
**PROPOSED SCREEN PLANTING
EXTENSION OF SAND QUARRY
SEVEN MILE BEACH ROAD
GERROA, MUNICIPALITY OF KIAMA**

A report prepared by

KEVIN MILLS & ASSOCIATES

September 2006
06/04/03

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1 INTRODUCTION

This document was prepared on behalf of Cleary Bros (Bombo) Pty Limited, which operates the Gerroa Sand Quarry. The purpose of the report is to describe the company's proposal to plant a screen of native vegetation between Seven Mile Beach Road and the site proposed for future extension of the quarry.

Kevin Mills & Associates (2005) described the flora and fauna, and the vegetation communities and habitats occurring on the Cleary Bros property at Gerroa, including the area around the proposed screen planting site. Kevin Mills & Associates (2006) also prepared a report on flora and fauna for the Environmental Impact Assessment for the proposed extension of the quarry. Background information on the vegetation and habitats in the local area can be obtained from those reports.

2 THE SITE

The site to be screen planted is about three kilometres to the southwest of Gerroa, in the Municipality of Kiama, about 500 metres to the north of the existing sand quarry. It is a strip of land about 400 metres long and 10 metres wide, with a total area of 4,000 square metres. The site is on the western side of Seven Mile Beach Road, and wholly on Cleary Bros' land. Figure 1 shows the location of the site.

The subject land was cleared many years ago and has since been used for the grazing of cattle. It is now covered by exotic grassland and is slashed regularly.

3 CONTENTS OF THIS REPORT

This report contains:

- a description of the vegetation to be planted, including a list of species suitable for planting;
- a discussion of the techniques to be used in the planting program;
- details on those responsible for supervising and carrying out the project;
- information on the maintenance regime; and
- details of the monitoring and reporting regime.

4 PROJECT OBJECTIVES

This project has the following objectives:

- to establish a substantial screen of native vegetation along the eastern edge of the quarry extension site, to screen it from view;
- to ensure the screen will be well advanced by the time it is required to screen the quarrying in the extension area; and

- to establish the screen totally on Cleary Bros' land.

5 PLANTING PROTOCOLS

5.1 Vegetation Management Objectives

The following vegetation management objectives have been identified for this planting project:

- only locally occurring indigenous plants will be used on this project;
- all plants will be obtained from a local source or derived from plant material obtained elsewhere on the property;
- the screen will be composed of a range of species (ground covers, shrubs and trees), so a dense and multi-layered screen will develop
- the maintenance of the vegetation on the site will commence with the initial plantings, and will continue for the life of the adjoining quarry i.e. a period of 15 years;
- an annual inspection will be undertaken by a qualified person, who will submit an annual report to the consent authority on the progress and condition of the vegetation.

Figure 2 shows a typical cross-section of the site, with the proposed works and plantings.

5.2 Initial Site Treatment

In some places the site will initially be raised using 'topsoil' from nearby areas, to create a bund that will help with screening. Planting would take place on the bund as soon as practicable after its construction. The areas to be screen planted will where necessary be slashed and fenced before any work is undertaken; it is presently covered by introduced grasses and other herbaceous plants. The area will be divided into several sections, or planting sites. Each section will be closely mown before planting, followed by "spot spraying" with a herbicide around each plant location for a radius of 0.5 metres. The plant will be planted in the centre of the sprayed area when the grass has browned off. Alternatively, the whole section may be sprayed and, following planting, heavily mulched.

5.3 Species Selection

Appendix 1 contains a native plant species list for the Cleary Bros property (Kevin Mills & Associates 2005). The list provides the name of each plant species (botanical and common names) and states the family to which each species belongs. The list contains the names of 135 native plant species occurring on the property. Most of the species occur in the forest on or near the proposed quarry extension site. The list has been used as a basis for species selection for this screen planting project.

