6 IMPLEMENTATION

6.1 Implementation

Table 5 below shows indicative timing of actions required to implement this VMP.

As many of the actions are common to most VMAs, the actions have been presented in the table for the site overall with the relevant VMA noted. The table also shows the responsibility for each action and reporting requirements.

Commencement of actions within of the VMP will be subject to the timing of various construction works to be undertaken on the site. The earthworks at the quarry area will not commence until the completion of the subdivision works. Revegetation of this area will thus commence after the subdivision works are completed. All other areas to be disturbed within the wildlife corridor can be re-vegetated when the works in that particular area are completed, which will be at various stages of the overall works programme.

Aspect of VMP	Applicable VMA	Months prior to site works	Immediately prior to commencement of site works	During on site excavation, clearing and construction works.	Start of reveg/weed control works to-6 months	6-12months	12-24 months	24-36 months	Responsibility
Mitigation of fauna impacts	All areas	Installation of 8 of the 15 nest boxes 3 months prior to clearing. It is proposed that the remaining 7 nest boxes will be salvaged from hollows onsite and will therefore be installed after clearing (Refer to Table 3 – Issue 7).	Relocation of wildlife from dams and other development areas as required.	Clearing to follow required protocols, including for habitat trees. Selection of salvageable hollows to be used for nest box construction (Refer to Table 3 - Issue 7).					Project Ecologist
Temporary fencing	All areas.		Installation of temporary exclusion fencing for corridor areas. Induction of personnel and contractors by Project Ecologist.		Installation of temporary exclusion fencing for revegetation areas.				Construction contractor
Erosion and Sediment Control	VMA 1, VMA 4 and Development Area.	Preparation and approval of Erosion and Sediment Control (ESC) Plan	Implementation of ESC Plan and monitoring of controls in clearing and construction areas, including the quarry area	Monitoring of controls in clearing and construction areas, including the quarry area	Implementation of ESC Plan and monitoring of controls in revegetation areas	Implementation of ESC Plan and monitoring of controls in revegetation areas until stabilised	Implementation of ESC Plan and monitoring of controls in revegetation areas until stabilised	Implementatio n of ESC Plan and monitoring of controls in revegetation areas until stabilised	Developer/ Construction Contractor

Table 5 - Timing and responsibilities for actions required to implement VMP

Aspect of VMP	Applicable VMA	Months prior to site works	Immediately prior to commencement of site works	During on site excavation, clearing and construction works.	Start of reveg/weed control works to-6 months	6-12months	12-24 months	24-36 months	Responsibility
Brush matting	VMA 1, VMA 4, VMA5 and development area.			Retain and store seed bearing branches for bush matting in revegetation areas.	Placement of branches in revegetation areas after topsoil is laid.				Construction contractor
Topsoil preservation	All areas where excavation will occur.			Collection and storage of topsoil and associated leaf litter	Placement of topsoil in revegetation areas after earthworks and construction works are complete.				Construction contractor
Landscaping	Development area, buffer areas	Landscape plan to incorporate suitable endemic species in buffer plantings to environmental corridors. Sourcing of plants for landscaping			Planting and maintenance of landscape plantings	Maintenance of landscape plantings	Maintenance of landscape plantings	Maintenance of landscape plantings	Landscape contractor
Weed control in regeneration areas	VMA 2, VMA 3. Buffer areas as required.			Primary weeding in corridor areas.	Primary weeding in corridor areas.	Secondary weeding in corridor areas.	Secondary weeding in corridor areas.	Secondary weeding in corridor areas.	Bush regeneration contractor
Rubbish and green waste removal	VMA 2, VMA 3. Buffer areas and revegetation areas as required.		Pre-development baseline monitoring of rubbish dumping	Removal of rubbish from VMA 2 and VMA 3. Removal from buffer areas and revegetation areas as required.	Monitoring of all areas on site and removal of rubbish or green waste as required.	Monitoring of all areas on site and removal of rubbish or green waste as required.	Monitoring of all areas on site and removal of rubbish or green waste as required.	Monitoring of all areas on site and removal of rubbish or green waste as required.	Developer

