

Figure H.3.14 Planting Plan 14: NH2U-DG-PL-0014

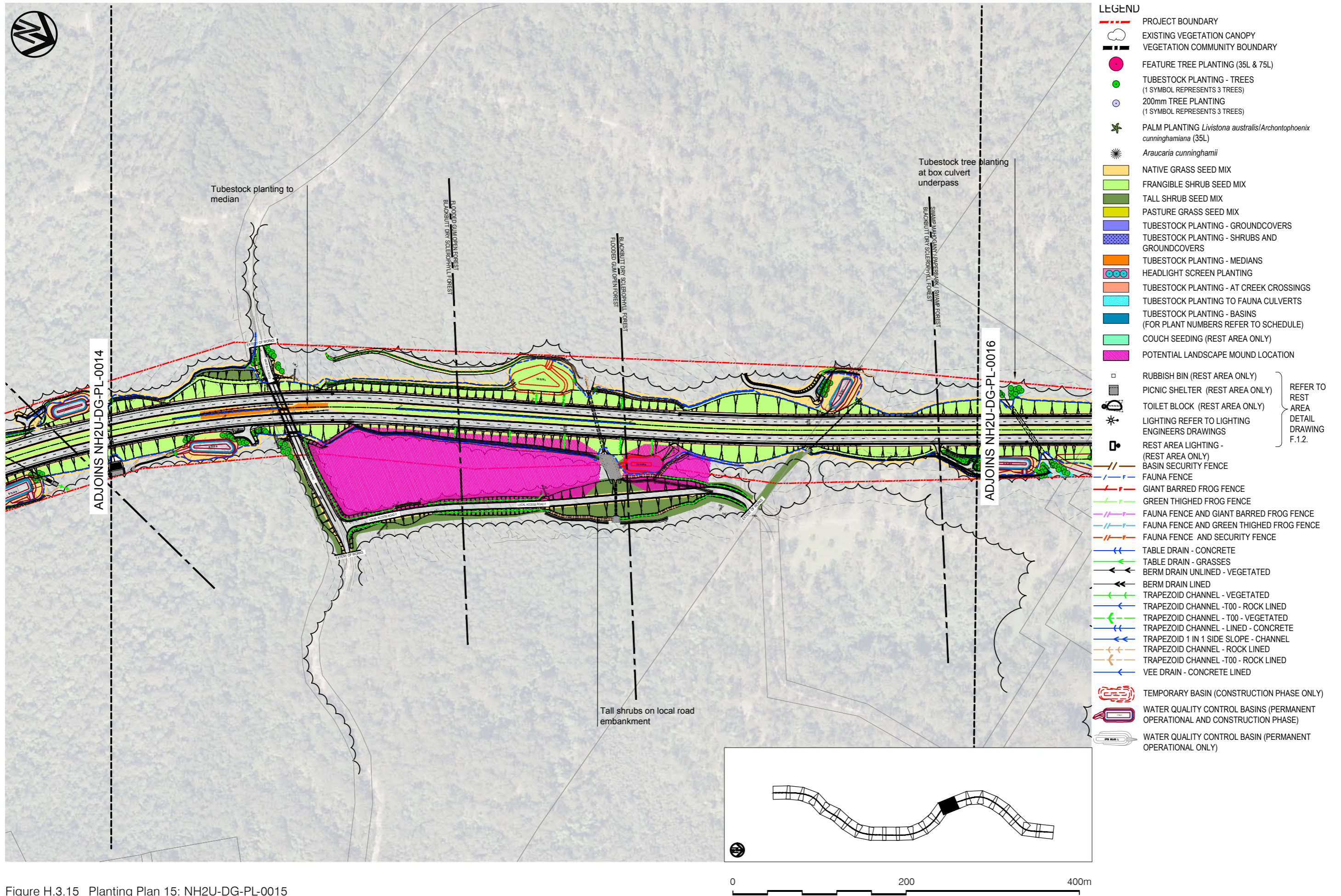
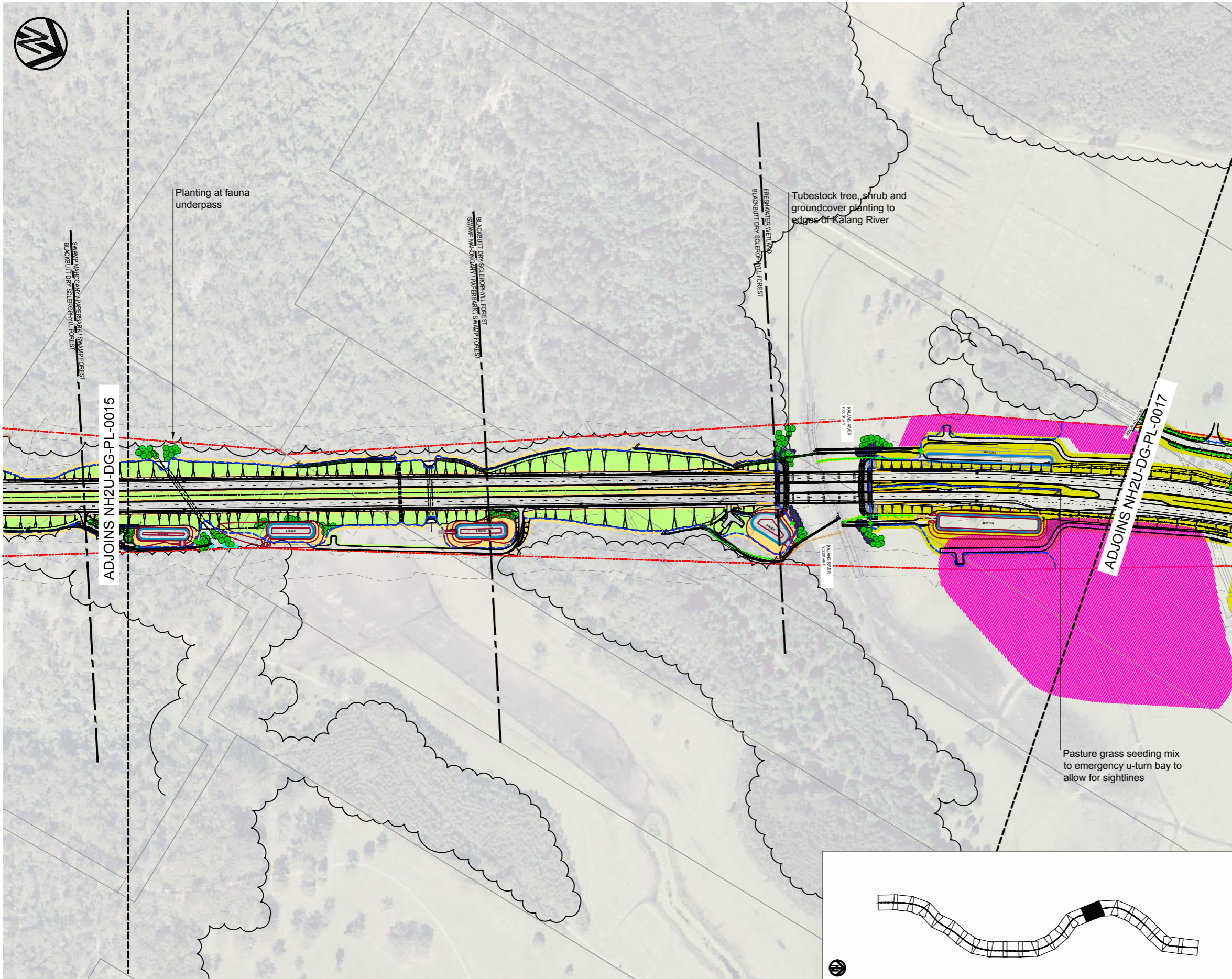