To establish a cover of trees and shrubs as quickly as possible, plantings of fast growing species will be interplanted with more permanent trees. The fast growing species will include Coast Banksia *Banksia integrifolia*, Golden Wattle *Acacia longifolia*, Maiden's Wattle *Acacia maidenii*, Two-veined Hickory *Acacia binervata* and Hickory Wattle *Acacia implexa*. These species will be planted with the knowledge that the wattles will not live much more than 20 years, by which time the permanent trees would be quite large. The more permanent species will include Blackbutt *Eucalyptus pilularis*, Bangalay *Eucalyptus botryoides*, Rough-barked Apple *Angophora floribunda* and Cheesetree *Glochidion ferdinandi*. Ground cover species can provide a dense cover to about one metre in height, and are useful for weed control purposes. Such species include Climbing Guinea Flower *Hibbertia scandens*, Spiny-headed Mat-rush *Lomandra longifolia* and Kangaroo Grass *Themeda australis*.

Species selected for the initial plantings have been listed in Table 1. Depending on the availability of propagation material at the time, other species in Appendix 1 may also be selected.

TABLE 1
List of Species Suitable for the Proposed Screen Planting

Main Trees

<i>Angophora floribunda</i>	Rough-barked Apple
<i>Banksia integrifolia</i>	Coast Banksia
<i>Eucalyptus botryoides</i>	Bangalay
<i>Eucalyptus pilularis</i>	Blackbutt
<i>Glochidion ferdinandi</i>	Cheesetree

Other Trees

<i>Acacia binervata</i>	Two-veined Hickory
<i>Acacia implexa</i>	Hickory Wattle
<i>Acacia maidenii</i>	Maiden's Wattle
<i>Guioa semiglauc</i>	Guioa
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Rapanea howittiana</i>	Muttonwood
<i>Synoum glandulosum</i>	Rosewood

Shrubs

<i>Acacia longifolia</i>	Golden Wattle
<i>Duboisia myoporoides</i>	Corkwood
<i>Pittosporum revolutum</i>	Yellow Pittosporum
<i>Zieria smithii</i>	Sandfly Zieria

Ground Covers

<i>Hibbertia scandens</i>	Climbing Guinea Flower
<i>Kennedia rubicunda</i>	Dusky Coral-pea
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
<i>Themeda australis</i>	Kangaroo Grass

5.4 Obtaining Plant Stock

Plants of the selected species will be obtained from a nursery that has propagated them from plant material obtained in the local area or, alternatively, has propagated them from plant material obtained on site, under contract from the company. Depending on the weather conditions at the time, it may be possible to transplant some small plants and seedlings from the quarry extension site, which is to be cleared.

5.5 Weed Control

Weed control in the early stages of the project is crucial. The growth of plantings will be severely retarded if the dense sward of grass is not controlled. In later years, woody shrubs such as Bitou Bush and Lantana may become a problem.

Weed control will be achieved by a combination of several methods, depending upon the weeds present and their abundance. These methods will include mowing, removal by hand, the use of a thick mulch and spraying

with a herbicide. Weed control effort will focus on species that are adversely affecting the plantings and weeds declared noxious under the *Noxious Weeds Act 1993*.

5.6 Watering

The need for watering will depend upon local rainfall. The initial plantings will be planted with water-holding crystals and watered once at the time of planting. Follow-up watering will occur at least once per week, depending on rainfall. The need for watering will be reduced by the use of water-holding crystals and by mulching around each plant. Watering will cease or be curtailed when the plants are large enough to survive without; this will encourage deeper root growth and better plant health.

5.7 Fertilising

The use of strong fertilisers is generally avoided in native planting projects. However, a couple of tablets of a slow-release fertiliser in the hole at the time of planting can be beneficial.

5.8 Protection from Grazing Animals

Grazing stock will be excluded from the site by fencing. Grazing by rabbits and possibly swamp wallabies may have to be addressed; bagging individual plants should provide enough protection.

5.9 Mulching

All mulch used on site will be from native species, preferably obtained elsewhere on the property. The mulch must be free of weed propagules and the seed of non local species.

5.10 Planting Methods

The following planting methods will be used.

Plant Spacing

Trees and shrubs will be planted at a spacing of no more than two (2) metre centres. Ground cover plants will be planted at a density of two plants per square metre.

Plant Protection

The staking of individual plants will be avoided, as it requires much effort and may be detrimental to the plant, which should be left to grow naturally. Placing plastic bags or 'Grow Tubes' around each plant can improve the success rate. These plant guards are used to protect the plant from grazing animals, reduce weed competition, reduce wind and frost effects, and lower evaporation rates around the plant. Treating individual plants can be high maintenance, but the results are usually worth the effort.