Aspect of VMP	Applicable VMA	Months prior to site works	Immediately prior to commencement of site works	Durring on site excavation, clearing and construction works.	Start of reveg/weed control works to-6 months	6-12months	12-24 months	24-36 months	Responsibility
Revegetation Works	VMA 1, VMA 4 and VMA5. VM2 if required.	Sourcing of plants for revegetation			Planting of tubestock.	Monitoring of tube stock and replacement planting if required. Weed control in revege areas.	Monitoring of tube stock and replacement planting if required. Weed control in revege areas.	Monitoring of tube stock and replacement planting if required. Weed control in revege areas.	Bush regeneration contractor
Monitoring of regeneration and revegetation areas	All VMAs.		Pre-development baseline monitoring of weed cover		Monitoring report at 6 months re weed control, native vegetation regeneration and revegetation success.	Monitoring report at 12 months re weed control, native vegetation regeneration and revegetation success.	Monitoring report at 18 months re weed control, native vegetation regeneration and revegetation success.	Final monitoring report at 24 months re weed control, native vegetation regeneration and revegetation success.	Project Ecologist

6.2 Indicative Costing

The following table 6 provides an estimate of costs for the implementation of Bush Regenerator responsibilities for this VMP. This costing is based on a professional estimate by Gecko Environmental Management July 11th, 2016.

Activity	Cost
Primary weed removal in VMA 2, VMA 3 and buffer area. To be carried out within first 6 months of contract commencement.	\$18,000
Secondary weeding/ maintenance. Weeding all VMAs to be carried out 6-12 months from contract commencement.	\$9,600
Secondary weeding/ maintenance. Weeding all VMAs to be carried out 12-24 months from contract commencement.	\$9,600
Secondary weeding/ maintenance. Weeding all VMAs to be carried out 24-36 months from contract commencement.	\$5,000
Seed collect, supply and install of provenance plants, and maintain to establish revegetated areas where necessary in regeneration zones as per VMP (VMA 1, VMA 4 and VMA 5. VMA 2 if required).	\$42,000
Total:	\$84,200
GST:	\$8,420
Total (including GST):	\$92,620

Table 6 - Indicative Costing for Implementation of Bush Regenerator Responsibilities

7 MAPS

7.1 Site and Vegetation Maps



Figure 1 – Location of Subject Site



Figure 2 - Proposed Rezoning with Proposed Subdivision Overlayed



Figure 3 - Zoning boundaries, weed densities, ecological survey locations and survey results



Figure 4 -Ecological features in relation to proposed subdivision layout

7.2 Management Units or Zones



Figure 5 - Vegetation Management Areas (VMAs)







Figure 6 - Photo monitoring locations



Figure 7 - Existing and proposed nest box locations

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Appendix 1 – Flora Species Lists

Table 7 - Flora Species List

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds – Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Tree	Myrtaceae	Corymbia maculata	Spotted Gum				4	3	x	x
Tree	Fabaceae	Erythrina x sykesii	Coral Tree	x					x	х
Tree	Myrtaceae	Eucalyptus eugenioides	Thin-leaved Stringybark						х	x
Tree	Myrtaceae	Eucalyptus siderophloia	Grey Ironbark				2	3	x	x
Palm Tree	Arecaceae	Livistona australis	Cabbage Tree Palm						x	
Small Tree	Fabaceae	Acacia implexa	Lightwood							x
Small Tree	Casuarinaceae	Allocasuarina torulosa	Forest Oak						x	x
Small Tree	Santalaceae	Exocarpus cupressiformis	Native Cherry						x	x

