the eight frog species that inhabit the park and the long-necked oblong tortoise is present in Lake Clifton.

Surveys carried out in south-western Australia between 1988 and 1992, showed that the Yalgorup lakes consistently supported the high numbers of musk ducks, Pacific black ducks, black swans and shelduck.

Black swans also live in high numbers at Lake Pollard, where they graze on extensive growths of stoneworts (musk grasses). The Shire of Waroona has in place a walking trail that runs from well to the south at Martin's Tank to Lake Pollard where a bird hide is located.

Lake Pollard

Lake Pollard is a Conservation Category Lake (UFI 3100) and is listed under the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 as an environmentally sensitive area under the Environment Projection (Clearing of Native Vegetation) Regulations 2004.

DPaW notes the vegetation surrounding Lake Pollard as Regionally Significant and a regionally ecological linkage is located immediately east of Lake Pollard. (DPaW Appendix 4).

The salinity of Lake Pollard, and Lake Clifton are similar and stratification does not generally occur.

DPaW notes that Lake Pollard is the only lake to support extensive areas of the aquatic plant *Lamprothamnium papulosum* which provides a valuable food source and supports large numbers of grazing water birds, up to 5 000 Australian Shellduck (*Tadoma tadornoides*) and 3000 Black Swan (*Cygnus atratus*). The lake also supports nesting habitat for Black Swans between October to March.

DPAW also notes that the lake contains relic microbialite structures.

As noted under 2.4 Hydrogeology above Lake Pollard accepts fresh water inflows from the west, including from Lot 1001.

Monitoring work performed by Cape Bouvard Investments found that the salinity in Lake Pollard varied from approximately 25,700 to 72,300 mg/L with salinities highest in the summer/autumn period.

The water levels and quality were assessed by Cape Bouvard Investments during the studies. They found that the lowest water level was recorded in March 2008 when the lake was slightly below mean sea level.

Cape Bouvard Investments 2009 found that the water elevation in Lake Pollard ranged from -0.4 metres AHD in February 2008 to +0.5 m AHD in July – September 2008 (Cape Bouvard Investments 2009 Figure 9). The lake was alkaline at pH 8 to 10 and in summer the high pH leads to precipitation of calcium carbonate making the water more turbid.

There have been some questions raised with respect to the carbonate concentrations in Lake Pollard and whether that will change as a result of limestone excavation.

The amended limestone quarry is now 600 metres from Lake Pollard, and Lake Pollard is not downstream of the quarry. The groundwater from the quarry travels to a vegetated area between Lake Pollard and Martin's Tank Lake and therefore will not influence the water in the lake.

Limestone such as this is crushed to increase the surface area and potential for soil acids to dissolve the calcium carbonate slowly over a number of years.

The crushing of the limestone floor may slightly increase the HCO_3^- content of water infiltrating under the floor of the pit, but like all limestone areas the water becomes saturated with respect to HCO_3^- and no further dissolution is possible.

The maximum dissolution will occur in winter as a result of the winter rainfall. It is noted that Lake Pollard is saturated in calcium carbonate which can lead to precipitation in summer as a result of water chemistry changes due to evaporation.

If there is any change to the calcium carbonate content of the groundwater as a result of the pit the groundwater logically will reach saturation with respect to HCO_3^- closer to the pit and then travel as saturated carbonate water in the same manner as currently exists. Once saturated no further dissolution can occur.

Therefore with the saturation of HCO_3^-, dilution factors, distance to the lakes and the groundwater water not flowing directly to the lakes, groundwater, there would not seem to be any significant mechanism for changes to the calcium carbonate content of the local groundwater and no impacts on the lake system

Recharge is not anticipated to change significantly and it if does there will be a slight increase as ground is opened and this will reduce as ground is closed.

See the attached Water Management Plan.

2.8 Yalgorup National Park

The Yalgorup National Park is situated between the Old Coast Road and the ocean. Figures 2 and 8.

The Park contains ten lakes and patches of small Tuart forests and woodlands.

The area was established as a National Park in the 1970's. The Aboriginal name chosen for the park is derived from two Nyoongar Aboriginal words; yalgor meaning 'lake or swamp' and up meaning 'place'.

The Yalgorup National Park is a discontinuous vegetated area extending along the western edge of Lake Clifton, adjoining the eastern boundary of Lots 1001 and 1002 and includes Lake Pollard. It also occurs along the western edge of Lots 1001 and 1002.

Yalgorup National Park has defined walkways within the vegetation that run from Martin's Tank Campground in the south to Lake Pollard where there is an established bird hide on the eastern side of the lake. The bird hide is over a kilometre from proposed excavations.

A walking track then runs around the perimeter of Lake Pollard but there is no connecting link across Lot 1001 which is private land. The walk track is well east from Lot 1002 and located behind a significant limestone ridge. Figure 2 and 11A.

The Park is used at all times of the year but more commonly in spring and autumn and Summer holidays. A camp ground exists at Martin's Tank where camping bays barbecue and picnic facilities are present.

There is an informal lookout at the southern edge of the limestone resource on the firebreak separating the Yalgorup National Park and Lot 1001.

3.0 PLANNING ISSUES

3.1 Current Land use

Most of Lots 1001 and 1002 have been parkland cleared and grazed for many years. The site was used for intense winter grazing by cattle.

A road reserve runs along the eastern boundary of Lot 1002 and cuts Lot 1001.

Lot 1002 was used as an airstrip for the aerial spreading of fertiliser and seed on local farming properties.

The remaining remnant vegetation has previously been strip cleared and intensively grazed to increase the returns from grazing.

The Yalgorup National Park surrounds the land. The Yalgorup National Park in this location is used for conservation and there is effectively no public access and no roads, parking or facilities.

3.2 Land Zonings and Policies

State Planning Policies

The State Planning Policy Framework provides for the implementation of a planning framework through the recognition and implementation of Regional Planning Policies above Local Planning Schemes and Policies.

Within each layer of planning, there are a number of key policies and strategies to provide guidance to planning and development to enable sustainable communities to develop, expand and prosper without compromising the environment and future generations.

Planning is governed under the *Planning and Development Act 2005.* This Act enables Government to introduce State and Regional Planning Schemes, Policies and Strategies to provide direction for future planning. The State and Regional Schemes sit above Town Planning Schemes and Strategies introduced by Local Government.

Strategies and Policies provide guidance on how planning is to be undertaken and how proposed developments are to be considered. These Strategies and Policies are at the State, Regional and Local levels.

Schemes are gazetted documents that provide for consideration and approval of proposed developments. These are normally at the Regional and Local Level.

In addition to the documents produced under the *Planning and Development Act 2005,* the *Local Government Act 1995* provides Local Governments with a mechanism to prepare Local Laws to manage issues of local significance.

As noted above the policies have little relevance over mining tenements on Crown Land in State Forest, but they do have relevance to the local roads, and the recognition of the need for limestone for dwellings, roads and construction.

Even though they are implemented under the *Planning and Development Act 2005,* over which the *Mining Act 1978* prevails, the policies have some relevance in providing guidance on the provision of basic raw materials for the community. They also have relevance in that the Department of Mines and Petroleum seeks advice from the Local Authority when assessing mining proposals.

Some policies do have relevance such as the State Industrial Buffer Policy and Basic Raw Materials Policy.

With respect to the supply of sand and limestone, the overarching document is the;

- State Planning Policy 1.0 State Planning Framework.

Complementing this are a number of Relevant State Policies;

- State Planning Policy 2.0, Environment and Natural Resources Policy
- State Planning Policy 2.4, Basic Raw Materials
- State Planning Policy 4.1, State Industrial Buffer Policy
- State Planning Policy 2.8, Bushland Policy for the Perth Metropolitan Region.

- ***State Planning Policy 2.0, Environment and Natural Resources Policy***

This policy provides for the protection of all natural resources under a number of sections;

5.1 General Measures
5.2 Water Quality including stormwater and wetlands
5.3 Air Quality
5.4 Soil and Land Quality
5.5 Biodiversity
5.6 Agricultural Land and Rangelands
5.7 Minerals Petroleum and Basic Raw Materials
5.8 Marine Resources and Aquaculture
5.9 Landscape
5.10 Greenhouse Gas Emissions and Energy Efficiency.

In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to *SPP 2.4 Basic Raw Materials*, *State Gravel Strategy 1998* and *State Lime Strategy 2001*. See Section 2.1 of this management plan.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials.

Part of Section 5.7 states;

> *Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.*
>
> *Planning strategies, schemes and decision making should:*
>
> *ii. Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 10 (2.4); Basic Raw Materials.*
>
> *iii. Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, by this management plan, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

- ***State Planning Policy 2.4, Basic Raw Materials, 2000***

This policy makes many statements on the intent and actions which local authorities should use to protect and manage basic raw materials.

Section 3.4 is very specific in explaining that basic raw materials need identification and protection because of increased urban expansion and conservation measures, (3.4.1), (3.4.2) and (3.4.4). Sections 3.4.5 and 3.4.6 recognise that environmental and amenity matters need to be considered.

There are specific provisions in Section 6.2 Local Planning Scheme Provisions, such as;

> *No support for the prohibition of extractive industries in zones that permit broad rural land uses.*
>
> *Providing an appropriate P, D or A use.*
>
> *Not precluding the extraction of basic raw materials on land which is not identified as a Priority Resource Location, Key Extraction Area* or Extraction Area (6.4.2).

The Western Australian Geological Survey has produced new mapping identifying Strategically Important Basic Raw Materials across private land and State Forest. The Geological Survey recognised the sand resources as a valuable community asset.

- ***SPP 2.5 – Agricultural and Rural Land Use Planning***

State Planning Policy No 2.5, Agricultural and Rural Land Use Planning, makes provision for the extraction of basic raw materials.

SPP 2.5 in Point 9 states that "The location of rural residential and rural small holdings should avoid unacceptable impacts on, or sterilisation, of natural primary resources including prospective areas for mineralisation and basic raw materials .....".

State Planning Policies are required to be considered under the Local Authority Town Planning Schemes as is the “identification and protection” for staged use, of basic raw materials.

- ***State Planning Policy No 4.1, State Industrial Buffer Policy***

SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise management, tree planting and operational procedures, are used to mitigate and reduce impacts.

This is discussed further in Section 2.8.1 Surrounding Landuses and 3.10 Buffers of this document.

- ***State Planning Strategy, 1997***

The Western Australian Planning Commission (WAPC) released the *State Planning Strategy in 1997*. It comprises a range of strategies, actions, policies and plans to guide the planning and development of regional and local areas in Western Australia and assists in achieving a coordinated response to the planning challenges and issues of the future by State and Local Governments.

The State Planning Strategy contains the following five key principles. These are:

- Environment & resources: to protect and enhance the key natural and cultural assets of the State and to deliver to all Western Australians a high quality of life which is based on sound environmentally sustainable principles.

- Community: to respond to social changes and facilitate the creation of vibrant, accessible, safe and self-reliant communities.

- Economy: to actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.

- Infrastructure: to facilitate strategic development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

- Regional Development: to assist the development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

- ***Directions 2031 and Beyond (WAPC 2010)***

Directions 2031 and Beyond provides data on the land uses and growth of the Perth Metropolitan and Peel areas over the 20 years to 2031.

- ***Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region (WAPC 2012).***

The Western Australian Planning Commission in *WAPC 2012, Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*, determined that limestone is in short supply and that all the limestone available including that in the Lake Pollard area was just sufficient to satisfy the demands of the region for the next 30 years. The demand for the next 30 years was listed in Table 7 of WAPC 2012 as requiring 30 359 000 m^3 of limestone within the next 30 years. Lime for agriculture was assessed as being 21 891 000 tonnes.

The Geological Survey estimated that the total limestone available, if all resources are taken, is 35 460 000 m^3 (WAPC 2012).

- ***Inner Peel Region Structure Plan 1997***

The Inner Peel Region Structure Plan 1997, lists Lots 1001 and 1002 as Rural – Broadacre.

- ***Coastal and Lakelands Planning Strategy 1999***

This Policy recognises the location as being in the Coastal precinct, being suitable for low density development and tourism. The Policy also recognises the need for Resource Extraction Activities and their location, as being determined by the “location of the resource”. The Geological Survey of WA recognises the significance of limestone in this location. (Figure 1).

The Policy recommends taking the resource from areas that are covered by remnant vegetation. The location of the proposed limestone pit is determined by the resource being located on a ridge. However the selection has taken into account the generally degraded nature of the site. (Attached Flora and Vegetation Assessment)

- ***Peel Region Scheme 2002***

The Peel Region Scheme overrides the *Town Planning Scheme (Planning and Development Act 2005 Part 9 123 (1 – 3)*. The Town Planning Scheme must be made consistent with the Peel Region Scheme *(Town Planning Scheme (Planning and Development Act 2005 Part 9 123 (1 – 3).*

Lots 1001 and 1002 will fall under the *Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy* dated October 2002. Section 5.0 of that Policy requires the town planning schemes to be consistent with the *Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy.*

Section 4.0 Objectives of the *Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy* direct; to identify land within the Peel Region that contains basic raw materials of State or Regional Significance and to prevent them from being sterilised by incompatible development and land uses.

Lots 1001 and 1002 are listed as Rural under the Peel Region Scheme.

The resource has been identified by the Geological Survey of Western Australia as a Regionally Significant Basic Raw Material – Limestone and therefore it should be used in a staged manner as proposed.

Local Government Planning Documents

- ***Shire of Waroona Town Planning Scheme No 7 (1996 – last updated 2012)***

The site is zoned Rural in the Shire of Waroona Town Planning Scheme No 7. There does appear to be a discrepancy between the Legend and the Scheme Text. The Scheme Text lists the zone as 13A Rural Coastal, whereas the legend that accompanies the Zoning Plans lists the site as 3A Coastal.

The Zoning Table lists the site as 13A but the Scheme Text on page 30 lists the zone as 3A Whilst this creates some confusion it is fairly clear what the intention of the zone is and what its name is.

Extractive Industries are an AA use in the Zone, which means that Council, using its discretion, may approve an Extractive Industry.

The relevant sections of the Rural Coastal Zone, seeks to ensure that appropriate rural activities are consistent with the protection of the coastal environment and the ecology of Yalgorup National Park. It also permits Council to approve the "establishment of commercial uses in accordance with the Zoning Table.

The text requires satisfactory advice from Department of Environment and Conservation (DPAW) and the Environmental Protection Authority to ensure that the proposed use does not detrimentally impact on the Yalgorup National Park.

Preston Beach North Road reserve runs across the southern end of Lot 1002 and an un-named road runs along the eastern boundary of Lot 1002 and cuts through Lot 1001.

- ***Shire of Waroona Local Planning Strategy 2009***

Section 14 of the Shire of Waroona Local Planning Strategy recognises the importance of basic raw materials and recommends that Industry – Extractive to be a permitted use in all Rural zones. Lots 1001 and 1002 lie within the Coastal Precinct and within the Rural Zone.

The Strategy recommends that extraction occur "where clearing of significant vegetation is not required and where the operations can be undertaken without unreasonable impact on the locality and environment. Extensive rehabilitation to be undertaken on a cell by cell basis on all extraction sites upon completion of extraction in that cell."

The location of the pit is determined by the location of the limestone resource. However an area of partially degraded vegetation has been selected for extraction. Only 10 plant taxa are present within the extraction area, which is low and indicates the level of disturbance and grazing.

