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

A report prepared by

KEVIN MILLS & ASSOCIATES

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September 2006
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as trustee for Kevin Mills & Associates Trust

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CONTENTS

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	
Angophora floribunda	Rough-barked Apple
Banksia integrifolia	Coast Banksia
Eucalyptus botryoides	Bangalay
Eucalyptus pilularis	Blackbutt
Glochidion ferdinandi	Cheesetree
Other Trees	
Acacia binervata	Two-veined Hickory
Acacia implexa	Hickory Wattle
Acacia maidenii	Maiden's Wattle
Guioa semiglauca	Guioa
Pittosporum undulatum	Sweet Pittosporum
Rapanea howittiana	Muttonwood
Synoum glandulosum	Rosewood
Shrubs	
Acacia longifolia	Golden Wattle
Duboisia myoporoides	Corkwood
Pittosporum revolutum	Yellow Pittosporum
Zieria smithii	Sandfly Zieria
Ground Covers	
Hibbertia scandens	Climbing Guinea Flower
Kennedia rubicunda	Dusky Coral-pea
Lomandra longifolia	Spiny-headed Mat-rush
Themeda australis	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 equistetina 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
DILLENIACEAE	
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 teucrioides DC.	Raspwort
HYDROCHARITACEAE	
Ottelia ovalifolia (R. Br.) Rich.	Swamp Lily
JUNCACEAE	
Juncus kraussii Hochst.	Sea Rush
Juncus planifolius R. Br.	Broad Rush
Juncus prismatocarpus R. Br.	Branching Rush
Juncus usitatus L.A.S. Johnson	Common Rush
JUNCAGINACEAE	
Triglochin procerum R. Br.	
LAMIACEAE	
Lycopus australis R. Br.	Australian Gypsywort
LAURACEAE	
Cassytha pubescens R. Br.	Downy Dodder-laurel
Endiandra sieberi Nees	Hard Corkwood
LOBELIACEAE	
Lobelia alata Labill.	Angled Lobelia
Pratia purpurascens (R. Br.) E. Wimmer	Lobelia Pratia
LOMANDRACEAE	
Lomandra longifolia Labill.	Spiny-headed Mat-rush
LORANTHACEAE	
Amyema pendulum (Sieber ex Sprengel) Tieghem	Drooping Mistletoe
LYTHRACEAE	
Lythrum hyssopifolia L.	Hyssop Loosestrife
Lythrum salicaria L.	Purple Loosesrtife
MELIACEAE	
Synoum glandulosum (Smith) A. Juss.	Rosewood
MENISPERMACEAE	
Stephania japonica (Thunb.) Miers	Snake Vine
MORACEAE	
Ficus coronata Spin	Sandpaper Fig
Ficus macrophylla Desf. ex Pers.	Moreton bay Fig
Ficus obliqua Forster f.	Small-leaved Fig
Ficus superba Miq.	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 glyciphylla 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	Slender Grape
Cissus hypoglauca A. Gray	Water Vine

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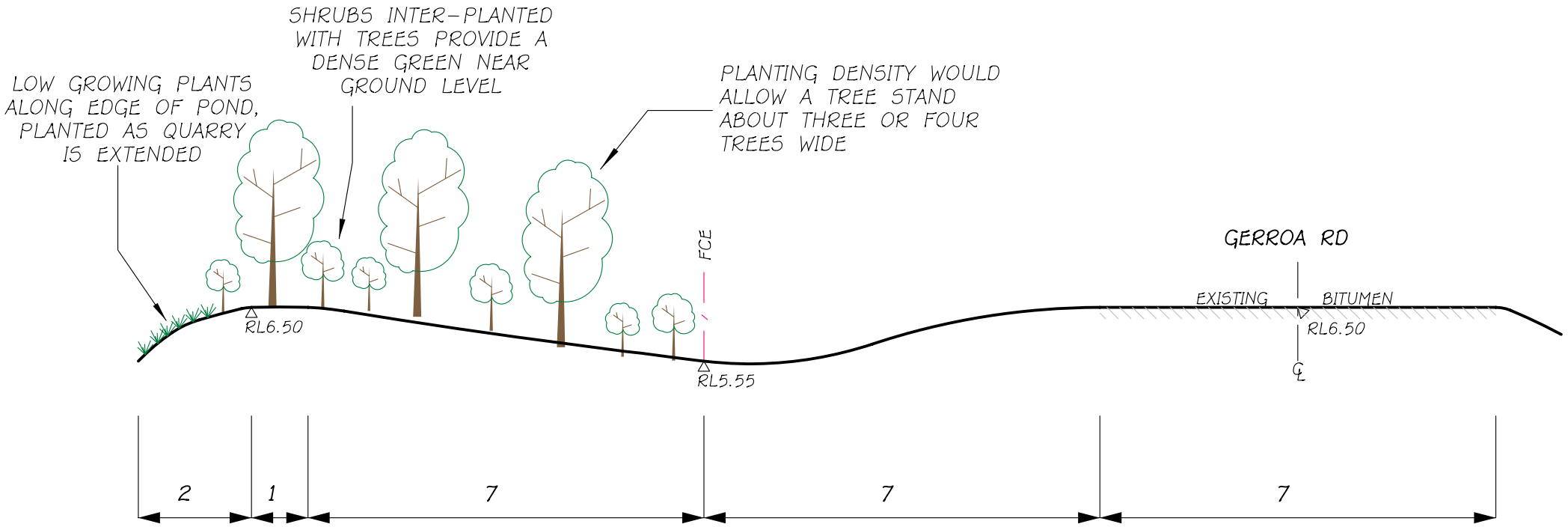

SUGGESTED TYPICAL CROSS-SECTION LANDSCAPE/BUND

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SURVEYOR:	DATE: 8-8-06	GERROA SAND MINE TYPICAL CROSS-SECTION LANDSCAPE BUND
HEIGHT DATUM: A.H.D.	DRAWN: SEA	
ORIGIN:	DESIGNED:	
HORIZ. DATUM:	CHECKED:	
ROT'N ANG:	APPROVED:	
SCALE: 1:100	DWG STATUS:	

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DWG No. 105594/806
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