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds - Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Small Tree	Phyllanthaceae	Glochidion ferdinandi var. ferdinandi	Cheese Tree					1	x	x
Small Tree	Myrtaceae	Melaleuca nodosa	Ball Honeymyrtle					3	x	x
Small Tree	Pittosporaceae	Pittosporum undulatum	Sweet Pittosporum	-			1	3		x
Shrub	Fabaceae	Acacia falcata	Hickory Wattle							x
Shrub	Fabaceae	Acacia longifolia subsp. longifolia	Sydney Golden Wattle							x
Shrub	Phyllanthaceae	Breynia oblongifolia	Coffee Bush				1		x	x
Shrub	Fabaceae	Daviesia ulicifolia	Gorse Bitter Pea							x
Shrub	Clusiaceae	Hypericum perforatum	St. Johns Wort	x		3				x
Shrub	Verbenaceae	Lantana camara	Lantana	x			1	3	x	x
Shrub	Oleaceae	Ligustrum sinense	Small-leaved Privet	x			2	3	x	x
Shrub	Zamiaceae	Macrozamia flexuosa							x	x
Shrub	Ochnaceae	Ochna serrulata	Mickey Mouse Plant	x				1	x	

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds - Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Shrub	Asteraceae	Ozothamnus diosmifolius	Rice Flower, White Dogwood							x
Shrub	Proteaceae	Persoonia linearis	Narrow-leaved Geebung						x	
Shrub	Fabaceae	Senna pendula		x						x
Shrub	Xanthorrhoeaceae	Xanthorrhoea macronema							x	
Sub-shrub	Asparagaceae	Asparagus aethiopicus	Ground Asparagus	x		4	1			х
Sub-shrub	Rubiaceae	Pomax umbellata	Pomax							x
Sedge	Cyperaceae	Carex appressa	Tall Sedge					2	x	
Sedge	Cyperaceae	Cyperus eragrostis	Umbrella Sedge	x						x
Sedge	Cyperaceae	Gahnia clarkei	Tall Saw-sedge					3	x	
Sedge	Cyperaceae	Gahnia sieberiana	Red-fruit Saw-sedge							x
Sedge	Cyperaceae	Lepidosperma laterale							x	
Rush	Juncaceae	Juncus usitatus					2	2	х	x

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds – Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Herb	Asteraceae	Bidens pilosa	Cobbler's Pegs	х						x
Herb	Gentianaceae	Centaurium tenuiflorum		x						x
Herb	Apiaceae	Centella asiatica	Indian Pennywort					1	x	x
Herb	Asteraceae	Cirsium vulgare	Spear Thistle	х			1		x	x
Herb	Commelinaceae	Commelina cyanea	Native Wandering Jew						x	x
Herb		Conyza spp.	Fleabane	x						х
Herb	Apiaceae	Cyclospermum leptophyllum	Slender Celery	x						х
Herb	Phormiaceae	Dianella caerulea var. producta	Blue Flax-lily				2	1	х	x
Herb	Convolvulaceae	Dichondra repens	Kidney Weed				1	1	х	x
Herb	Asteraceae	Euchiton sphaericus	Cudweed							x
Herb	Rubiaceae	Galium propinqum	Maori Bedstraw						х	
Herb	Asteraceae	Gamochaeta purpurea	Purple Cudweed	x			1			х

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds – Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Herb	Goodeniaceae	Goodenia heterophylla							x	х
Herb		Hydrocotyle peduncularis								x
Herb	Asteraceae	Hypochaeris radicata	Cats Ear or Flatweed	x			1			х
Herb	Asteraceae	Onopordum acanthium	Scotch Thistle	x						x
Herb	Plantaginaceae	Plantago lanceolata	Lamb's Tongues	x			2			x
Herb		Pratia purpurascens	Whiteroot				1	1	x	x
Herb	Polygonaceae	Rumex brownii	Swamp Dock							x
Herb	Polygonaceae	Rumex crispus	Curled Dock	x						x
Herb	Asteraceae	Senecio madagascariensis	Fireweed	x	x	4	1			x
Herb		Sida rhombifolia	Paddy's Lucerne	x			1			x
Herb	Solanaceae	Solanum nigrum	Black-berry Nightshade	x						x
Herb	Asteraceae	Sonchus oleraceus	Common Sowthistle	x						x