Excavation is proposed to be progressively followed by rehabilitation. The proposal has been designed to minimise impact on the local environment and the tourism and conservation values of the local area.

- ***Shire of Waroona Extractive Industries Local Law 1999***

The proposed excavation has been designed to comply with the Local Law.

3.3 End Use

The planned end use of the site is to restore a natural soil and return the ridge to native vegetation along the buffer to Lake Pollard and on the steeper southern and northern slopes with pasture in the west so there is no net loss of native vegetation.

3.4 Responsible Authorities

A number of state and local government authorities are responsible for overseeing the safety and management of the proposed quarry. Other authorities have an interest in the proposal but may not hold any responsibility.

Shire of Waroona

- Provides Planning Consent.
- Issues the Extractives Industries Licence for the quarry.
- Regulates land zonings in conjunction with the Western Australian Planning Commission.
- Has control over local roads.

Main Roads

- Has an interest in the transport routes and controls major roads.

Department of Water

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

Department of Environment Regulation

- Oversees all aspects of environmental impact and management.
- Issues licences for crushing and screening plants.

- Has an interest in the flora and fauna of the area, particularly Lake Preston.
- Provides Approval for clearing under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*

Western Australian Planning Commission

- Responsible for structure plans.
- Responsible for State Planning Policies.
- Responsible with the Shire for land zoning.
- Responsible for State Planning Policy No 2.5, Agriculture and Rural Land Use Planning.

Environmental Protection Authority

- Oversees the potential for significant environmental impacts on environmental matters.

Department of Mines and Petroleum

- Controls the safety and methods of excavation through the *Mines Safety and Inspection Act 1994.*
- Responsible for overseeing the health and safety of the operations and the administration of the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Department of Planning

- Responsible, in conjunction with the Western Australian Planning Commission, for *Directions 2031 (2010)* and *Draft Industrial Land Strategy Perth and Peel (2009).*

Department of Aboriginal Affairs

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

Commonwealth of Australia

- Oversees the potential for impacts on matters listed under the *EPBC Act 1999*, including Lake Clifton and Black Cockatoos.

3.5 Social Impacts

The main potential social impacts are to perceived local recreation values.

Lake Pollard lies within the Yalgorup National Park. There is no access to the lake from Lot 1002. The Lake Pollard Walk Trail, which runs from Martins Tank in the south, extends to the bird hide on the eastern side of the lake with an extension running along the fire break south of Lot 1001 to the peak of the ridge which acts as an informal lookout.

The proposed pit is separated by a sigificant distance from the walk trail which is well to the east behind a limestone ridge.

The proposal has been designed to enable use of the lookout to continue near Lot 1001 and it is believed that the quarry will be hidden from view from Lake Pollard Walk Trail.

Whilst Saturday transport is desirable for agricultural supply a compromise has been offerred to restrict operations and transport to Monday to Friday excluding Public Holidays to minimise potential impacts on road traffic and tourism.

The operation of the pit is anticipated to be January to April annually, avoiding the busy spring and Holiday tourist seasons. By Easter operations will be winding down.

4.0 QUARRYING OPERATIONS

The proposed methods of excavation will be the same as those used on the existing pits on Lot 4, Ludlow Road, Myalup operated by Doyles Lime Service. The Myalup operation will be used to demonstrate the nature, size and scale of the proposed operations on Lot 1002. Figures 5, 6 and 10.

The descriptions and photographs of the Myalup limestone pit that are used in this documentation will provide the information on the proposed operations.

Limestone will predominantly be used for agriculture, although road base and minor other products will be produced as the higher grade material becomes exhausted. The taking of road base is more likely to be a second phase of excavation by another operator after all the limestone suitable for agriculture has been taken.

The limestone is relatively soft and can be removed with an excavator or loader without the need for a bulldozer or blasting. It is then screened to produce products of the correct size. A small mobile crusher is required to prepare the correct grainsize.

All screening and crushing equipment is portable and brought to the site as needed. The necessary Licences for the equipment will be obtained from the Department of Environment Regulation for all plant used on site as required.

Quarry operations will be carried out under the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. 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.

Overall the proposed pit is well isolated from any sensitive premises with none within 1 km.

Project Summary

ASPECT	**PROPOSAL CHARACTERISTIC**
EXCAVATION	
Area of proposed new excavation	Proposed Pit – 13.0 hectares in four stages of about 4.0 hectares. Sand excavation 3.0 hectares.
Limestone extraction	50 000 per year
Sand Extraction	10 000 tonnes per year
Total estimated resource	Limestone - approximately 1 000 000 tonnes. Sand 150 000 tonnes but with potential to expand
Life of project	20 years
Area cleared per year	Initially about 2 hectares and then 0.5 – 1.0 per year depending on the elevation of the ridge. Sand excavation can occur for the most part without the need to clear native vegetation.
Total area to be cleared	7.5 hectares in proposed pit The future pit of 2.5 ha will also require clearing when applied for and approved.
Area mined per year	0.5 – 1.0 hectares total
Dewatering requirements	None
Maximum depth of excavations	16 metres
PROCESSING	
Limestone	50 000 tonnes per year
Water requirements	Only required for dust suppression on road

	transport.
Water supply source	Existing sump for which application will be made to use 5 000 kL per year for commercial purposes.
INFRASTRUCTURE	
Total area of plant and stock	Located within excavation footprint or on adjoining cleared land. 2.0 ha
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	
Truck movements	Variable but approximately 10 laden trucks per day maximum
Access	Existing limestone Preston Beach North Road from the sealed Preston Beach Road.
WORKFORCE	
Construction	2 –3
Operation	2 - 3
Hours of operation	Monday - Friday 6.30 am to 5.00 pm excluding public holidays.

4.1 Limestone Extraction

1. Any trees cleared will be utilised for firewood wherever possible. In general the Eucalypt trees around the base of the ridge and through the swale have been excluded from development because the land holder wishes to retain as many as possible. However the removal of some trees may be unavoidable. Figures 5, 6 and 10.

2. An Application for Clearing is concurrently lodged with this application to cover the remaining remnant vegetation on site. A Clearing Permit will be applied for to cover the clearing of the proposal area.

3. The excavation footprint has been determined from Landgate contour mapping and detailed aerial photography. Prior to excavation commencing the site will be ground surveyed, the excavation footprint marked out and a 1 metre contour plan developed.

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

5. Where practicable vegetation will be directly transferred to an area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on batter slopes of completed areas.

6. If direct transfer is not possible the vegetation will be stored in dumps, mulched or swapped with a nearby operator to try and ensure that the material is not wasted.

7. All topsoil will be removed for spreading directly onto areas to be revegetated and screening or perimeter bunds. If direct spreading is not possible the top soil will be stored in low dumps, for spreading at a later date. See 5.9.2 Rehabilitation Procedures. Unfortunately much of the topsoil has a high weed load of pasture species some of which are invasive. It may not always be possible to reuse this apart for creating pasture.

8. Soil and overburden, as yellow and brown sand and low grade limestone, will then be removed and either directly transferred to a rehabilitation area or stored in low dumps for later rehabilitation use. Where this is not used overburden will be stored in dumps for future use in rehabilitation or the creation of bunds.

9. Limestone interburden, if encountered, will be incorporated into the overburden dumps for later use in re-contouring the land surface at the conclusion of excavation.

10. A bulldozer will be used to rip and push the limestone down the excavation face and track roll the limestone in the process.

11. The preliminary crushed limestone will then be picked up by a rubber tyred loader and fed to the mobile crusher.

12. All static and other equipment, such as crushers and screens (where used), will be located on the floor of the quarry to provide visual and acoustic screening. Figures 5, 6 and 10.

13. Excavation will commence on the western ridge and then move to the eastern ridge, working on the floor of the pit towards the edges to minimise the potential visual impact. The face and walls of the pit will act as noise barriers.

14. Upon completion of each section of quarry the section will be reformed and back filled, where subgrade material is available, to achieve the proposed final contours which are shown on the plan "Proposed Finished Contours".

15. It is not anticipated that blasting will be required.

16. At the end of excavation the floor of the quarry will be deep ripped, covered by overburden and top soil, and rehabilitated to a constructed soil. Details of the Rehabilitation are listed under 5.9 Rehabilitation.

Sand Extraction

17. Sand will be sourced by pushing the topsoil into perimeter bunds for later rehabilitation.

18. Sand will then be excavated with a loader, loading directly to a road truck.

4.2 Staging and Timing

The excavation footprint has been determined from Landgate contour mapping and detailed aerial photography. A staging plan is attached and shows indicative staging and the direction of excavation. Figure 11.

Prior to excavation commencing the site will be ground surveyed, the excavation footprint marked out and a 1 mete contour plan developed.

At this stage it is difficult to predict the speed of excavation because the amount of material extracted depends on market conditions.

50 000 tonnes of limestone may be extracted in a year. Limestone extraction will generally only be during the summer and autumn months for agricultural lime. Actual quantities will depend on the type and size of contracts won, and sales.

However it is expected that the quarry will progress by up to 0.5 to 1.0 hectare per year. Twenty years of resource is anticipated to be available on site.

The active area needs to be large to enable a range of limestone products to be available at all times, and to provide sufficient area for processing/screening and for stockpiles.

Wherever possible all completed ground will be rehabilitated as soon as possible to ensure that the amount of ground that is open at any one time is minimised. The nature of the excavation means that it will be difficult to commence rehabilitation of the floor of the quarry until the underlying limestone has been removed.

Sand extraction will be in the order of 5 000 to 10 000 tonnes per year. It is anticipated that it will be used predominantly for sand fill at Preston Beach and nearby.

4.3 Hours of Operation

Hours of operation will be 6.30 am to 5.00 pm Monday to Friday inclusive, excluding public holidays. See Traffic Management in Appendix 2 for additional information.

Transporting material on Saturday would be desirable but is not regulated by reduced truck speeds in order to minimise impact on visitor traffic along Preston Beach Road. Saturday transport is requested to enable farmers to access lime in the autumn period prior to sowing their crops.

4.4 Access, Transport and Security

Access to the site will be along Preston Beach Road which is sealed, and then to Preston Beach North Road which is limestone and will need grading and maintenance. See Traffic Management in Appendix 2 for additional information.

Traffic volumes along Preston Beach Road are greater, with most traffic associated with holiday times and on weekends. On the other hand there is little traffic along Preston Beach North Road which does not lead to any dwellings.

Preston Beach Road exits onto Old Coast Road at a long time established intersection.

Transport from the site is by a variety of trucks depending on the contractor and the type of product carried. In summer – autumn, when the majority of lime is sold, there will be an estimated maximum of 50 laden truck movements leaving the site in one week although this number will vary with market demand. At times when road making materials are being transported from the site the number of truck movements may be greater.

On any week day the number of trucks is anticipated to be 10 to 15 laden trucks which will be 1 to 1.5 per hour. On Saturday the number of laden movements is, from the experience at Myalup, expected to be less with less than one laden truck per hour.

The destination of the lime is normally in the Wheatbelt and any truck will normally only access the site once on any day.

The access and internal roads will be limestone based and watered as needed in the drier months to suppress dust.

The existing perimeter fences and gates will be maintained. Warning signs will be maintained as required by the Department of Mines and Petroleum and the Shire of Waroona.

4.5 Equipment

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

Site office	A caravan is proposed to serve as a site office.
Toilet system	Portable serviced system will be used
Bulldozer	Removal of limestone rubble and road base, track crushing of limestone as required and pushing down the resource.
Excavator	May be used to remove limestone.
Portable crushing plant	Preparation of road base and agricultural lime.
Screening plant	Preparation of limestone for road base.
Water tanker	Used for dust suppression on the access roads and working floors as necessary.
Loader	Loading and handling materials from the stockpiles.
Fuel Storage	Refuelling will be undertaken using potable tankers located 800 metres from Lake Pollard and not upstream of the lake. If required, fuel will be stored in an above ground tank with a capacity of approximately 5 000 litres, appropriately located on the floor of the pit to Department of Environment Regulation, Department of Water and Department of Mines and Petroleum Guidelines. Fuel storage will be located in a bunded area lined with an impermeable membrane a minimum of 800 metres south west from Lake Pollard 4 metres above the highest known water table.

Excavation

During excavation a bulldozer and loader or excavator will be used to move the topsoil, clay resource and overburden.

The loader will then pick up the freed resource and feed it to the mobile crushing plant.

4.6 Final Contours

The slope of the final contours of the proposed pit is an undulating surface at around 5 metres AHD which is consistent with the adjoining land.

Slopes of the batters at the end of excavation will be retained at 1 : 4 vertical to horizontal.

Sand excavation will cut to an elevation of 4 metres AHD because the resource is thin. That retains 3 metres to the water table post mining which complies with all development or rural guidelines.

See Attached Concept Final Contour Plans. Figures 11B.

4.7 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.

4.8 Water Usage

Water will only be required for dust suppression, which will be carried out as required during drier weather. A water tanker will be used to water the access road and the pit floor whenever necessary to minimise dust generation from transport and during crushing. Normally only small volumes of water will be used for a quarry of this type. A quarry could be expected to require less than 5 000 kL per year.

Water will be drawn from a sump located to the west of Lot 1001. A licence from Department of Water will be applied for to enable the taking of up to 5 000 kL water per year for dust suppression.

There will be no significant change to recharge or water flows to Lake Pollard during excavation or as a result of excavation. See the Water Management Plan Appendix 6.

Potable water will be brought to the site as required.

4.9 Transport Corridors

Lime products are to be transported from this site for about three months through late summer and autumn (January to April). See Traffic Management in Appendix 2 for additional information.

Road transport use a variety of trucks such as semi-trailers or rigid (8) wheeler trucks to a 5 axle dog trailer.

Department of Parks and Wildlife raised a number of issues in relation to the trannsport along Preston Beach North Road.

A traffic Management Study has been commissioned from Greenfields Technical Services and is attached as Appendix 2.

DPaW (Appendix 4) raised concerns with respect to potential impacts on the Yalgorup National Park, visitors and recreational users and on the Martin's Tank Campsite. DPaW note that upgrades to the Martin's Tank Campsite will incorporate some campervan and caravan accommodation.

DPaW also raised the issue of walkers who currently use section of Preston Beach Road North and the intersection of Preston Beach Road and Preston Beach North Roads. In addition potential noise and dust impacts on the amenity of Martin's Tank Campsite was noted.

Greenfield Technical Services assessed the road impacts based on 50 000 tonnes per year of limestone transported during the period December to April annually. See Appendix 2.

Greenfield noted that being public roads there is no restriction on 19 metre semi-trailer trucks using Preston Beach North Road. The Shire has erected a sign on the road "Closed to all vehicles Class 3 and over". An email has been received from the Shire of Waroona that is included in Appendix 2 that states that "When DPaW did some improvements to their campsite at Martin's Tank, which is at the end of the road, we (The Shire of Waroona) negotiated with them to allow them to use larger vehicles, with conditions. We'd be looking to instigate something similar if Doyles' proposal gets up".

Greenfield recorded the road as a flat bladed sandy material with some evidence of limestone sheeting. Road minimum widths vary from 5.4 to 7.0 m plus. Sight distance is compromised by roadside vegetation and varies from 60 – 200 metres. See Appendix 4 for photographs.