Plant Size

Tubestock or similar sized plants will be used for all plantings. Advanced plants are not usually successful in this type of project and should not be used.

Planting Configuration

For aesthetic reasons, the plants should not be planted in rows, lines or grid patterns. The plantings should be at random, with an average density as set out above.

Individual Planting Method

Each plant will be placed in a hole of suitable size. Two slow-release fertiliser tablets will be placed at the bottom of the hole, and a handful of water-holding crystals placed around the plant as the hole is filled in. A

tree guard (e.g. plastic bag) will be placed around the planted trees and shrubs, although this may not be necessary for the ground cover plants. Each plant will be watered immediately after planting. The area around the plant will be mulched as soon as possible after planting, as each section is completed.

6 MAINTENANCE

The planted screen will require ongoing maintenance for the life of the quarry, i.e. 15 years. The maintenance requirements will decrease over time, but because the screen will be narrow and the potential for weed infestation is high, there will be an ongoing need for an active management approach. Furthermore, some plants may die and need to be replaced.

The following maintenance activities will be undertaken by Cleary Bros (Bombo) on-site staff:

- check that the fencing is intact;
- carry out weed control;
- water plants as required;
- replace dead plants;
- remove rubbish (e.g. roadside litter);
- treat erosion should this occur; and
- address the impact of grazing animals, if required.

7 MONITORING AND REPORTING

An annual inspection will be undertaken and a report prepared by a qualified person, and submitted annually to the consent authority. The report will outline the progress of the project, report on the condition of the vegetation, detail the works carried out over the past year, identify any problems with the project, and determine whether any remedial measures are required.

8 REFERENCES

Kevin Mills & Associates (2005). Overview of the Flora and Fauna, Cleary Bros (Bombo) Property at Gerroa. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, February.

Kevin Mills & Associates (2006). Flora and Fauna Assessment, Extension of Cleary Bros (Bombo) Sand Quarry, Gerroa, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, March.

New South Wales (1993). *Noxious Weeds Act 1993*. NSW Government, Sydney.

APPENDIX 1

NATIVE PLANT SPECIES LIST FOR THE CLEARY BROS (BOMBO) PROPERTY AT GERROA

PTERIDOPHYTA (Ferns)

DENNSTAEDTIACEAE

Hypolepis muelleri Wakef.

Harsh Ground Fern

Pteridium esculentum (Forster f.) Cockayne

Common Bracken

SINOPTERIDACEAE

Pellaea falcata (R. Br.) Fee

Sickle Fern

ANGIOSPERMAE (Flowering Plants)

ALISMATACEAE

Alisma plantago-aquatica L.

Water Plantain

AMARYLLIDACEAE

Crinum pedunculatum R. Br.

Swamp Lily

APIACEAE

Centella asiatica (L.) Urban

Indian Pennywort

Hydrocotyle laxiflora DC.

Stinking Pennywort

Lilaeopsis polyantha (Gand.) H. Eichler

Creeping Crantzia

APOCYNACEAE

Parsonsia straminea (R. Br.) F. Muell.

Monkey-rope Vine

ARECACEAE

Livistona australis (R. Br.) Mart.

Cabbage Palm

ASCLEPIADACEAE

Marsdenia rostrata R. Br.

Common Milk Vine

Tylophora barbata R. Br.

Bearded Tylophora

ASTERACEAE

Cassinia aculeata (Labill.) R. Br.

Common Cassinia

Cassinia quinquefaria R. Br.

Rosemary Cassinia

Ozothamnus diosmifolius (Vent.) DC.

Everlasting

Senecio bipinnatisectus Belcher

Groundsel

Senecio hispidulus A. Rich.

Rough Fireweed

Sigesbeckia orientalis L.

Indian Weed

BIGNONIACEAE

Pandorea pandorana (Andrews) Steenis

Wonga Vine

CAMPANULACEAE

Wahlenbergia gracilis (Forster f.) A. DC.