Figure H.3.15 Planting Plan 15: NH2U-DG-PL-0015



- ### LEGEND
- PROJECT BOUNDARY
 - EXISTING VEGETATION CANOPY
 - VEGETATION COMMUNITY BOUNDARY
 - FEATURE TREE PLANTING (35L & 75L)
 - TUBESTOCK PLANTING - TREES (1 SYMBOL REPRESENTS 3 TREES)
 - 200mm TREE PLANTING (1 SYMBOL REPRESENTS 3 TREES)
 - ✱ PALM PLANTING *Livistona australis/Archontophoenix cunninghamiana* (35L)
 - ✱ *Araucaria cunninghamii*
 - NATIVE GRASS SEED MIX
 - FRANGIBLE SHRUB SEED MIX
 - TALL SHRUB SEED MIX
 - PASTURE GRASS SEED MIX
 - TUBESTOCK PLANTING - GROUNDCOVERS
 - TUBESTOCK PLANTING - SHRUBS AND GROUNDCOVERS
 - TUBESTOCK PLANTING - MEDIANS
 - HEADLIGHT SCREEN PLANTING
 - TUBESTOCK PLANTING - AT CREEK CROSSINGS
 - TUBESTOCK PLANTING TO FAUNA CULVERTS
 - TUBESTOCK PLANTING - BASINS (FOR PLANT NUMBERS REFER TO SCHEDULE)
 - COUCH SEEDING (REST AREA ONLY)
 - POTENTIAL LANDSCAPE MOUND LOCATION
 - RUBBISH BIN (REST AREA ONLY)
 - PICNIC SHELTER (REST AREA ONLY)
 - TOILET BLOCK (REST AREA ONLY)
 - ✱ LIGHTING REFER TO LIGHTING ENGINEERS DRAWINGS
 - REST AREA LIGHTING - (REST AREA ONLY)
 - BASIN SECURITY FENCE
 - FAUNA FENCE
 - GIANT BARRED FROG FENCE
 - GREEN THIGED FROG FENCE
 - FAUNA FENCE AND GIANT BARRED FROG FENCE
 - FAUNA FENCE AND GREEN THIGED FROG FENCE
 - FAUNA FENCE AND SECURITY FENCE
 - TABLE DRAIN - CONCRETE
 - TABLE DRAIN - GRASSES
 - BERM DRAIN UNLINED - VEGETATED
 - BERM DRAIN LINED
 - TRAPEZOID CHANNEL - VEGETATED
 - TRAPEZOID CHANNEL - T00 - ROCK LINED
 - TRAPEZOID CHANNEL - T00 - VEGETATED
 - TRAPEZOID CHANNEL - LINED - CONCRETE
 - TRAPEZOID 1 IN 1 SIDE SLOPE - CHANNEL
 - TRAPEZOID CHANNEL - ROCK LINED
 - TRAPEZOID CHANNEL - T00 - ROCK LINED
 - VEE DRAIN - CONCRETE LINED
 - TEMPORARY BASIN (CONSTRUCTION PHASE ONLY)
 - WATER QUALITY CONTROL BASINS (PERMANENT OPERATIONAL AND CONSTRUCTION PHASE)
 - WATER QUALITY CONTROL BASIN (PERMANENT OPERATIONAL ONLY)