It is calculated that "as of right" 19 m long semitrailer combinations with approx 30 tonne payloads would equate to 1563 loads from site. That is 10 loads per day or 20 movements per day and 2 per hour on average.

Greenfields determined that the current road structure will not support that traffic in its present form. Some changes to intersection and sightlines will also be required.

Several scenarios are presented by Greenfield Technical Services which included consideration of the Martin's Tanks Campsite traffic. The most expensive and extensive being Option 2B. See Traffic Management in Appendix 2 for additional information.

It is a little unclear why the Lake Pollard walk trails uses Lake Preston North Road for part of its route. (DPaW Appendix 4). There is another route through woodland and it remains unclear why visitors would walk along the road, from a safety or experience point of view. The trail just touches the road for less than 50 metres at a sharp left dogleg and from observations it appears that there are short cuts removing the need to access the road.

As part of the upgrade a shortcut should be constructed to be part of the track, and the public safety for users of the DPaW walking trail would be improved.

Discussions have been held with Doyles Limes Service who have indicated that the upgrade to the road as Option 2B would be the most suitable and are prepared to commit to that. This work will be completed through the Shire of Waroona in consultation with Department of Parks and Wildlife.

This will mean that;

- The road network will be upgraded to take the required truck traffic.
- Upgraded intersection work and signage.
- Trimming of road vegetation to increase sightlines.
- Grading of the road.
- Additional signage.
- The road will become safer for all users including the caravans and visitor traffic to Martin's Tank.

In addition

- Carting will be December to April inclusive which will avoid the busy spring season and could exclude Christmas and Easter holiday seasons.
- During transport, a water cart will be provided on site to ensure the road is treated for dust as required.
- Speed restrictions could be placed on the road, particularly for truck traffic.
- Construct a short cut to avoid the need for users of DPaW Lake Pollard Walktrail to walk along Lake Preston North Road and increase the safety for walkers.
- Check and modify the entrance to Martin's Tank Campsite to ensure that the safety of walkers is improved.

These measures will benefit all road users.

See Appendix 2.

4.10 Safety

Excavation will be conducted to *Mines Safety and Inspection Act 1994 and Regulations 1995.* Excavation practices, and operations procedures will be in compliance with the Act. Health and safety issues are overseen by the Department of Mines and Petroleum.

Regular inspections and audits will be carried out by officers of the Department of Mines and Petroleum to inspect safety, operational procedures and workplace health such as dust and noise.

Doyles Lime Services has procedures in place to manage safety, health, environmental impact, site completion and rehabilitation. All workers are required to wear full protective safety and high visibility gear when on site.

They have in place Safety Management Plans and a site specific Emergency Response Plan to cover operational procedures, which include workforce induction and training to ensure that all employees involved are made aware of the environmental and safety implications associated with all stages of the mining activities.

Workers and staff on all sites 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.

All vehicles have two way radio capability. No light vehicles are permitted on site without registering with mobile plant on site. Full personal protection is required for all persons on site at all times.

The site is registered under the Department of Mines and Petroleum SRS reporting system for minesites and quarries.

It is anticipated that the deepest excavation will be a maximum of approximately 16 metres below natural ground level. Where possible no slope will be left at an angle greater than 1: 2 vertical to horizontal at times when the site is unattended. There may be times when this is not possible or desirable.

At all times excavation will be in compliance with the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Fencing, locked gates and warning signs will be maintained.

The batter slopes of the pit will be dozed down at between 1 : 1 and 1 : 2 which will prevent any fall situations. A fence will be constructed around the top of the pit, installed with warning signs. The fence will be approximately 1.2 metres high and of farm wire construction.

The edge of the pit will be located 500 metres from the informal lookout separated by remnant vegetation on private land and fences.

Emergency

The site is within mobile phone contact and all vehicles will be equipped with two way radios. Safety management and operating procedures will be in place.

Fire

Fire risk is less than the risk from general farming. The open area of excavation will form a natural firebreak and will be used for the emergency muster area.

Fire Safety is incorporated into safety management for the site.

The site is within mobile telephone range which will assist in fire safety.

Earth moving vehicles, and the water tanker when on site during excavation, will be available for fire fighting if required. Operators are trained in the use of fire extinguishers for all types of fire.

Perimeter fire breaks will be maintained.

Final contours of the batter slopes will be 1: 2 vertical to horizontal with the floor of the excavation left as gently undulating around 6 metres AHD.

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.	Doyles Lime Service are committed to maintaining a safe working environment and have standard Safety Management Plans for their operations.	Compliance with *Mines Safety and Inspection Act 1994 and Regulations 1995.* Ongoing
Adjoining properties	*Mines Safety and Inspection Act 1994 and Regulations 1995.* • Warning signs are erected around the operating area. • Locked gates and fences will be maintained on site.	Doyles Lime Service are committed to maintaining a safe working environment and have standard Safety Management Plans for their operations.	Compliance with *Mines Safety and Inspection Act 1994 and Regulations 1995* Compliance operating conditions

5.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

5.1 Surrounding Landuses and Buffers

The site has been used for agriculture and grazing for many years.

A number of Government Policies relate to buffer distances and the protection of basic raw materials. State 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. Figures 1, 2 and 8.

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.

The Environmental Protection Authority of South Australia recommends a 300 metre separation for a Quarry - Non Blasting.

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.

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

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

The same type of quarrying therefore has very different generic buffers developed by State Environmental Protection Authorities, illustrating the need to consider separations on on-site environmental impact and not theoretical or generic buffers.

The main issues are the potential generation of dust and noise, which are addressed later.

The excavation of limestone from the site complies with these policies.

As far as is known there are no dwellings within 1000 metres of the proposed excavation and no new dwellings in the nearby area. The closest dwellings are 2.8 km away to the east of Lake Clifton

The site is set back 600 metres from the edge of Lake Pollard.

The Lake Pollard Walk Trail does not extend onto Lot 1001 or Lot 1002 and is located 600 km from the proposed limestone pit behind the intervening ridge and 500 metres from the lookout. Figure 2.

5.2 Aesthetics

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.

The limestone will be extracted from a ridge and will result in the ends of the two dunes being reshaped down to the elevation of the intervening swale. The main ridge line will not be modified but maintained. Figures 5 and 8.

See also the notes under 5.1 Surrounding Landuse and Buffers above.

For sand excavation the thin resource and low elevation requires cutting to 4 metres AHD, 3 metres above the water table in compliance with DOW guidelines and matching nearby and adjoining swales.

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 main risk of view is from the east, east of Lake Clifton and the Lake Pollard walk Trail which will now be separated by a distance of 600 metres behind the main limestone ridge.

It is felt that the operations are unlikely to be seen from any location.

Below is a list of ideal visual management activites with a simple compliance audit for the operations.

IDEAL OPERATIONAL PROCEDURES	**COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE**
• Locate exposed features behind natural barriers and landform.	• The quarry and processing facilities are to be worked from the west behind the ridge of material being excavated. • The limit of the pit is set back 600 metres from Lake Pollard and there is intervening vegetation and high ridge between the pit and Lake Pollard. Figure 3.
• Operate from the floor of the pit below natural ground level.	• The pit is to be worked from the inside below natural ground level via an internal haul road. • The processing area is to be located on the floor of the pit to the west, in the most efficient location. Figure 5.
• Avoid breaks in the skyline due to workings and haul roads.	• Excavation will come from the west. The main ridge will not be altered and the skyline will not change . • There are no sensitive premises or locations from which people are likely to see the pit from the east or south. • At all times the pit will be operated behind a face of natural vegetation. • Based on the site contours and the proposed excavation methods operations are not anticipated to be seen from Old Coast Road. It may just be possible that the northern batter face and the southern batter face will be visible from

	the south east and north east as small glimpse from east of Lake Clifton, but as these will be rehabilitated these views are anticipated to be covered within two years of excavation of that part of the pit.
• Push overburden and interburden dumps into positions where they will not be seen or can form screening barriers.	• Perimeter bunds of overburden and natural face are to be used when material becomes available, but largely in the west and just ahead of excavation to increase the potential screening.
• Construct screening bunds and plant tree and shrub screens to reduce visual impact.	• Some screening bunds and natural vegetation are already in place around the perimeter. • The bunds will be used as overburden becomes available. • A screening belt of trees will be used on the southern edge of the pit. • A separation of 500 metres will be maintained to the lookout on the fire break in the Yalgorup National Park. Figure 3. • It is not anticipated that the quarry will be able to be seen from the Yalgorup National Park or Lake Pollard Walk Trail because of the design of the operations to minimise visual impact and the visual management procedures and actions proposed. Figure 3.
• Stage workings and progressive rehabilitation to provide visual protection of later activities.	• The staging of the pit footprint is designed to minimise visual impact with special attention concentrating on the eastern sightlines.
• Cover barriers and landscaping with forms, colours and textures compatible with the natural environment.	• Natural vegetation will be retained around the perimeter.
• Adopt good house cleaning practices such as orderly storage and removal of disused equipment or waste.	• Doyles Lime Service maintains a tidy work environment at all their sites. Waste is regularly removed off site to an approved waste facility. • Where possible usable materials will be recycled which is part of normal operational procedures.
• Provide progressive rehabilitation of all completed or disturbed areas.	• This has always been used at other pits and is proposed. • Areas not required will be revegetated when each part of the site has reached its final form.
• Minimise the amount of ground used at any one time.	• The amount of ground used will be minimised to that needed for current and future operations and fluctuations.

Light Overspill

No night activities are proposed.

Visual Management - Applicable Legislation / Policies
• None applicable
Commitments to Visual Management
• Doyles Lime Service is committed to management of visual impact and will implement the measures outlined. • Every effort will be made to minimise the visual impact using appropriate methods from those listed above.

5.3 Noise

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 and rural areas, are not subjected to general noise levels (excluding blasting), during the hours 7.00 am to 7.00 pm Monday to Saturday that exceed 45 dBA. Allowable noise to 55 dBA is permitted for up to 10% of the time and to 65 dBA for 1% of the time. Noise levels are not to exceed 65 dBA during normal working hours.

Between 9.00 am and 7.00 pm on Sundays and Public Holidays and between 7.00 pm and 10.00 pm on all days the base level is 40 dBA.

At night, between 10.00 pm and 7.00 am Monday to Saturday, and before 9.00 am on Sundays and Public Holidays, the permitted level drops to 35 dBA.

The 10% and 1% “time above” allowances apply at night and on Sundays and Public Holidays as well.

There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, that are added to the permitted levels. That is, if the noise is tonal or modulated the permitted levels drop by 5 dB. Impulsiveness is not likely to be relevant for the quarry under normal circumstances.

Influencing factors of external noise and nearby land uses such as busy roads, and industrial properties are not applicable to this site.

At a distance greater than 15 metres from the sensitive premises (eg dwelling), and commercial premises a base level of 60 dBA applies at all times with the 10% time permitted to be up to 75 dBA and the 1% permitted to be up to 80 dBA. For Industrial premises the base level is 65 dBA at all times with the 10% time permitted to be up to 80 dBA and the 1% permitted to be up to 90 dBA.

Noise can originate from a number of operations and may impact on onsite workers, or travel offsite and impact on external sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

There are a number of management actions that can be taken in quarries to minimise noise generation or travel .

These actions are routinely used by Doyles Lime Service where applicable and as the opportunity presents to minimise noise on site.

Doyles Limes Service will comply with the *Environmental Protection (Noise) Regulations 1997.*

There are no known sensitive premises within 1 km, with the closest dwellings being 2.8 km away across Lake Pollard and Lake Clifton.

Occupational Noise

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 Mines and Petroleum.

As part of its commitments, Doyles Lime Service continues to be pro-active with its worker safety awareness;

- by providing all necessary safety equipment such as ear protection,
- identifying sections of the plant where hearing protection is required, as well as,
- conducting induction and educational programs for its staff.

The operating noise levels around the site are regularly monitored by independent consultants in accordance with the *Mines Safety and Inspection Act 1994*, and the results communicated to the Department of Mines and Petroleum (DMP). All staff are provided with comprehensive ongoing training on noise protection as part of Doyles' commitment to occupational health and safety.

The DMP conducts Occupational Noise Audits of the Operations, on their existing operations, which have been found to be in compliance.

Warning signs are to be used to identify areas of potential noise for workers.

All static and processing equipment will be located to provide maximum noise screening, behind bunds if sufficient overburden is available. Excavation will be staged from the west, behind the eastern ridge which will provide continuous noise screening.

Not all equipment operates at the same time. Similarly not all resources will be worked at the same time.

Warning signs are to be used to identify areas of potential noise.

IDEAL OPERATIONAL PROCEDURES	**COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE**
• Comply with the *Environmental Protection (Noise) Regulations 1997.*	• The proposed operations are so far from any dwelling, > 1 km and screened by the eastern face, that they will comply with the Regulations.
• Comply with the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995*.	• Doyles Lime Service, like any quarry, is regularly inspected by officers of the DMP.
• Maintain adequate buffers to sensitive premises.	• The quarry complies with the Generic EPA Buffer Guidelines. • There are no dwellings within 1000 metres.
• Locate exposed features behind	• The eastern and southern faces of the

natural barriers and landform.	pit will provide hard screening of the operations which will be located on the floor of the pit.
• Operate from the floor of the pit below natural ground level.	• This will be used.
• Push overburden and interburden dumps into positions where they can form screening barriers.	• Perimeter faces, overburden dumps and natural vegetation are proposed where possible.
• Design site operations to maximise the separation and protection from sensitive premises.	• The shape of the pit, setbacks and method of operation have been designed to ensure landform protection is maximised will continue.
• Maintain all plant in good condition with efficient mufflers and noise shielding.	• Doyles Lime Service has efficient equipment that is maintained in good condition and replaced from time to time.
• 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 in good condition in conjunction with the landholder's access road.
• Implement a site code outlining requirements for operators and drivers.	• A site induction and training program for all personnel is to be implemented and maintained.
• Shut down equipment when not in use.	• This is normal policy.
• Scheduling activities to minimise the likelihood of noise nuisance.	• Activities are proposed to minimize impacts on the local community.
• Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible.	• Lights or low frequency beepers are to be used rather than beepers. • The design and shape of the pit will maximise noise screening.
• Use transport routes that minimise community disruption.	• There is only one road to access the site, so trucks will be specifically instructed not to interrupt holiday makers on Preston Beach Road.
• Avoid the use of engine braking on product delivery trucks in built up areas.	• The surrounding area on Old Coast Road is generally flat with reduced gradients. • Air brakes are unlikely to be required. Drivers are to be instructed not to use air brakes under normal situations when exiting along the access road.
• Minimise and conduct at the least disruptive times, non day to day activities such as vegetation, topsoil or overburden stripping on exposed ridgelines.	• The hours proposed are designed to minimise impact.
• Provide a complaints recording, investigation, action and reporting procedure.	• A complaints recording procedure is proposed to cover all site activities.
• Conduct training programs on noise minimisation practices.	• Doyles Lime Service conducts site induction and training to all personnel.
• Provide all workers with efficient noise protection equipment.	• All noise protection personal equipment will be provided to staff.