Australian Bluebell

CASUARINACEAE

Casuarina glauca Sieber ex Sprengel

Swamp Oak

CLUSIACEAE*Hypericum gramineum* Forster f.

Small St John's Wort

COMMELINACEAE*Commelina cyanea* R. Br.

Wandering Sailor

CONVOLVULACEAE*Dichondra repens* Forster & Forster f.

Kidney Weed

CYPERACEAE*Baumea articulata* (R. Br.) S. T. Blake

Jointed Twig-rush

Carex appressa R. Br.

Tall Sedge

Carex longebrachiata Boeck.

Bergalia Tussock

Eleocharis acuta R. Br.

Common Spike-rush

Eleocharis equisetina C. Presl

Spike-rush

Eleocharis sphacelata R. Br.

Tall Spike-rush

Gahnia clarkei Benl

Tall saw-sedge

Isolepis nodosa (Rottb.) R. Br.

Knobby Club-rush

Schoenoplectus validus (Vahl) A. & D. Love

River Club-rush

DILLENACEAE*Hibbertia obtusifolia* DC.

Grey Guinea Flower

EPACRIDACEAE*Monotoca elliptica* (Smith) R. Br.

Tree Broom-heath

EUPHORBIACEAE*Breynia oblongifolia* Muell. Arg.

Breynia

Glochidion ferdinandi (Muell. Arg.) Bailey var. *ferdinandi*

Cheesetree

Glochidion ferdinandi (Muell. Arg.) Bailey var. *pubens*

Hairy Cheesetree

Omalanthus populifolius Graham

Bleeding Heart

EUPOMATIACEAE*Eupomatia laurina* R. Br.

Bolwarra

FABACEAE**FABOIDEAE (subfamily)***Desmodium varians* (Labill.) G. Don.

Slender Tick-trefoil

Glycine clandestina J.C. Wendl.

Twining Glycine

Kennedia rubicunda (Schneev.) Vent.

Dusky Coral-pea

MIMOSOIDEAE (subfamily)*Acacia binervata* DC.

Two-veined Hickory

Acacia implexa Benth.

Hickory Wattle

Acacia longifolia (Andrews) Willd.

Golden Wattle

Acacia maidenii F. Muell.

Maiden's Wattle

Acacia mearnsii De Wild.

Black Wattle

Acacia suaveolens (Smith) Willd.

Sweet Wattle

Acacia ulicifolia (Salisb.) Court

Prickly Moses

GERANIACEAE*Geranium solanderi* Carolin

Native Geranium

GOODENIACEAE*Goodenia bellidifolia* Smith

Rocket Goodenia

HALORAGACEAE*Gonocarpus teucroides* DC.

Raspwort

HYDROCHARITACEAE*Ottelia ovalifolia* (R. Br.) Rich.

Swamp Lily

JUNCACEAE*Juncus kraussii* Hochst.*Juncus planifolius* R. Br.*Juncus prismatocarpus* R. Br.*Juncus usitatus* L.A.S. Johnson

Sea Rush

Broad Rush

Branching Rush

Common Rush

JUNCAGINACEAE*Triglochin procerum* R. Br.**LAMIACEAE***Lycopus australis* R. Br.

Australian Gypsywort

LAURACEAE*Cassytha pubescens* R. Br.*Endiandra sieberi* Nees

Downy Dodder-laurel

Hard Corkwood

LOBELIACEAE*Lobelia alata* Labill.*Pratia purpurascens* (R. Br.) E. Wimmer

Angled Lobelia

Lobelia Pratia

LOMANDRACEAE*Lomandra longifolia* Labill.

Spiny-headed Mat-rush

LORANTHACEAE*Amyema pendulum* (Sieber ex Sprengel) Tieghem

Drooping Mistletoe

LYTHRACEAE*Lythrum hyssopifolia* L.*Lythrum salicaria* L.

Hyssop Loosestrife

Purple Loosertife

MELIACEAE*Synoum glandulosum* (Smith) A. Juss.

Rosewood

MENISPERMACEAE*Stephania japonica* (Thunb.) Miers

Snake Vine

MORACEAE*Ficus coronata* Spin*Ficus macrophylla* Desf. ex Pers.*Ficus obliqua* Forster f.*Ficus superba* Miq.