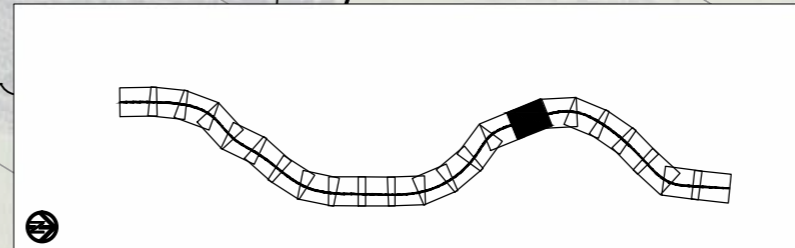


Figure H.3.16 Planting Plan 16: NH2U-DG-PL-0016

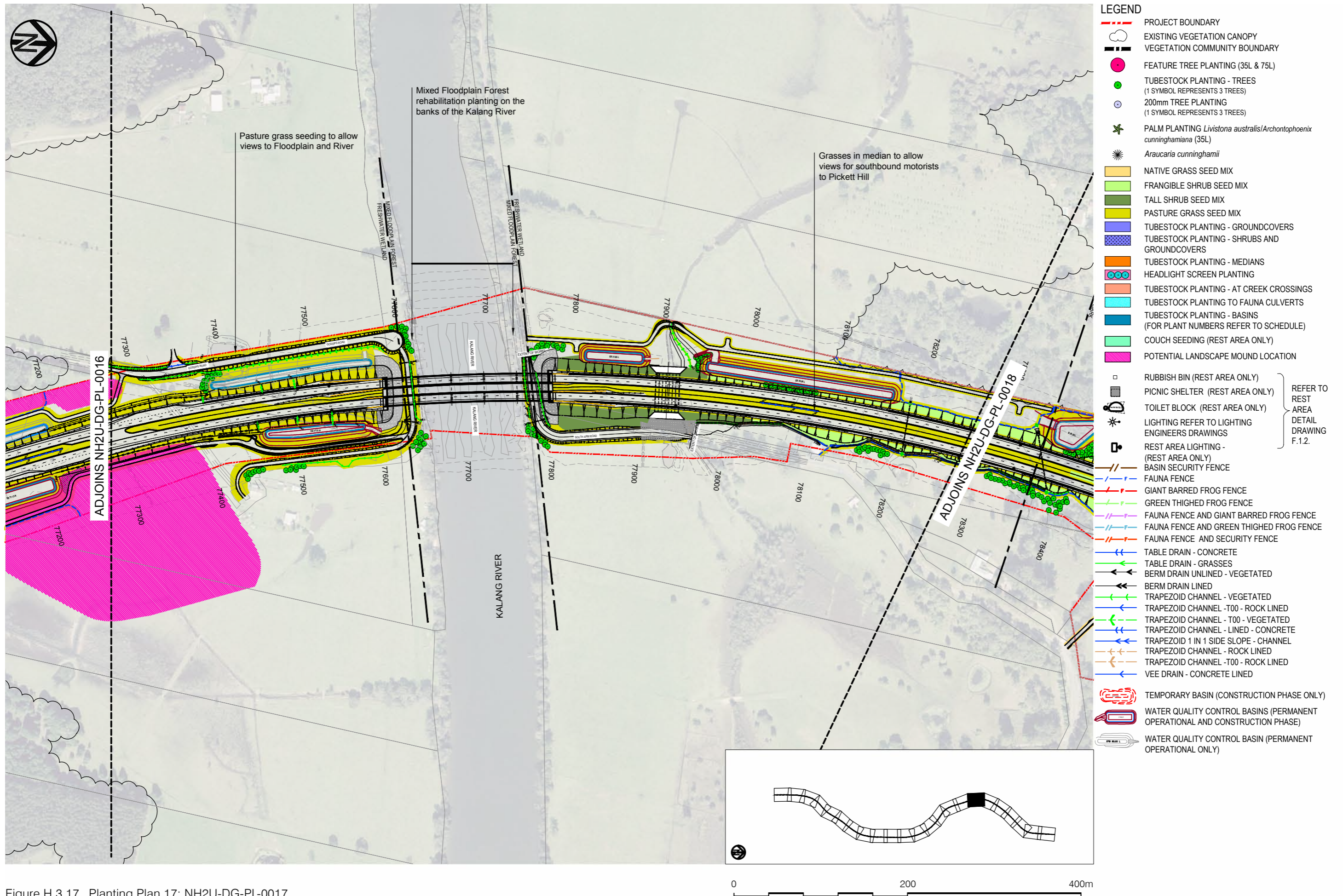