• **Noise Management - Applicable Legislation / Policies** • *Environmental Protection (Noise) Regulations 1997.* • *Mines Safety and Inspection Act 1994 and Regulations 1995.* • *Australian Standard AS 2187.*
Commitments to Noise Management • Doyles Lime Service is committed to minimising noise emissions and will implement the measures outlined above. • Doyles Lime Service will comply with the *Environmental Protection (Noise) Regulations 1997.*

5.4 Dust

High Impact Audits of occupational dust will be completed by Department of Mines and Petroleum from time to time.

Doyles Lime Service provides induction and protective equipment for all persons on sites.

Dust Management Actions

Extensive Dust Management is proposed as outlined in the Dust Management Plan included as Appendix 5.

The proposed dust management will minimise the risk of dust to Lake Pollard and local road users.

Doyles Lime Service will upgrade the road network as outlined in Option 2B in Greenfields Technical Services Traffic Management Plan attached at Appendix 2.

Greenhouse Gas

The development of agriculture in the local area, near wheatbelt, Peel and Bunbury Regions generates the need for lime products for soil neutralisation on farms and developments. There is also a need for roadbase although this will not normally be produced at this pit.

Over the years trucks have become more efficient with respect to greenhouse gas emissions, particularly with the use of truck and trailer and road train configurations.

Doyles Lime Service continually seeks ways to reduce the amount of fossil fuels used, and has obtained more efficient mobile plant and equipment when this has become economically available.

Dust Monitoring

The most effective dust monitoring is through visual diligence. This is instantaneous and any issues can be observed and acted upon before they become a problem.

No other form of monitoring is so immediate, as other measures are either on property boundaries of have significant time delays.

Visual dust monitoring will be conducted on site at all times by all operators and the quarry manager.

The amount and source of dust will be observed before any dust monitoring could trigger. Treatment is therefore more effective and targeted.

When a significant source of dust is noticed it will be dealt with by temporary or permanent changes to procedures and equipment or treatment using water.

A personal (occupational) dust monitoring program will be used as per Department of Mines and Petroleum specifications.

High Impact Audits of occupational dust will be completed by Department of Mines and Petroleum from time to time.

Doyles Lime Service provides induction and protective equipment for all persons on site.

Dust monitoring is tied to a proposed complaints mechanism.

Dust Management - Applicable Legislation / Policies
• *Guidance for the Assessment of Environmental Factors, EPA, March 2000.* • *Land development sites and impacts on air quality, DEP, 1996.* • Department of Environmental Protection Guidelines, November 1996 and *DEC 2008, A guideline for the development and implementation of a dust management plan*
Commitments to Dust Management
• Doyles Lime Service will take the necessary steps to manage and contain dust by implementing and maintaining the Dust Management Plan.

5.5 Water Quality

- **Background**

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 *Land Use Compatibility in Public Drinking Water Source Areas.*

The protection of water, whether groundwater or surface water, is an important part of the management of quarries.

The main Environmental Objective relating to water management is;

- Minimise the impact on surface and ground water quality.

The limestone pit site lies on a ridge that is well elevated and set 600 metres away from the edge of Lake Pollard and not upstream of the lake.

Shallow groundwater on Lots 1001 and 1002 is fresh, sitting as a layer overlying the saline groundwater. Groundwater flow is to the east to Lake Pollard.

A sump is present in the north of Lot 1002 that is used for stock.

Water will be sourced from the property by way of the use of a sump that is also used for stock. A Licence from the DOW may be required for the anticipated 1 500 kL of water likely to be required for the management of dust.

The base of the excavation will be over 4 metres to the water table.

Potable water will be brought in from scheme supply and used to fill a tank at the site office.

The management actions are considered in the Water Management Plan attached as Appendix 6. See also Section 2.7 Wetlands.

The proposal is consistent with all Government Policies for extraction of limestone and sand and complies with the same requirements for extracting in Priority Drinking Water Source Protection Area.

Water Management - Applicable Legislation / Policies
DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing • *Overview* • *Minesite water quality monitoring* • *Minesite stormwater* • *Mechanical servicing and workshop facilities* • *Mine dewatering* • *Health Act 1911*
Commitments to Water Management
• The site complies with Department of Water Guidelines for separation to groundwater. • The nature of the operation and the depth to groundwater will minimise any risk to groundwater systems and Lake Pollard. • Management procedures outlined above are committed to, to protect water quality. • There will be no alteration to surface water flows or groundwater levels. • Doyles Lime Service has in place a site code outlining requirements for operators and drivers. • Doyles Lime Service conducts training programs on pollution minimisation practices. • Doyles Lime Service conducts regular water sampling of the water source sump and maintains the water quality protection measures listed above.

5.6 Biodiversity Management

5.6.1 Vegetation and Flora

Regional vegetation and flora assessments were made by Freeman, K, B Keighery, G Keighery, V Longman, A Black and S Molloy, 2009, *Flora and Vegetation of the Dawesville to Binningup Region (Swan Coastal Plain)*, prepared for the DEC.

Extensive flora and vegetation studies were conducted for the land to the north and touching the northern boundary of Lot 1001 by Cape Bouvard Investments 2009 in support of proposed developments. Appendix 1.

All these studies provide background to the vegetation on site.

In order to provide additional information, a separate flora and vegetation study was completed by Arthur Weston on 1 November and 3 December 2013. The studies cover both the limestone ridge and the sand resource as separate studies and reports. Both reports are attached as Appendix 1 (Weston 2014).

A separate vegetation study of the amended limestone extraction area was conducted by Lindsay Stephens of Landform Research in October 2015. Only 11 species were identified on site.

The land has been strip cleared in the past and intensively grazed and in part seeded with pasture species. See Section 2.5 Flora for additional information in the vegetation.

In spite of extensive searches only 21 native species were found. Effectively there are only nine species, present. which is very low for this type of vegetation over an area of 7.5 hectares. The vegetation is dominated by *Trachyandra divaricata* an exotic species. The sand resource can be taken with almost no clearing.

The local vegetation is originally 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.

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.

Whilst there exists greater then 30% of this Complex it is not well reserved. The clearing Regulations provide a higher level of protection than was previously available, and the same vegetation complex is included in the Yalgorup National Park.

The assessments within the Flora and Vegetation Assessment attached, found that the proposed clearing will have little overall effect on flora and fauna within the local area, with most of the effect relating to the final end use, and that appears to have been the case.

- **Vegetation Condition**

The area covered by the proposal will require a Clearing Permit CPS. It has been strip cleared in the past as shown on the existing aerial photography. See Section 2.5 Flora for additional information in the vegetation.

Weston 2014 listed the vegetation condition of the site for each community in Section 5.1 of his report as the letter code CD (Completely Degraded) or D (Degraded) using Bush Forever 2000 descriptors. The Condition Codes are listed above under vegetation communities. Appendix 1.

The vegetation was strip cleared and heavily grazed in the past. With the Prescribed Clearing Exemptions under the *Environmental Protection Act 1986 Section 51C* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004 Section 5* it is possible for the landholder to return the vegetation for agricultural purposes to its 1994 condition under Prescribed Clearing in the Regulations, Section 5 .14.

That Prescribed Clearing does not include clearing for extraction of limestone but if the limestone ridge was returned to its 1994 condition, the vegetation will be significantly more degraded than it currently is.

There will be no clearing of the native vegetation unless a New Clearing Permit is approved.

- **Rare and Priority Species**

No Declared Rare or Priority species were recorded. No Threatened Ecological Community was noted.

5.6.2 Vegetation Clearing

*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*

Although the Clearing Principles consider Biodiversity and other conservation issues, they do not specifically 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.

The *Environmental Protection ACT 1986 Section 51O* states that the "CEO may take into account other matters that the "CEO considers relevant" (*EP ACT 1986 Section 51O*). Therefore 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 and community need.

A separate Flora and Vegetation Assessment and Report is prepared for the site and is attached as Appendix 1.

The procedures used for vegetation clearing are documented in 5.9.2 Rehabilitation. These were used and are included here in case a small area of additional clearing is applied for to the immediate north of the existing permited area.

Topsoil and overburden treatment is covered in 5.9 Rehabilitation. All suitable materials will be retained for rehabilitation and directly transferred where possible.

5.6.3 Fauna

A fauna study was not conducted because the site is significantly altered native vegetation that is subject to grazing. Fauna do not seem to have been impacted on by the past clearing and continued excavation.

A summary of the fauna on site is included in 2.6 fauna. Some data on the wetlands of the Yalgorup National Park is provided in 2.7 Wetlands.

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.

With the degraded nature of the vegetation and the species present it is unlikely that *Calyptorhynchus latirostris* and *Calyptorhynchus baudinii,* which are listed on State and EPBC conservation databases, would nest or use the site for feeding. The flora species are not regarded as significant habitat species. They are not used for roosting or nesting.

Considering the proposed disturbance and the small number of suitable food species, referral to the Commonwealth under the *EPBC Act 1999* would not be triggered.

The fauna that may potentially occur are listed in 2.6 Fauna and in particular Dell and Hyder (1) 2009.

The key issues are the fauna associated with elevated remnant vegetation and those associated with the lakes.

The dry land fauna will be little impacted. The area proposed to be cleared and progressively rehabilitated is only 12 hectares over 20 years. This is very small in relation to the total area of habitat that remains and is protected by the Yalgorup National Park status. There has been no change to that vegetation in recent years with no additional clearing.

In fact, with regrowth on pasture, habitat will be increasing. Some species such as kangaroos have been advantaged by permanent water soaks on pasture and the introduction of grassland.

The potential for dust to deposit on the adjoining vegetation is less than for a gravel road because the on site activities will be set back further than the vegetation which can be as close as 3 metres along a roadside.

Any risks associated with the potential for Root Mat Communities and stygofauna are regarded as low and if present are unlikely to occur or to be impacted on.

The limestone is too young, there is no evidence of stream caves or notching at wetlands and no Tuart trees are present. The base of the excavation is proposed to be in the order of 20 metres AHD, 20 metres above the water table.

Troglofauna may occur in cracks and crevices of the rocks and limestone, but no evidence of such occurrences have been noted in previous excavations.

The removal of limestone will be progressive and followed by rehabilitation. The limestone will be excavated to a limestone floor and batter slopes that will also contain similar small cracks and joints, which will help replicate any potential habitats that currently exist. Some of the rehabilitated area will be left with limestone rock and boulders scattered on the surface to provide additional habitat. Rehabilitation will be to native vegetation.

All of the above measures will minimise the risk to any troglofauna should they currently occur.

5.6.4 Wetlands

Lake Clifton

It is impossible to think that dust will travel over 2 km and have any significant or noticeable impact on any sensitive premises or Lake Clifton. With a buffer of 200 metres, with intervening vegetation, it is also considered most unlikely that any dust will impact on Lake Pollard. Limestone is predominantly calcium carbonate with some sand grains. It is an integral part of the local environment. Calcium carbonate is an integral substance in the waters and sediments of Lake Clifton and Lake Pollard and is essential for the development of most life within those systems, including the Thrombolites which incorporate it into their structures. (Figures 2, 3 and 8).

Assessment of the proposal against EPA Bulletin 864 and EPA Guidance 28 shows that Extractive Industries are not listed as a landuse requiring management with respect to Lake Clifton. This includes the potential for impacts from quarries which have been actively conducted in the catchment for many years, long before the documents were published.

Lake Pollard

Lake Pollard is brackish as confirmed by (Cape Bouvard Investments 2009 Figure 8). A fresh water lens overlays the subject land with water flow both to the east to Lake Pollard and west towards the coast. There is also a suggestion that there could be a connection in water flow between Lake Pollard and Lake Clifton because of the large surface area of Lake Clifton causing a small draw from Lake Pollard.

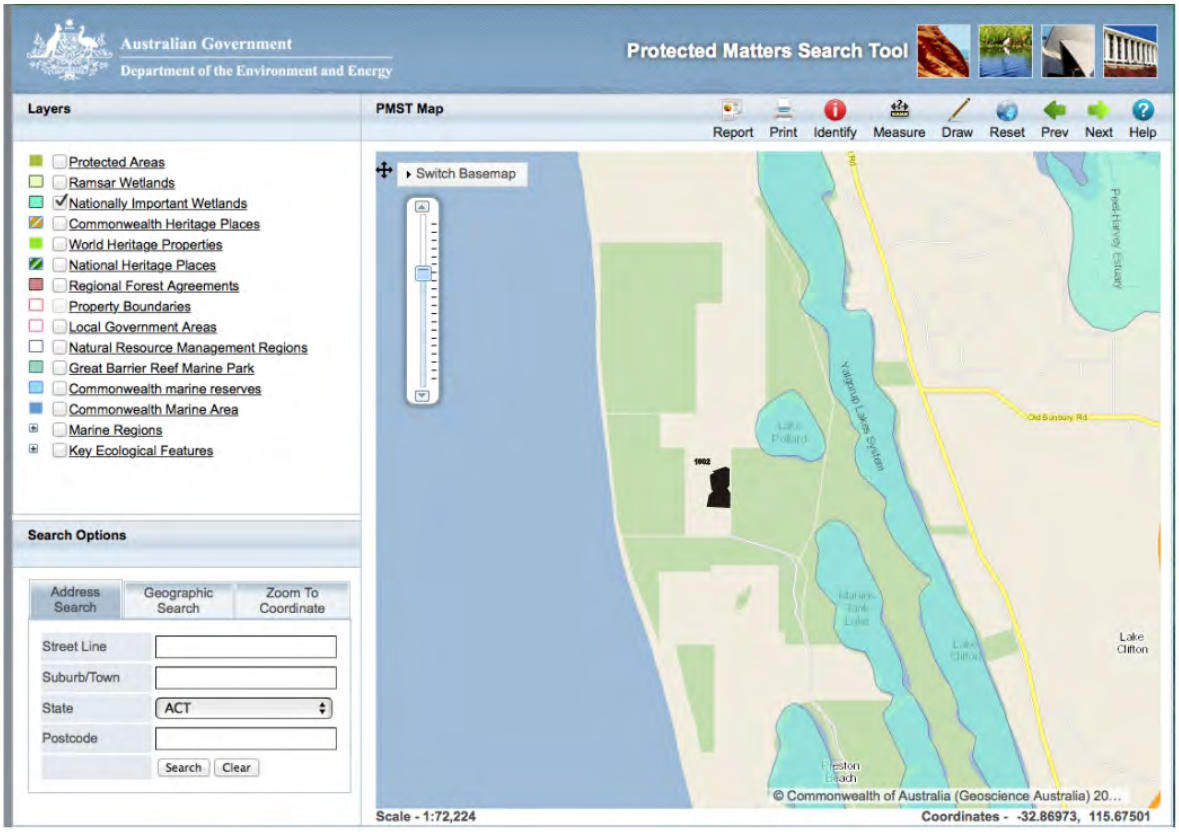
The Guidelines, which include the Department of Health guidelines for spray drift and studies conducted at Emerald in Queensland that are used by the Department of Health, all suggest that a tree buffer of 20 metres width will provide an effective buffer for fine particulates. The site has a 200 metre tree buffer to Lake Pollard. (*Department of Health, 2012, Guidelines for Separation of Agricultural and Residential Land uses*).