Sandpaper Fig

Moreton bay Fig

Small-leaved Fig

Deciduous Fig

MYRSINACEAE

Rapanea howittiana Mez

Muttonwood

MYRTACEAE

Angophora floribunda (Smith) Sweet

Rough-barked Apple

Eucalyptus botryoides Smith

Bangalay

Eucalyptus pilularis Smith

Blackbutt

Eucalyptus robusta Smith

Swamp Mahogany

Eucalyptus tereticornis Smith

Forest Red Gum

Leptospermum juniperinum Smith

Prickly Teatree

Melaleuca ericifolia Smith

Swamp Paperbark

Melaleuca linariifolia Smith

Narrow-leaved Paperbark

Melaleuca styphelioides Smith

Prickly-leaved Paperbark

OLEACEAE

Notelaea longifolia Vent.

Native Olive

ORCHIDACEAE

Acianthus fornicatus R. Br.

Pixie Caps

Dendrobium teretifolium R. Br.

Rat's-tail Orchid

PHILESIACEAE

Eustrephus latifolius R. Br.

Wombat Berry

Geitonoplesium cymosum (R. Br.) A. Cunn. ex Hook.

Scrambling Lily

PHORMIACEAE

Dianella caerulea Sims

Flax-lily

PITTOSPORACEAE

Billardiera scandens Smith

Common Apple-berry

Citriobatus pauciflorus Cunn. ex Ettingsh.

Orange Thorn

Pittosporum revolutum Aiton

Yellow Pittosporum

Pittosporum undulatum Vent.

Sweet Pittosporum

POACEAE

Cymbopogon refractus (R. Br.) A. Camus

Barbed Wire Grass

Cynodon dactylon (L.) Pers.

Couch Grass

Dichelachne crinita (L.) Hook. f.

Longhair Plumegrass

Echinopogon caespitosus C. E. Hubb.

Tufted Hedgehog-grass

Echinopogon ovatus (G. Forst.) P. Beauv.

Forest Hedgehog-grass

Entolasia stricta (R. Br.) Hughes

Wiry Panic

Eragrostis? brownii (Kunth) Nees

Common Love-grass

Hemarthria uncinata R. Br.

Mat Grass

Imperata cylindrica P. Beauv. var. *major* (Nees) C. E. Hubb.

Blady Grass

Microlaena stipoides (Labill.) R. Br.

Weeping Grass

Oplismenus aemulus (R. Br.) Roem. & Schult.

Australian Basket-grass

Oplismenus imbecillus (R. Br.) Roem. & Schult.

Pademelon Grass

Paspalum distichum L.

Water Couch

Phragmites australis (Cav.) Trin. ex Steud.

Common Reed

Themeda australis (R. Br.) Stapf

Kangaroo Grass

POLYGONACEAE

Persicaria decipiens (R. Br.) K. L. Wilson

Slender Knotweed

Persicaria strigosa (R. Br.) Gross

Spotted Knotweed

POTOMOGETONACEAE

Potamogeton tricarinatus F. Muell & A. Benn. ex A. Benn. Floating Pondweed

PROTEACEAE

Banksia integrifolia L. f.

Coast Banksia

Persoonia linearis Andrews

Narrow-leaved Geebung

RANUNCULACEAE

Clematis aristata R. Br. ex DC.

Australian Clematis

Ranunculus inundatus R. Br. ex DC.

River Buttercup

RESTIONACEAE

Restio tetraphyllus Labill. subsp. *meiostachyus*

L. Johnson & O. D. Evans

Tassel Cord-rush

RHAMNACEAE

Alphitonia excelsa (Fenzl) Reisseck ex Benth.

Red Ash

ROSACEAE

Rubus parvifolius L.

Native Raspberry

RUBIACEAE

Morinda jasminoides Cunn.

Morinda

RUTACEAE

Melicope micrococca (F. Muell.) T. Hartley

White Euodia

Zieria smithii Jackson

Sandfly Zieria

SAPINDACEAE

Dodonaea triquetra Wendl.

Long-leaved Hop-bush

Guioa semiglauca (F. Muell.) Radlk.