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds – Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Herb	Asteraceae	Tagetes minuta	Stinking Roger	x						х
Herb	Caryophyllaceae	Vaccaria hispanica	Bladder Soapwort	x						x
Herb	Verbenaceae	Verbena incompta	Purpletop	x						x
Herb	Asteraceae	Vernonia cinerea								x
Herb	Fabaceae	Vicia sativa subsp. nigra	Narrow-leaved Vetch	x						x
Grass	Poaceae	Andropogon virginicus	Whisky Grass	x			3	2	x	х
Grass	Poaceae	Aristida vagans	Three-awned Speargrass					1	x	
Grass	Poaceae	Briza maxima	Blowfly Grass	х			1			х
Grass	Poaceae	Chloris gayana	Rhodes Grass	x			2			x
Grass	Poaceae	Cortaderia selloana	Pampas Grass	x		3			x	
Grass	Poaceae	Cymbopogon refractus	Barbed Wire Grass				3			x
Grass	Poaceae	Dichelachne micrantha	Shorthair Plumegrass				4			x

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds – Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Grass	Poaceae	Digitaria parviflora	Small-flowered Finger Grass						x	
Grass	Poaceae	Echinopogon caespitosus	Tufted Hedgehog Grass							x
Grass	Poaceae	Entolasia marginata	Bordered Panic					1	х	х
Grass	Poaceae	Entolasia stricta	Wiry Panic				2	1	х	x
Grass	Poaceae	Imperata cylindrica	Blady Grass					3	х	х
Grass	Poaceae	Lachnagrostis aemula	Blowngrass				1			x
Grass	Poaceae	Microlaena stipoides	Weeping Grass						х	x
Grass	Poaceae	Oplismenus aemulus	Australian Basket Grass					3	x	x
Grass	Poaceae	Panicum simile	Two-colour Panic					3	х	x
Grass	Poaceae	Paspalum urvillei	Vasey Grass	x						х
Grass	Poaceae	Pennisetum clandestinum	Kikuyu Grass	٠x						x
Grass	Poaceae	Rytidosperma monticola	Wallaby Grass				1			x

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds - Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Grass	Poaceae	Sporobolus africanus	Parramatta Grass	x						x
Grass	Poaceae	Sporobolus elongatus	Slender Rat's Tail Grass				1			x
Grass	Poaceae	Themeda triandra	Kangaroo Grass					2	x	x
Graminoid	Lomandraceae	Lomandra longifolia	Spiny-headed Mat-rush					3	x	x
Graminoid	Lomandraceae	Lomdandra multiflora subsp. multiflora	Many-flowered Mat-rush					1	x	x
Fern	Pteridaceae	Adiantum aethiopicum	Common Maidenhair							x
Fern	Pteridaceae	Cheilanthes sieberi subsp. sieberi	Poison Rock Fern					1	x	х
Fern	Pteridaceae	Pellaea falcata	Sickle Fern					3	x	x
Fern	Pteridaceae	Pellaea viridis	Green Cliff Brake	x						x
Fern	Gleicheniaceae	Sticherus flabellatus	Umbrella Fern					1	x	
Climber	Asparagaceae	Asparagus asparagoides	Bridal Creeper	x		1	2	2	x	x
Climber	Ranunculaceae	Clematis glycinoides	Headache Vine							х