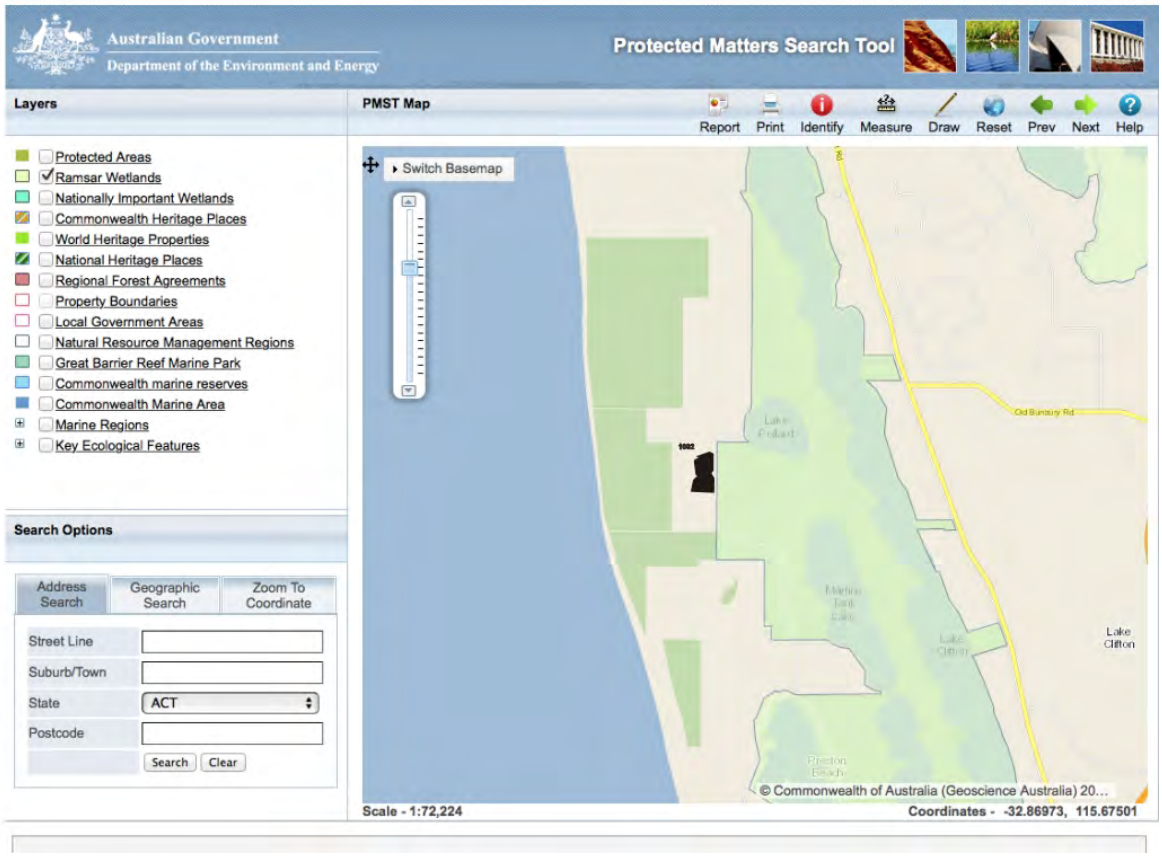
A 600 metre buffer of vegetation is to be retained to the adjoining land of Yalgorup National Park in the south.

Any dust falling on vegetation will have minimal impact as evidenced by native vegetation around limestone pits that are unaffected by the operations. For example at Wesco Road and Hopkins Road limestone quarries. Figure 9.

Any dust is readily washed from leaves by even very small amounts of rainfall. The potential impacts are minimal, and adjacent to gravel roads there is almost always no discernible impacts on the growth and success of native vegetation. Figures 3 and 9.

The bird life on Lake Pollard will be protected because of the 600 metre setback to the lake. It is shown in many locations that some activity set back from lakes does not impact on bird life. For example the Peel Harvey Estuary, Lake Clifton and the Coorong in South Australia still have significant amounts of birdlife even though clearing and human activity occurs in close proximity to the water bodies in some locations.





Lake Pollard and Lake Clifton Wetlands

Lake Pollard Walking Trail

The Lake Pollard Walking Trail runs from Martins Well in the south towards Lake Pollard, It skirts the southern end of the lake and runs to a Bird Hide located on the eastern side of the lake one km from the proposed excavation. Figure 2.

This portion of the walk trail will not be impacted by the proposed excavation. One part of the walk trail directs walkers to the southern boundary of Lot 1001 to walk up the fire break in the Yalgorup National Park to the hill on the ridge immediately south of the proposed excavation. The excavation will not impede the views of the lake but it may be possible to see the pit from the top of the ridge even with an expanded setback of 500 metres combined with a planted tree belt and natural regrowth of the native vegetation. Figure 2.

It is anticipated that the quarry will not be visible from the Lake Pollard Walk Trail which is located to the east behind the large limestone ridge.

A small section of the walk trail accesses Preston Beach Road North.

It is a little unclear why the Lake Pollard walk trails uses Lake Preston North Road for part of its route. (DPaW Appendix 4). There is another route through woodland and it remains unclear why visitors would walk along the road from a safety or experience point of view. The trail just touches the road for less than 50 metres at a sharp left dogleg and from observations it appears that there are short cuts removing the need to access the road.

As part of the upgrade a shortcut should be constructed to be part of the track, and the public safety for users of the DPaW walking trail would be improved.

Operational times are restricted to the summer and autumn months (December to April) on Monday to Friday excluding Public holidays.

Biodiversity - Applicable Legislation / Policies
• None applicable – Likely to be conditioned
Commitments to Biodiversity Management
• The excavation areas are cleared. • The level of bushland disturbance and the use of the site for grazing reduces the potential for significant fauna to be present. • The site will be progressively cleared and rehabilitated.

5.6.5 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. Microscopic soil-borne fungi of the genus *Phytophthora* kill a wide range of native plants and can cause severe damage to many vegetation types, particularly those from the families Proteaceae, Epacridaceae, Xanthorrhoeaceae and Myrtaceae.

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 (DPaW) Dieback Hygiene Manual 1992 is a practical guide to Dieback management.
- Department of Environment and Conservation (DPaW) 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 Regulation 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. The same is noted in DEC 2009.

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 all parts of the proposed quarry operations.

- Excavation will be undertaken using practices recommended by DEC. 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.*
- 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 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.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- 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.
- When clearing land or firebreaks vehicles are to work from dieback free areas towards dieback areas; or, in situations where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- Roads should be free draining and hard surfaced.
- 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.
- Compliance with the Weed Management Policy.

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).

The proposed access road will be the limestone road.

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.

Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and farm maintenance activities.

Topsoil will be cleared according to 5.9.2 Rehabilitation Procedures.

Dieback - Applicable Legislation / Policies

- *DEC (DPaW) Dieback Hygiene Manual 1992.*
- *DEC (DPaW) Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.*
- Dieback Working Group 2005, *Management of Phytophthora Dieback in Extractive Industries.*

Commitments to Dieback Management

- Doyles Lime Service will not impact on the adjoining remnant vegetation by the proposed excavation.
- Doyles Lime Service willmaintain the Dieback Management Policy to reduce the spread of Plant Pathogens.

5.6.6 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 control weeds.

Weed management is an integral part of normal farming operations on Lots 1001 and 1002. However the pasture land has, on the limestone resource, much *Trachyandra divaricata,* a weed that is noted by DEC 2009 as being invasive, but is mostly invasive on pasture and on the limestone resource area occurs on the cleared strips.

- 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 excavation vehicles until required.
- 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 or sprayed to minimise the weed impact.
- 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 areas of better vegetation towards areas of lower quality vegetation.
- Weeds should be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils.
- Unwanted 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.
- Weeds will be treated promptly no matter how few there are.
- Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.

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

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

Weed - Applicable Legislation / Policies
• *Agriculture and Related Resources Protection Act 1976.*
Commitments to Weed Management
• Doyles Lime Service will use the weed policy to try and prevent the introduction of Declared, Environmental or other weeds to the site.

5.7 Fire Protection

The excavation area will form a natural firebreak; the access road will also assist. Water available on site can be used for fire fighting.

Normal rural firebreaks will be maintained.

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 the 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 site Safety Management Procedures.
- 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.
- Maintain normal farm fire breaks and fire prevention procedures.

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.

Perimeter firebreaks will be maintained.

Fire Management - Applicable Legislation / Policies
• *Bush Fires Act 1954.* • *Shire of Waroona Bylaws.*
Commitments to Fire Management
• Doyles Lime Service will ensure the quarry operates to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.* • Doyles Lime Service will ensure the quarry complies with the local fire safety requirements and operates in compliance with normal rural fire practise and restrictions.

5.8 Aboriginal Sites

A search of the Department of Aboriginal Affairs database does not reveal any aboriginal sites on the subject land. The land has been significantly disturbed over many years.

Aboriginal Sites
• *Aboriginal Heritage Act 1972-1980*
Commitments to Fire Management
• Should any evidence of early aboriginal occupation be uncovered during the operation of the quarry, 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, the proponent will comply with the provisions of the Act, relating to development in areas of recognised aboriginal sites.

5.9 Rehabilitation

5.9.1 Background

The area is currently used for agricultural activities. The excavation site has been cleared in strips and grazed.

It therefore varies between Completely Degraded strips to Degraded to Good strips of vegetation.

- **Land Use Policies**

The land is zoned Rural and is currently used as a grazing property.

- **End Use**

The extraction of limestone and sand is seen as an interim use of the land prior to utilisation of the area by the current land holder.

The eastern 20 metres of pit will be rehabilitated to local native vegetation. The remainder will be pasture with a minimum of 200 trees in clumps which will compensate for the land to be cleared. (Figures 3, 4 and 9).

The remainder, including the sand resource, will be returned to pasture to enable the agricultural productivity of the land to be maintained.

The final contours are shown on the attached Concept Contour Plans.

- **Mine Closure Considerations**

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 planting good native vegetation or tree belts if they are to be immediately cleared for an alternative land use.

Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.

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

- **Rehabilitation Objectives and End Use**

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.

- **Completion criteria – Interim Final Landuse**

The aim of the rehabilitation is to stabilise the finished floor pending decisions to be made on the end use of the site.

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

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

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

- Provide a self sustaining cover of local native plants at a minimum of 1200 native plant stems per hectare on the steeper slopes. (Figure 5).

- Sustainable pasture for the remainder of the excavated area with a minimum of 200 trees in clumps. (Figure 5)

5.9.2 Rehabilitation Procedures

- **Vegetation Clearing – Recovery**

1. Vegetation clearing will be progressive, subject to a Clearing Permit being granted. The sand resoruce can be extracted without clearing for much of the resource.

2. Useful timber will be taken for firewood, if feasible and subject to liabilities and site safety.

3. Where practicable vegetation will be directly transferred to a batter slope or bund being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable. Vegetation fragments will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

4. If direct transfer is not possible the vegetation will be stored in low dumps for later spreading.

- **Landform Reconstruction and Contouring**

1. All buildings, equipment and machinery will be removed from site.

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

3. The land surface will be a gently undulating floor as shown on the attached Final Concept Plans with sloping batters at less than I : 4 vertical to horizontal and some at 1 : 2 at the steeper northern and southern edges of the ridge.

4. The land surface will be formed to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* pending decisions to be made on the final end use.

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.

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.

- **Topsoil and Overburden Recovery and Reuse**

1. Where possible topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated.

2. Overburden, as yellow and brown sand and low grade limestone, will be pushed to the perimeters of the excavation, particularly the western edges, to assist with visual and noise screening. From there it can be used for the rehabilitation process.

3. 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.

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

5. Topsoil will be spread at depths of 5 cm and should be spread during summer, preferably by the end of February.

- **Pre - Vegetation Establishment**

1. Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species.

2. 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 and some pasture species but may be required if the weed load is to be reduced.

3. 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 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**

Native Vegetation

1. Doyles Limes Service will spread any native 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 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 readily 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. However this needs to be balanced against the weed load as described under Weed Management.

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 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 500 tube plants of local native species per hectare, in June. Alternatively establish the vegetation wholey through the use of tube stock.

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.

Pasture Regeneration

16. The pit earthworks and restoration are as above including the spreading of overburden and topsoil.

17. Seeds of pasture species are spread during autumn if there is insufficient in the existing topsoil. Seeding is normally undertaken by the land holder or a contractor.

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

19. 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.

20. 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.

21. Plant an additional 500 tube plants of local native species per hectare, in June. Alternatively establish the vegetation wholey through the use of tube stock.

22. For the existing rehabilitation there has been sufficient seed within the topsoil to return pasture.

23. However if sufficient seed is not available or does not germinate then additional seed will be added. The establishment of pasture, including the selection of the pasture species is appended to this Management Plan. The documentation is produced by the Department of Agriculture and Food.

24. For pasture land in this situation it is essential that the species are matched to the soil types and rainfall. The location falls into the "High Rainfall Coastal" planting regime with sandy to loamy gravel soils. Suitable perennial legumes include Birdsfoot trefoil, Lucerne, Strawberry Clover, and Sulla. Perennial pasture includes Perennial Ryegrass, Phalaris, Cocksfoot, and Summer Active Tall Fescue, Kikuyu and Rhodes Grass. Annual pasture species include Italian Ryegrass, Serradella, subterranean clover.

25. The actual species used will be determined by the individual season, nature of the rainfall in the preceding months and stocking/hay production proposed by the landholder which may change from time to time.

26. Seeding rates are 2 – 5 kg/ha depending on the species used; for example Ryegrass is seeded at 3 kg/ha whereas Rhodes Grass is seeded at 4 kg/ha.

27. The amount of fertiliser applied will depend on the species used; for example when planting legumes nitrogen fertiliser is reduced or not used as it inhibits nitrifying bacteria. Also the amount of sulphur, phosphate and trace elements used depends on the species and residual amounts retained in the soil. As a guide 50 kg/ha of superphosphate is likely to be used to assist legume and grass based pasture.

- **Fertiliser**

1. 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 30 - 50 kg/hectare, applied to rehabilitation areas in the year of planting.

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.

- **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 significant 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. The interim pasture cover will stabilise the soils pending decisions on the end use of the finished floor.

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

- **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 soil stabilisation.

3. Native vegetation cover and soil stability will be assessed and corrected if found to be non compliant.

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

5. 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 vegetation cover.

6. 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 or planting.

Temporary Closure

1. If for any reason the site is closed on a temporary basis for any period of time the following will be implemented.

2. The faces will be made safe or protected by bunds and/or fencing with signs in compliance with the *Mines Safety and Inspection Act 1994*.

3. All fluids, liquids and other materials that could leak over time, change or potentially impact on the environment will be removed from site, or stored in a manner that will not permit any environmental impact.

4. Mobile and other plant will be made safe or removed from site in compliance with the *Mines Safety and Inspection Act 1994.*

5. Fencing will be maintained to make the pit safe.

6. Perimeter signage will be maintained.

7. The site will be monitored for weeds and interim rehabilitation success twice per year.

8. Regular site inspections will be made to ensure compliance with the *Mines Safety and Inspection Act 1994,* and any other actions that are required to make the site compliant or environmentally sound will be made as the need arises.

Rehabilitation - Applicable Legislation / Policies
• *EPA, Guidance 6, Rehabilitation of Terrestrial Ecosystems*
Commitments to Rehabilitation
• Doyles Lime Service will ensure the completed land surface is formed to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.* • Doyles Lime Service will rehabilitate the surface as outlined above and monitor the revegetation as described above.

Tree and Shrub Species to be used in rehabilitation for native vegetation and the trees in parkland pasture.