Guioa

SCROPHULARIACEAE

Bacopa monniera (L.) Pennell

Bacopa

SMILACACEAE

Smilax glycyphylla Sm.

Thornless Sarsaparilla

SOLANACEAE

Duboisia myoporoides R. Br.

Corkwood

SPARGANIACEAE

Sparganium antipodum Graebner

Floating Bur-reed

STACKHOUSIACEAE

Stackhousia viminea Smith

Slender Stackhousia

STERCULIACEAE*Commersonia fraseri* Gay

Bush Kurrajong

TYPHACEAE*Typha orientalis* C. Presl

Broad-leaved Cumbungi

VERBENACEAE*Clerodendrum tomentosum* R. Br.

Hairy Clerodendrum

VIOLACEAE*Viola hederacea* Labill.

Native Violet

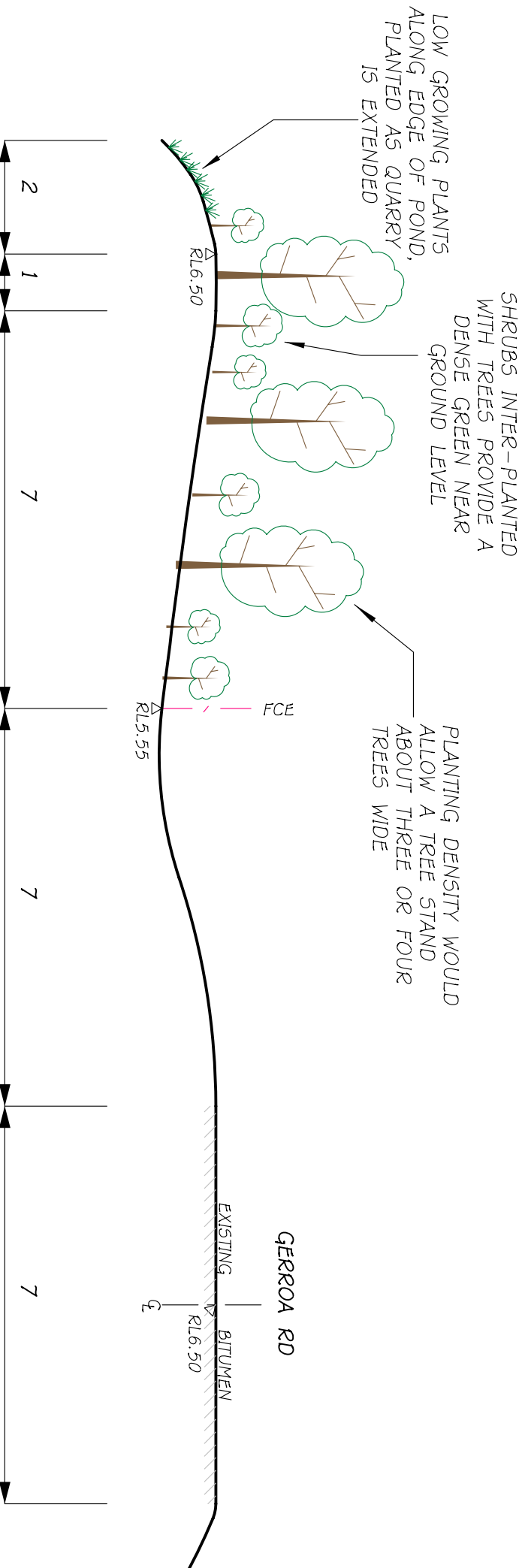
VISCACEAE*Notothixos subaureus* Oliver

Golden Mistletoe

VITACEAE*Cayratia clematidea* (F. Muell.) Domin*Cissus hypoglauca* A. Gray

Slender Grape

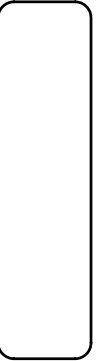
Water Vine



SUGGESTED TYPICAL CROSS-SECTION LANDSCAPE/BUND



REVISIONS	DESCRIPTION	DRN	APP	DATE



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SCALE: 1:100	

GERROA SAND MINE
TYPICAL CROSS-SECTION
LANDSCAPE BUND

JOB No. **KF105594**
DWG No. **105594/206**
SHEET 1 OF 1