Life Form	Family	Species	Common Name	Introduced Species	Weeds of Nat. Sign.	Nox Weeds - Wyong LGA	Quadrat 1	Quadrat 2	E2 Zoned Area	Proposed Rezoning Area
Climber	Fabaceae	Desmodium varians	Slender Tick-trefoil							х
Climber	Fabaceae	Glycine clandestina							x	x
Climber	Fabaceae	Hardenbergia violacea	False Sarsparilla				1			x
Climber	Convolvulaceae	Ipomoea purpurea	Common Morning Glory	x						х
Climber	Bignoniaceae	Pandorea pandorana	Wonga Wonga Vine						x	
Climber	Apocynaceae	Parsonsia straminea	Common Silkpod					4	x	
Orchid	Orchidaceae	Caladenia catenata	White Caladenia						x	x
Orchid	Orchidaceae	Calochilus sp.	Bearded Orchid species							х
Orchid	Orchidaceae	Pterostylis bicolor	Black-tip Greenhood				1			x
Orchid	Orchidaceae	Thelymitra pauciflora	Slender Sun Orchid							x
Aquatic	Salviniaceae	Azolla sp.	Free floating fern							х

Appendix 2- Habitat tree clearing protocol

All hollows are to be inspected for inhabitants by an Ecologist with the aid of a tree climber immediately prior to removal if safe to do so. In the event that hollow/s are inhabited by fauna, then the following options are available depending on the sensitivity of the species and/or its breeding cycle:

- If the fauna species is breeding, then tree felling is delayed until the species completes its breeding cycle, after which time the hollow would need to be inspected again immediately prior to felling;
- The hollow entrances are blocked with towels and the tree is sectionally dismantled and hollows are carefully lowered to the ground. The blocks will be released after dark and occupying specimens are re-located to suitable adjoining bushland areas; or
- If the fauna is a prevalent denswapping species or the hollow appears to be a temporary roost, the hollow is to be removed when unoccupied, confirmed by inspection, allowing the tree to be felled.

Appendix 3 - Plant species suitable for revegetation

Table 8 - Plant species suitable for revegetation

Life Form	Species	Common Name	Beneficiary fauna species of keystone or feed tree flora species	
			Squirrel Glider. An important	
Tree	Corymbia maculata	Spotted Gum	winter foraging resource.	
Tree	Eucalyptus eugenioides	Thin-leaved Stringybark		
Tree	Eucalyptus siderophloia	Grey Ironbark	Squirrel Glider	
Palm Tree	Livistona australis	Cabbage Tree Palm		
Small Tree	Acacia implexa	Lightwood		
Small Tree	Allocasuarina torulosa	Forest Oak	Glossy Black Cockatoo	
Small Tree	Exocarpus cupressiformis	Native Cherry		
Small Tree	Glochidion ferdinandi var. ferdinandi	Cheese Tree		
Small Tree	Melaleuca nodosa	Ball Honeymyrtle	Squirrel Glider	
Small Tree	Pittosporum undulatum	Sweet Pittosporum		
Shrub	Acacia falcata	Hickory Wattle		
Shrub	Acacia longifolia subsp. longifolia	Sydney Golden Wattle	Squirrel Glider	
Shrub	Breynia oblongifolia	Coffee Bush		
Shrub	Daviesia ulicifolia	Gorse Bitter Pea		

Life Form	Species	Common Name	Beneficiary fauna species of keystone or feed tree flora species
Shrub	Macrozamia flexuosa		
Shrub	Ozothamnus diosmifolius	Rice Flower, White Dogwood	
Shrub	Persoonia linearis	Narrow-leaved Geebung	
Shrub	Xanthorrhoea macronema		Squirrel Glider
Sub-shrub	Pomax umbellata	Pomax	
Sedge	Carex appressa	Tall Sedge	
Sedge	Gahnia clarkei	Tall Saw-sedge	
Sedge	Gahnia sieberiana	Red-fruit Saw-sedge	
Sedge	Lepidosperma laterale		
Rush	Juncus usitatus		
Herb	Centella asiatica	Indian Pennywort	
Herb	Commelina cyanea	Native Wandering Jew	
Herb	Dianella caerulea var. producta	Blue Flax-lily	
Herb	Dichondra repens	Kidney Weed	
Herb	Euchiton sphaericus	Cudweed	
Herb	Galium propinqum	Maori Bedstraw	
Herb	Goodenia heterophylla		
Herb	Hydrocotyle peduncularis		
Herb	Pratia purpurascens	Whiteroot	