Tree and tall shrub species to be used for rehabilitation occur locally and will include; (Tree or large shrub is listed T)

Acacia cyclops (T)
Acacia lasiocarpa

Acacia saligna (T)
Acacia truncata
Agonis flexuosa (T)
Dryandra lindleyana var *lineleyana (Banksia dallannyei)*
Dryandra (Banksia) sessilis
Eremaea glabra
Eucalyptus decipiens (T)
Eucalyptus foecunda (T)
Eucalyptus gomphocephala (T)
Eucalyptus petrensis (T)
Grevillea vestita
Hakea lissocarpha
Hakea prostrata
Hakea trifurcata
Hardenbergia comtoniana
Kennedia prostrata
Kunzea glabrescens
Melaleuca huegelii (shrub)
Melaleuca lanceolata (T)
Melaleuca systena (shrub)
Myoporum insulare
Olearia axillaris
Templetonia retusa

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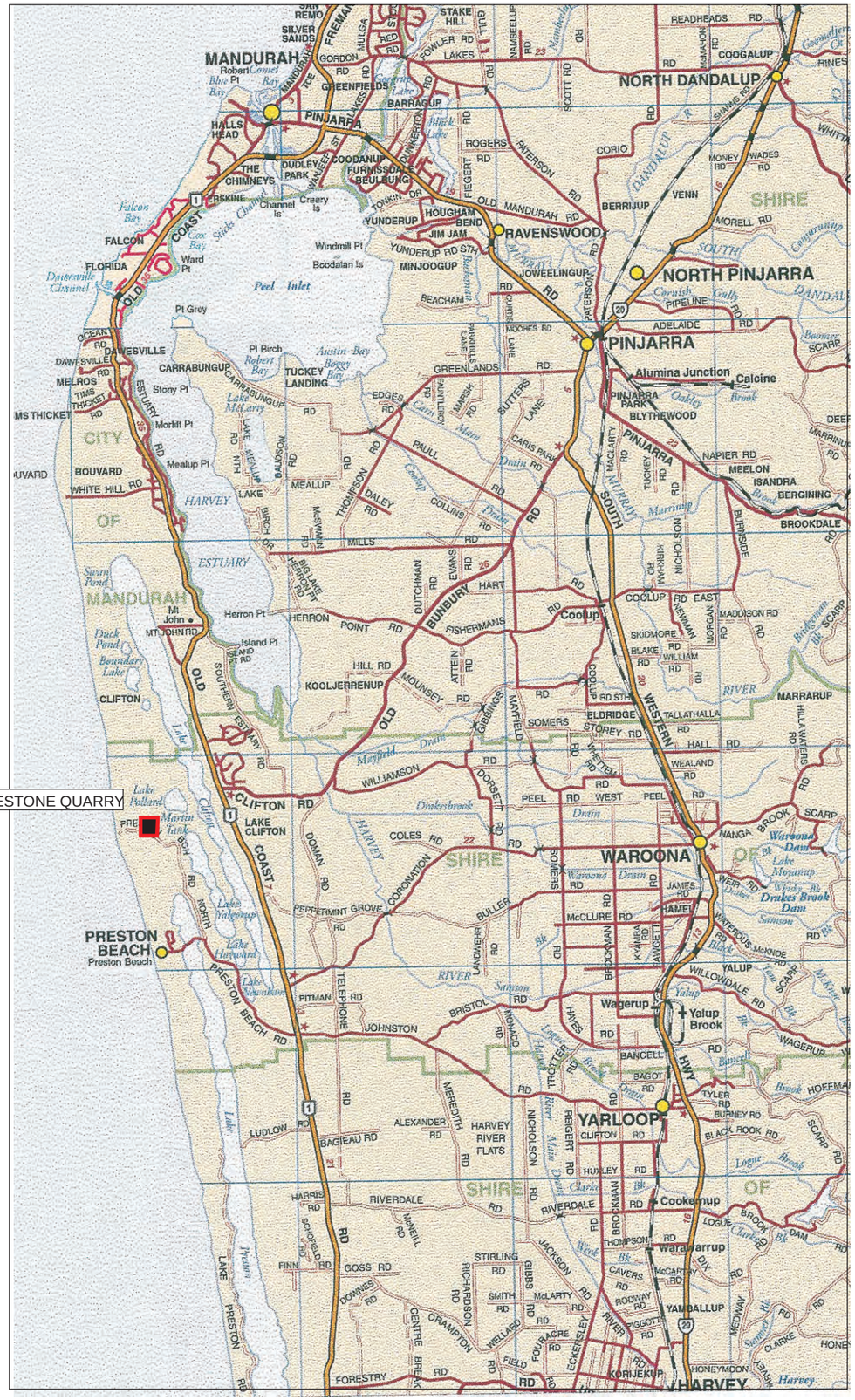
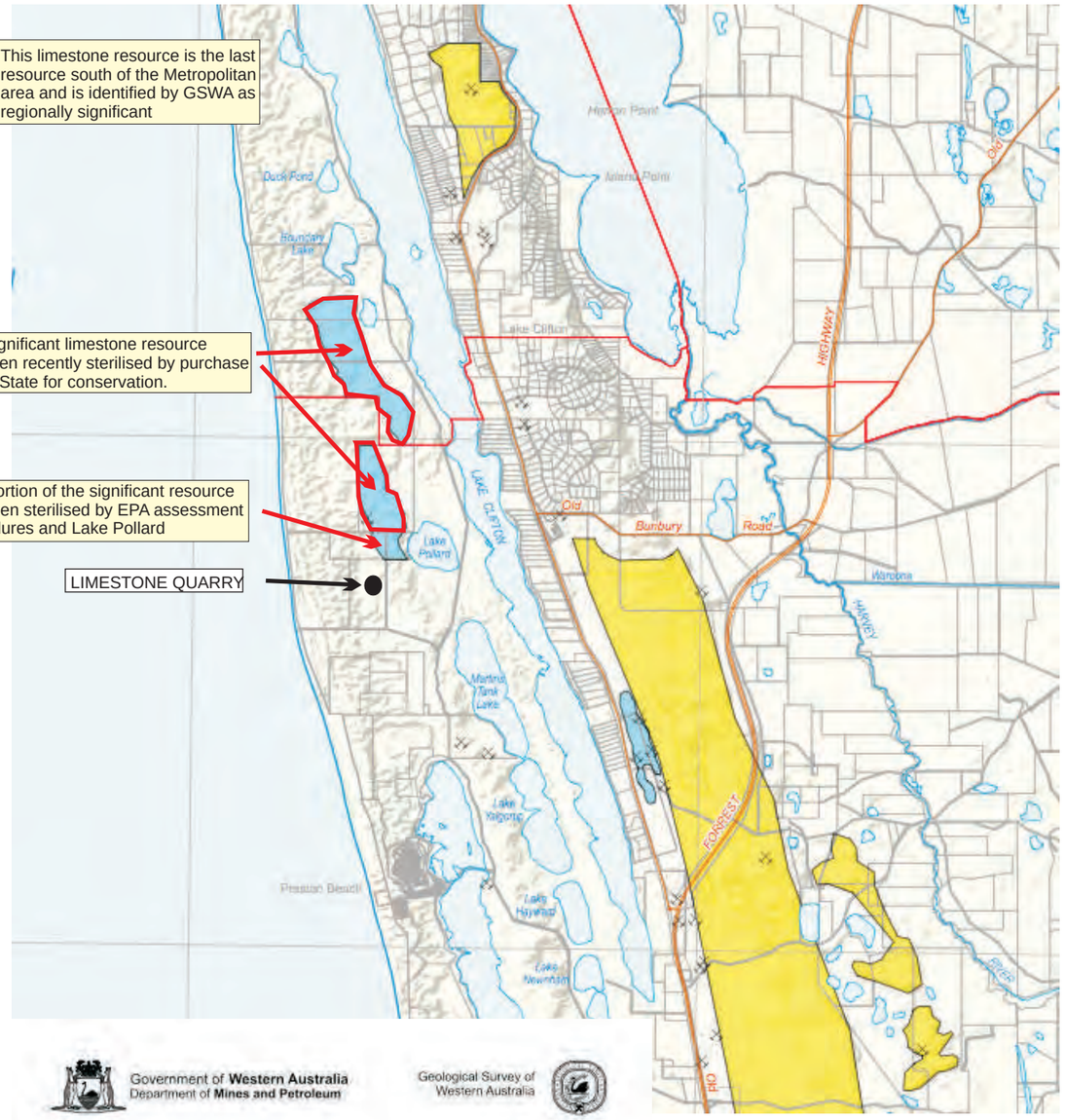




Government of Western Australia
Department of Mines and Petroleum

Geological Survey of Western Australia

Scale 1:100 000

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUSTRALIA 1994

GDA

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

RESOURCE POTENTIAL FOR LAND USE PLANNING

REGIONALLY SIGNIFICANT BASIC RAW MATERIALS

PINJARRA

SHEET 2032 FIRST EDITION 2012

Figure 1

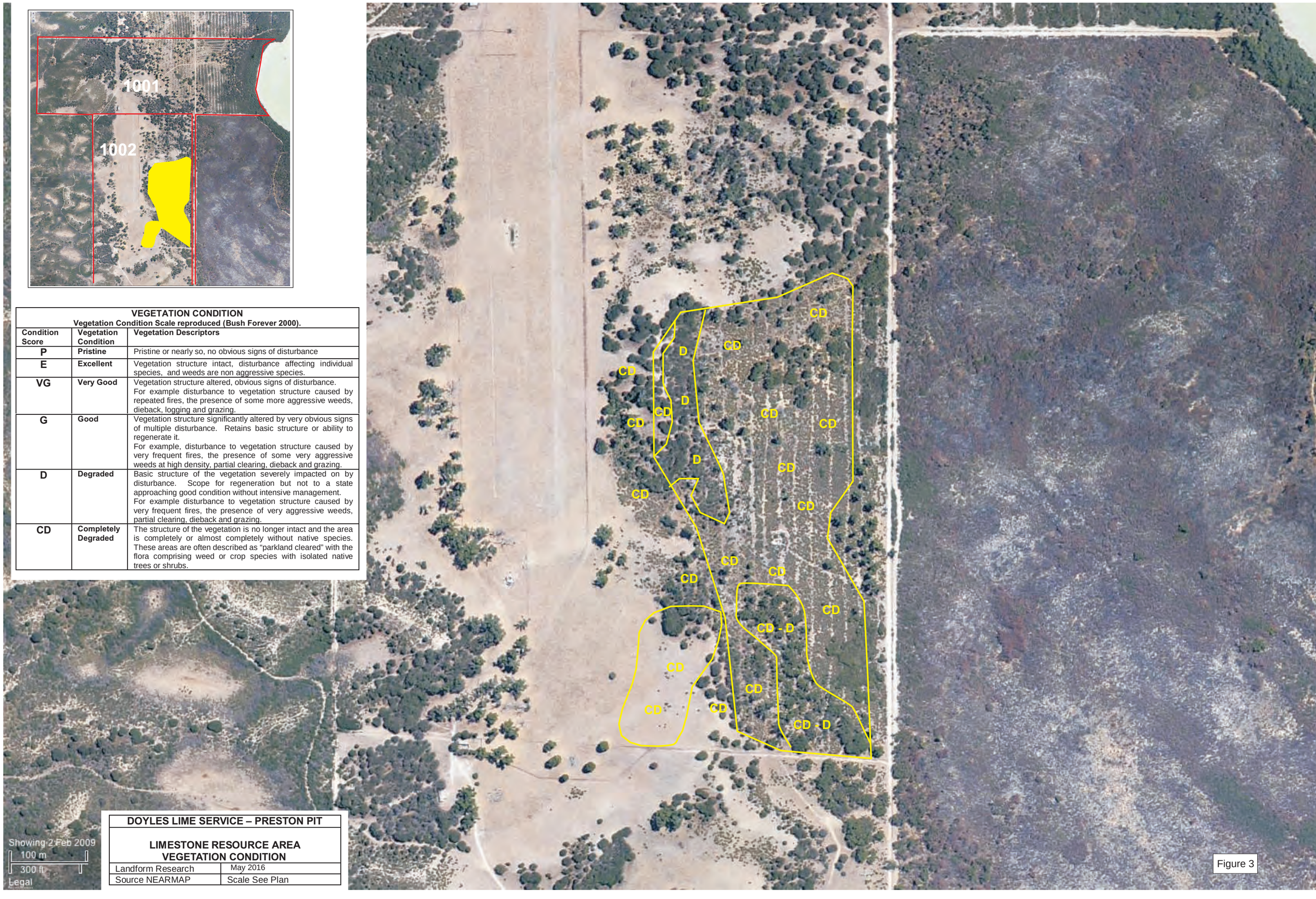
DOYLES LIME SERVICE – PRESTON PIT	
LOCATION	
Landform Research	May 2013
Source NEARMAP	Scale See Plan

Figure 2

DOYLES LIME SERVICE – PRESTON PIT	
SURROUNDING LANDUSE	
Landform Research	May 2013
Source NEARMAP	Scale See Plan

VEGETATION CONDITION
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.



DOYLES LIME SERVICE – PRESTON PIT	
LIMESTONE RESOURCE AREA VEGETATION CONDITION	
Landform Research	May 2016
Source NEARMAP	Scale See Plan

Figure 3

Resource are showing limestone and strip clearing. Pasture and exotic species occupy the cleared strips. Other vegetation has been grazed and is regrowth

Sand and Limestone resource area, view east to the limestone ridge. The resource in the trees will not be taken

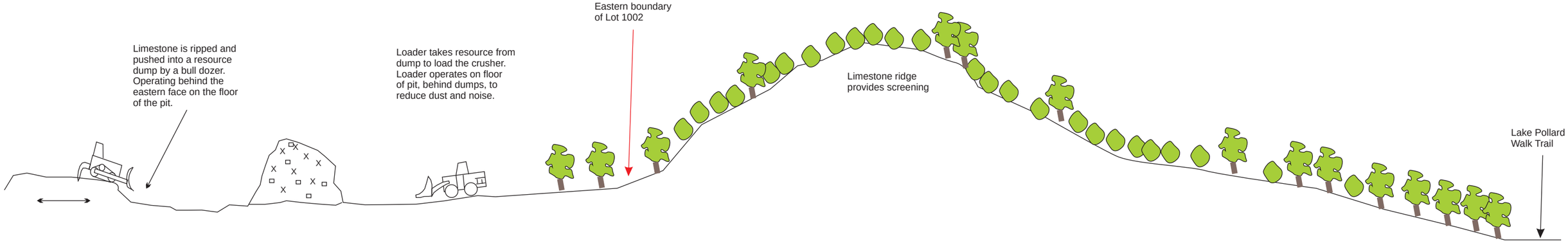
Figure 4

DOYLES LIME SERVICE – PRESTON PIT	
VEGETATION – LIMESTONE PIT	
Landform Research	May 2016
Source NEARMAP	Scale See Plan

RESOURCE EXCAVATION

WEST

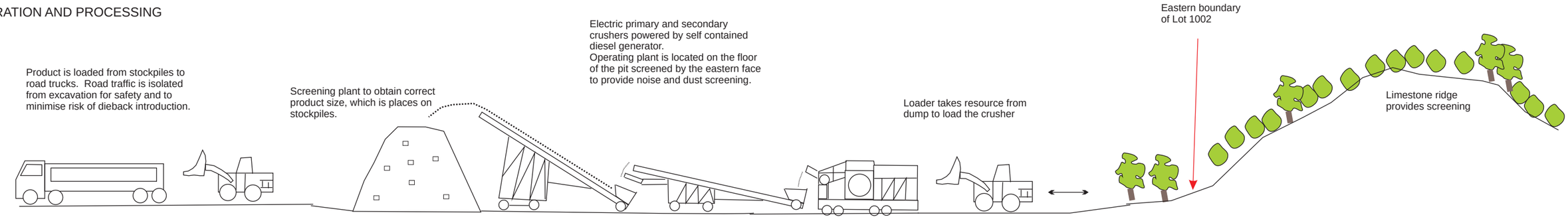
EAST



WEST

EAST

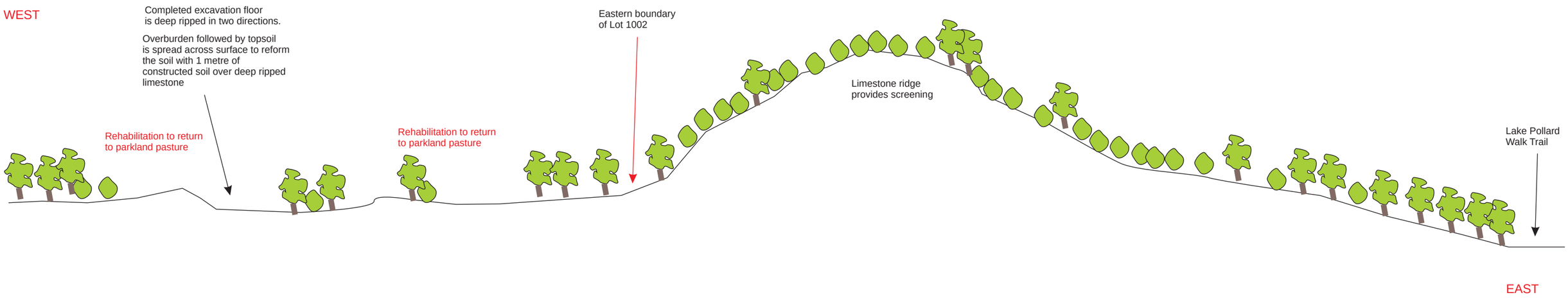
OPERATION AND PROCESSING



LAND RESTORATION AND REHABILITATION

EAST

WEST



EAST

PROCESSING

Landform Research

PROPOSED OPERATIONS - LIMESTONE OPERATIONS - PRESTON
SKETCH SECTIONS

See Figures 4 and 6 for sections and aerial view of typical and proposed operations.

DOYLES LIME SERVICE

Figure 5

Doyles Lime typical operations at Myalup pit. Operations will be similar at the proposed Preston pit.

Typical crushed lime resource showing working behind a face as proposed

Loader used to move materials around the operations.

See Figures 4 and 5 for sections and aerial view of typical and proposed operations.

Processing at Myalup showing the face used for visual, noise and dust screening

Figure 6

DOYLES LIME SERVICE – PRESTON PIT	
OPERATIONAL PHOTOGRAPHS	
Landform Research	May 2013

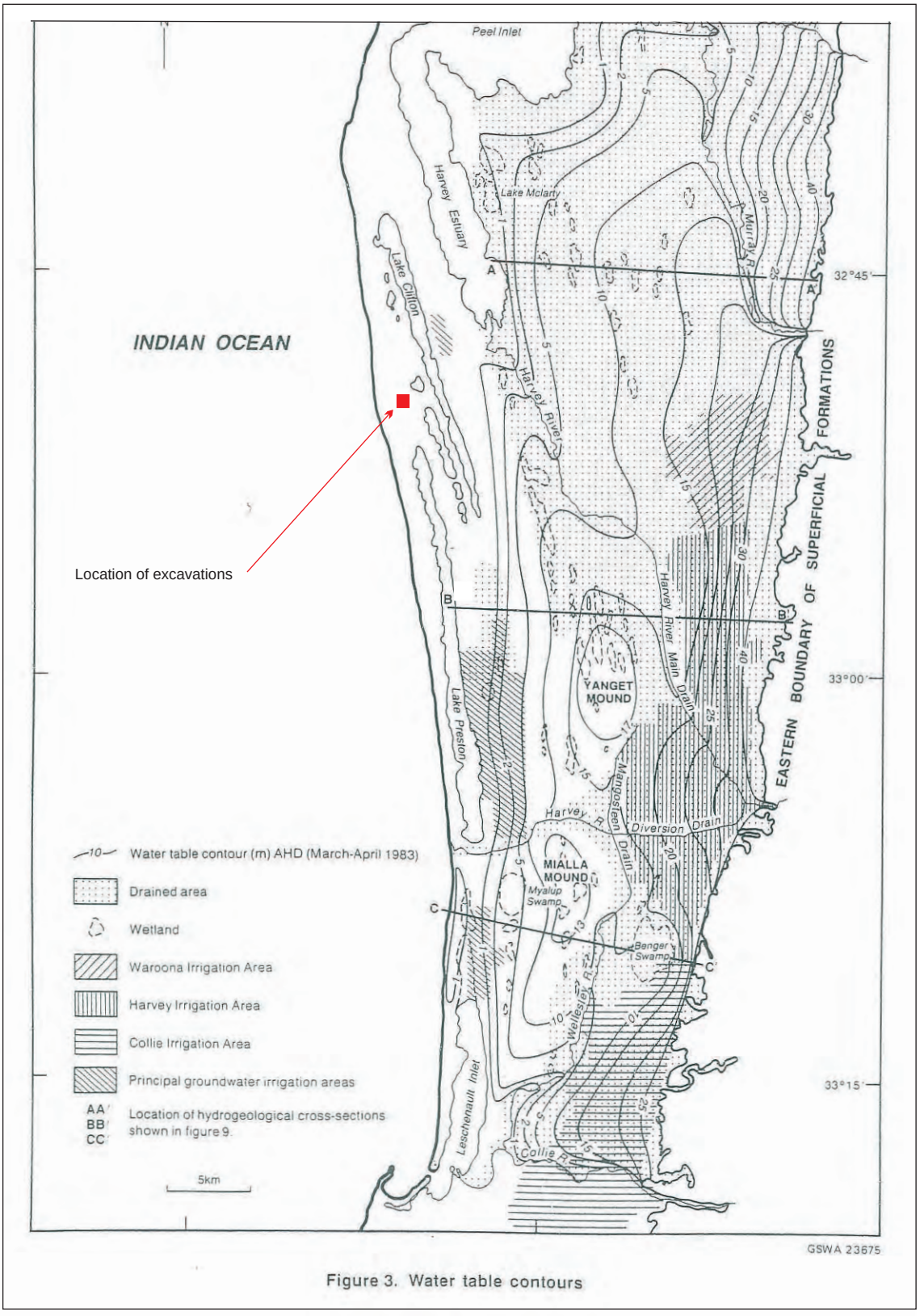
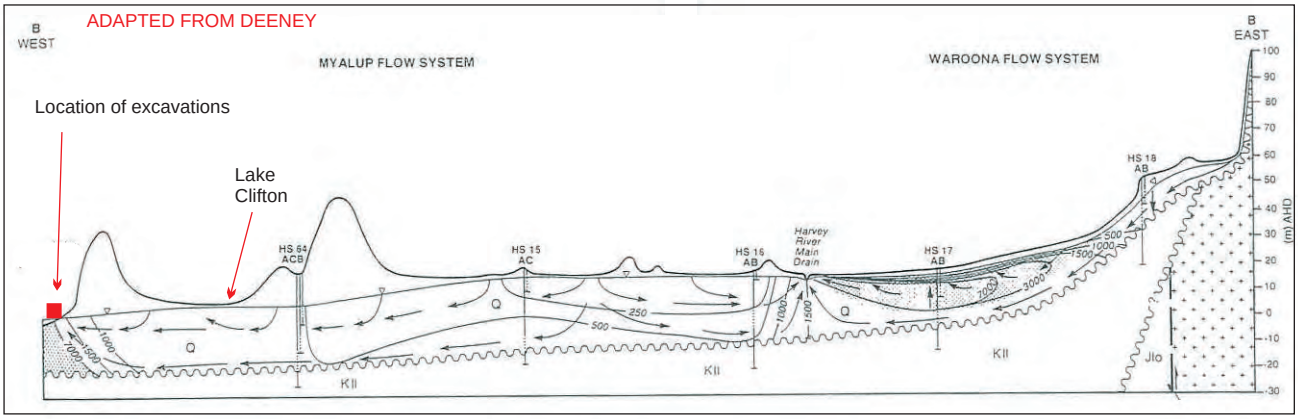


Figure 3. Water table contours

HYDROLOGY - Copied from Deeney (undated) Figures 3 and 9) Figure 7



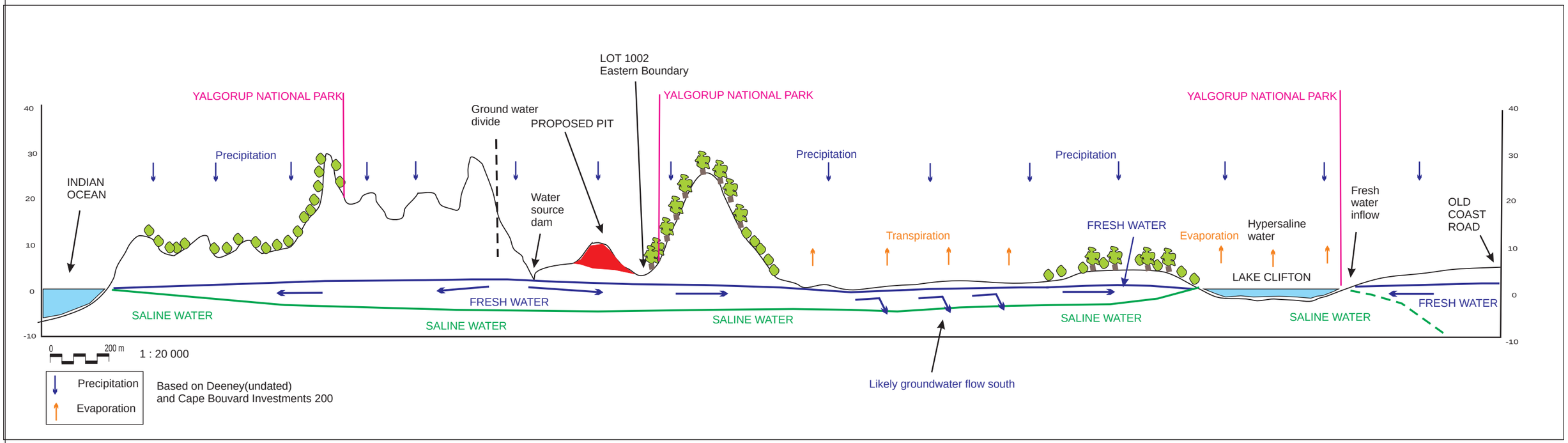
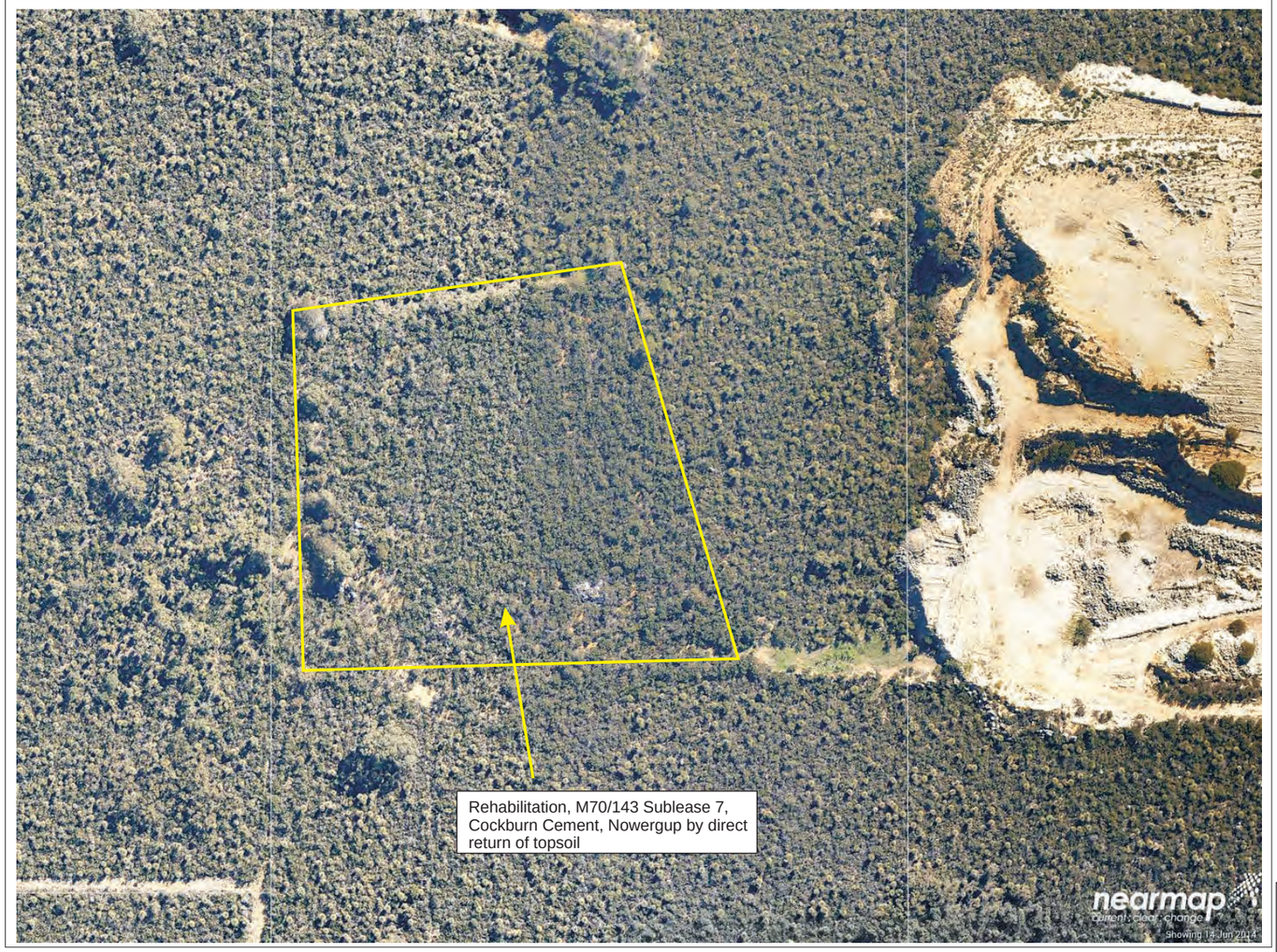


Figure 8

DOYLES LIME SERVICE – PRESTON PIT	
GROUNDWATER FLOWS	
Landform Research	April 2016
Source DPaW	Scale See Plan

The landholder seeding the rehabilitated portion of Lot 4 (Doyles Pit Myalup)

Looking from Lot 5 across part of the resource to rehabilitated land on Lot 4 (Doyles Pit Myalup)



NOTE

Rehabilitation of limestone pits is usually not required because of sequential land use to other uses in the Metropolitan Area such as Industrial land, (Hope Valley and Flynn Drive Nowergup) or has not had sufficient time for rehabilitation to be required.