Life Form	Species	Common Name	Beneficiary fauna species of keystone or feed tree flora species		
Herb	Rumex brownii	Swamp Dock			
Herb	Vernonia cinerea				
Grass	Aristida vagans	Three-awned Speargrass			
Grass	Cymbopogon refractus	Barbed Wire Grass			
Grass	Dichelachne micrantha	Shorthair Plumegrass			
Grass	Digitaria parviflora	Small-flowered Finger Grass			
Grass	Echinopogon caespitosus	Tufted Hedgehog Grass			
Grass	Entolasia marginata	Bordered Panic			
Grass	Entolasia stricta	Wiry Panic			
Grass	Imperata cylindrica	Blady Grass			
Grass	Lachnagrostis aemula	Blowngrass			
Grass	Microlaena stipoides	Weeping Grass			
Grass	Oplismenus aemulus	Australian Basket Grass			
Grass	Panicum simile	Two-colour Panic			
Grass	Rytidosperma monticola	Wallaby Grass			
Grass	Sporobolus elongatus	Slender Rat's Tail Grass			
Grass	Themeda triandra	Kangaroo Grass			
Graminoid	Lomandra longifolia	Spiny-headed Mat-rush			
Graminoid	Lomdandra multiflora subsp.	Many-flowered Mat-rush			

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Life Form	Species	Common Name	Beneficiary fauna species of keystone or feed tree flora species
	multiflora		
Fern	Adiantum aethiopicum	Common Maidenhair	
Fern	Cheilanthes sieberi subsp. sieberi	Poison Rock Fern	
Fern	Pellaea falcata	Sickle Fern	
Fern	Sticherus flabellatus	Umbrella Fern	
Climber	Clematis glycinoides	Headache Vine	
Climber	Desmodium varians	Slender Tick-trefoil	
Climber	Glycine clandestina		
Climber	Hardenbergia violacea	False Sarsparilla	
Climber	Pandorea pandorana	Wonga Wonga Vine	
Climber	Parsonsia straminea	Common Silkpod	

Appendix 4 - Guidelines for nest box type & installation

This following points provide some general information to be considered in nest box selection and/or construction, placement and installation:

- The selection of nest boxes with a variety of entrance holes i.e. Squirrel Glider's (*Petaurus norfolcensis*) prefer small (approximately 3-4cm) entrance holes where as Parrot species prefer larger (approximately 7.5-10cm) entrance holes;
- Internal laddering or natural climbing surface provided by a natural hollow i.e. for accessibility for a variety of fauna, particularly important for juveniles;
- Provide nest boxes with a variety of depths & widths of the cavity;
- Extent of canopy cover above the site selection. This can influence the protective cover, internal temperature & light level of the nest box i.e. micro-bats prefer nest sites that have a higher internal temperature & some species of diurnal fauna prefer more protected locations;
- Aspect, i.e. most species of birds & mammals prefer a south-eastern aspect from the tree, whereas micro-bats may prefer a north north-western aspect which creates a higher internal temperature as referred to above;
- The angle or incline of the nest box so as to minimise the entry of rainfall;
- Height above the ground, i.e. a height of 3-6m is suitable for most species;
- Accessibility from tree branch or trunk i.e. Smaller arboreal mammals prefer the entrance to be positioned close (turned slightly inwards) to the trunk or branch;
- Tree species i.e. choosing species which are already utilised for nest sites by the target species within the study area; &
- Spread or density of nest boxes type at a site with consideration for territorial behaviour of individuals of the same species. Territorial ranges of Squirrel Glider's requires separation of approximately 160-200m. Common Brushtail Possum (*Trichosurus vulpecular*) should be place at least 100m apart.