EXAMPLES OF REHABILITATION

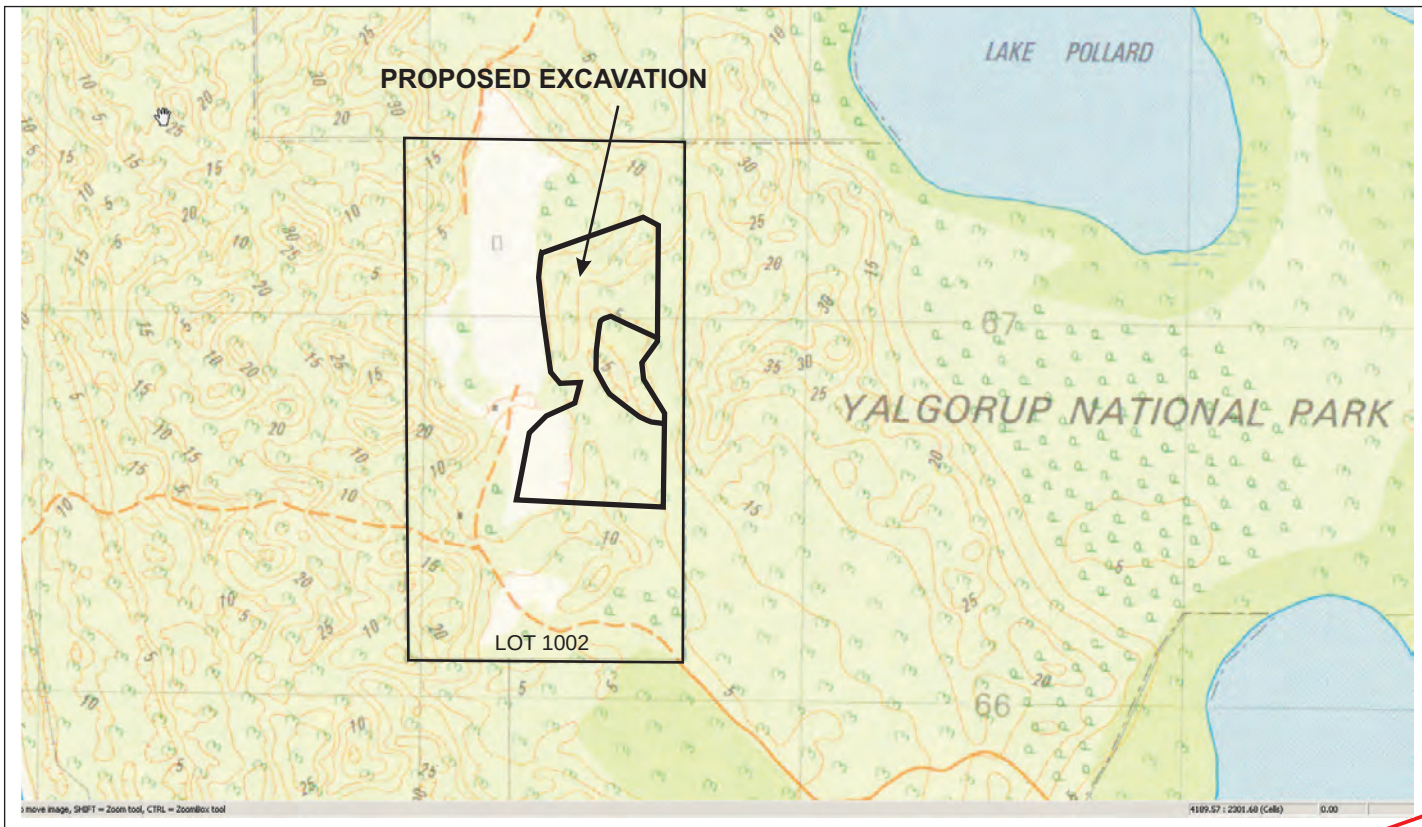
LIMESTONE PITS

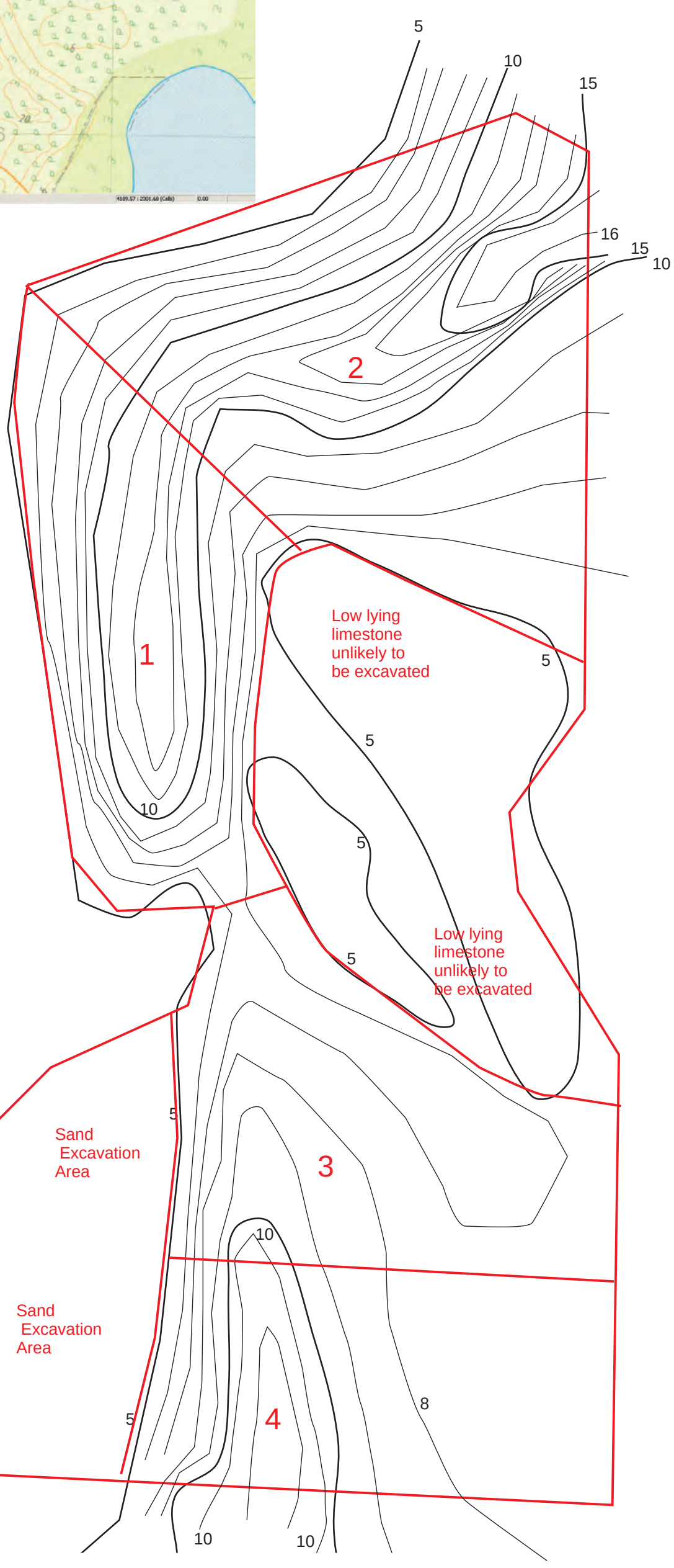
Limestone Building Block Company, Nowergup.
Rehabilitation 3 - 8 years old. Seeded and tube planted. No Topsoil.

Figure 9

Figure 10

DOYLES LIME SERVICE – PRESTON PIT	
MYALUP PIT SHOWING TYPICAL SITE LAYOUT	
Landform Research	May 2013
Source NEARMAP	Scale See Plan



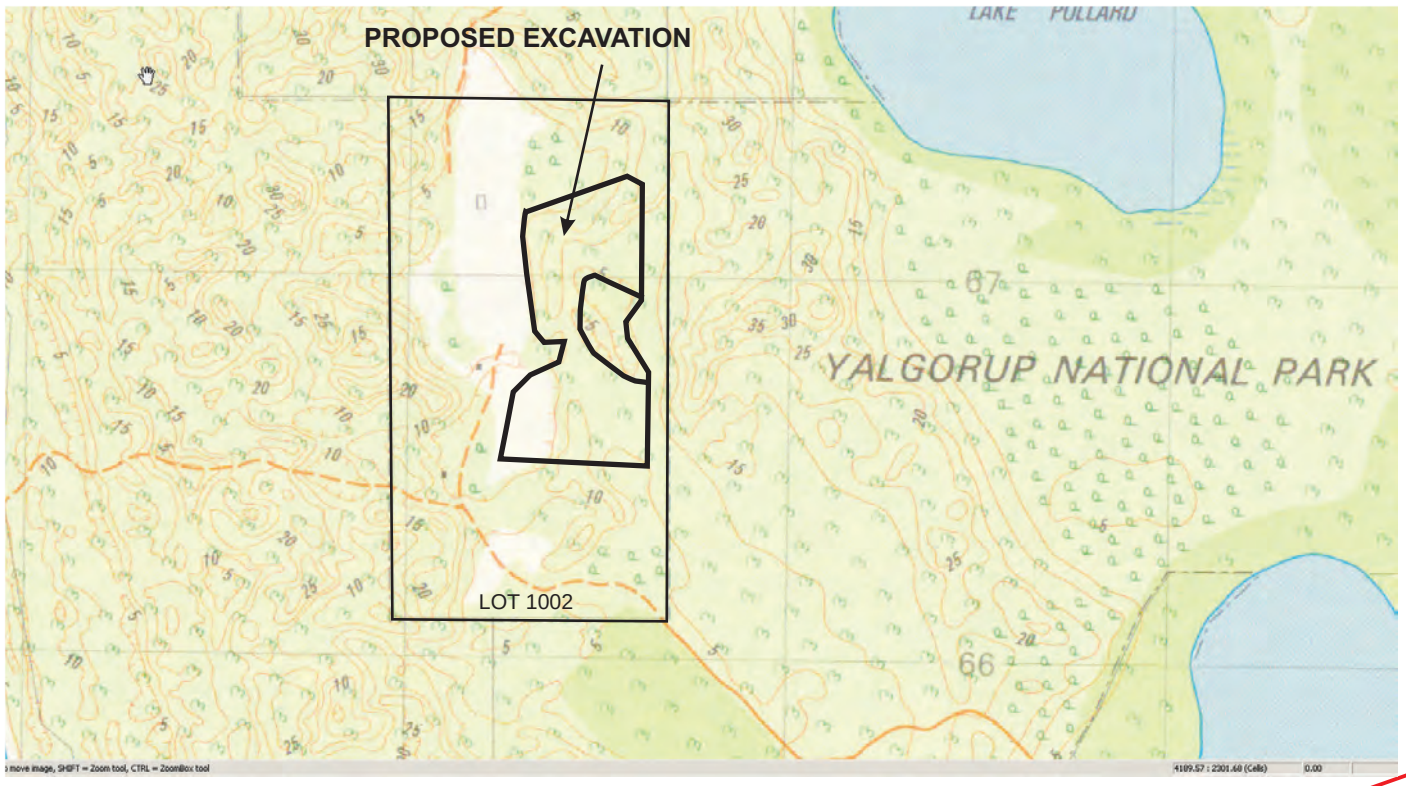


STAGING OF LIMESTONE EXTRACTION

Figure 11A

DOYLES LIME SERVICE – PRESTON PIT	
LIMESTONE PIT EXISTING CONTOURS	
Landform Research	May
Source LANDGATE	Scale

0 100m



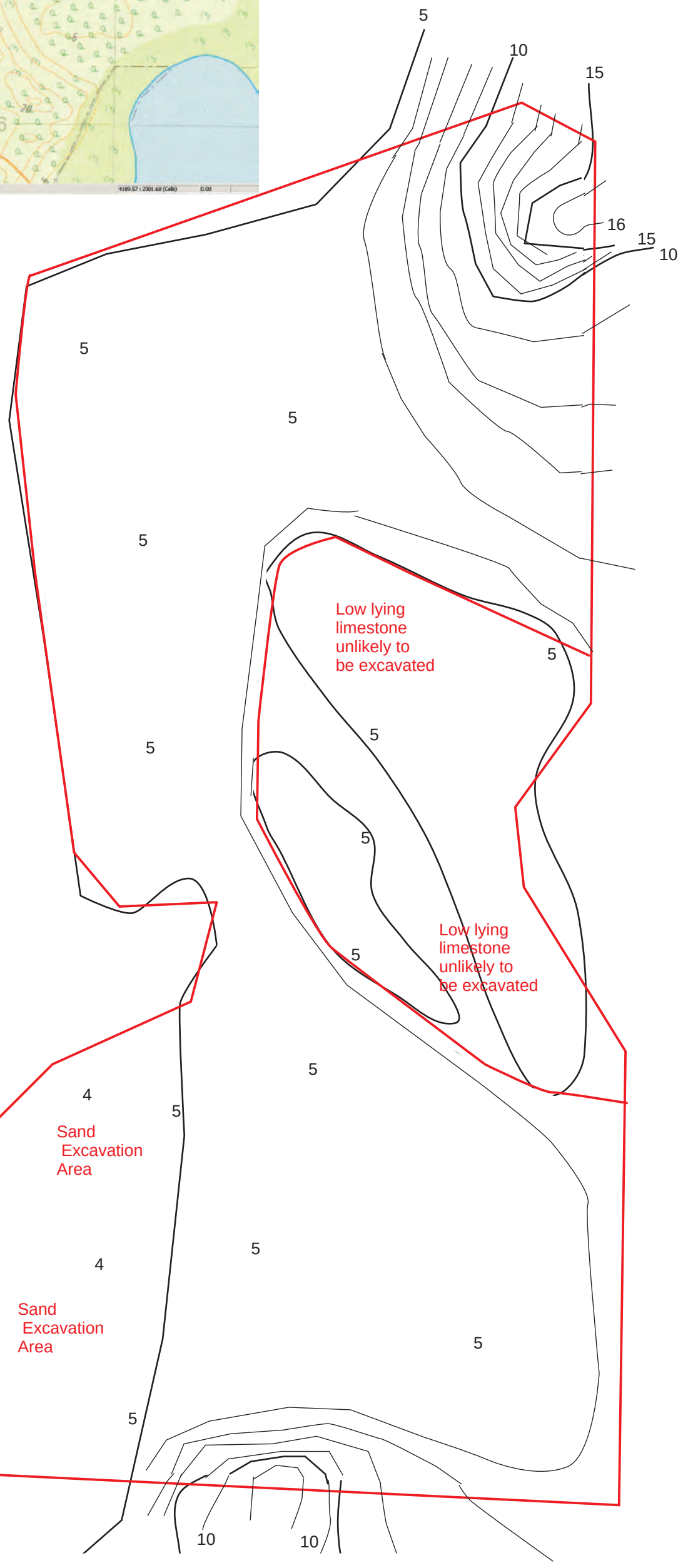


Figure 11B

DOYLES LIME SERVICE – PRESTON PIT	
SAND PIT CONCEPT FINAL CONTOURS	
Landform Research	May 2016
Source LANDGATE	Scale

0 100m