Figure H.3.17 Planting Plan 17: NH2U-DG-PL-0017

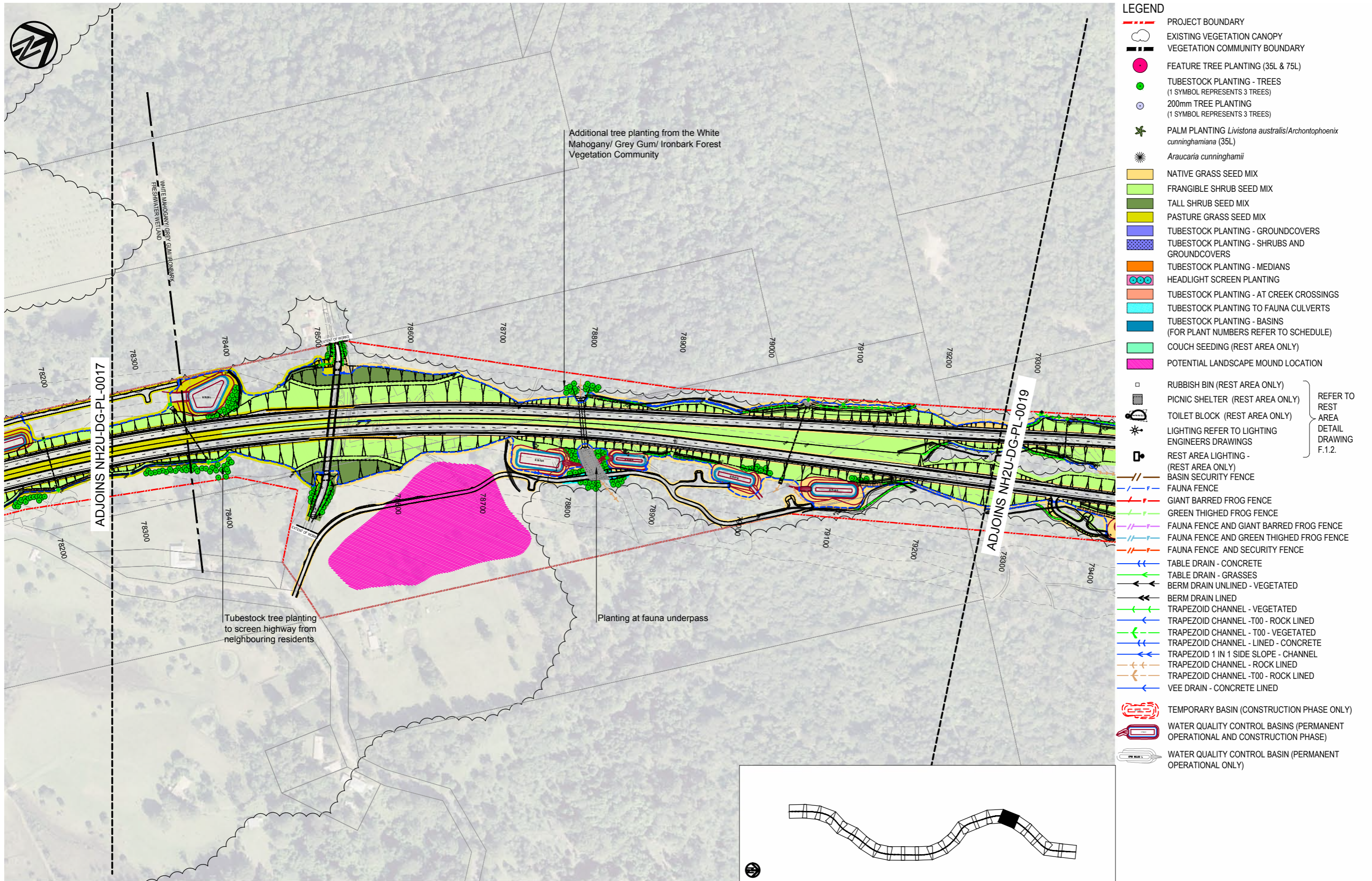


Figure H.3.18 Planting Plan 18: NH2U-DG-PL-0018

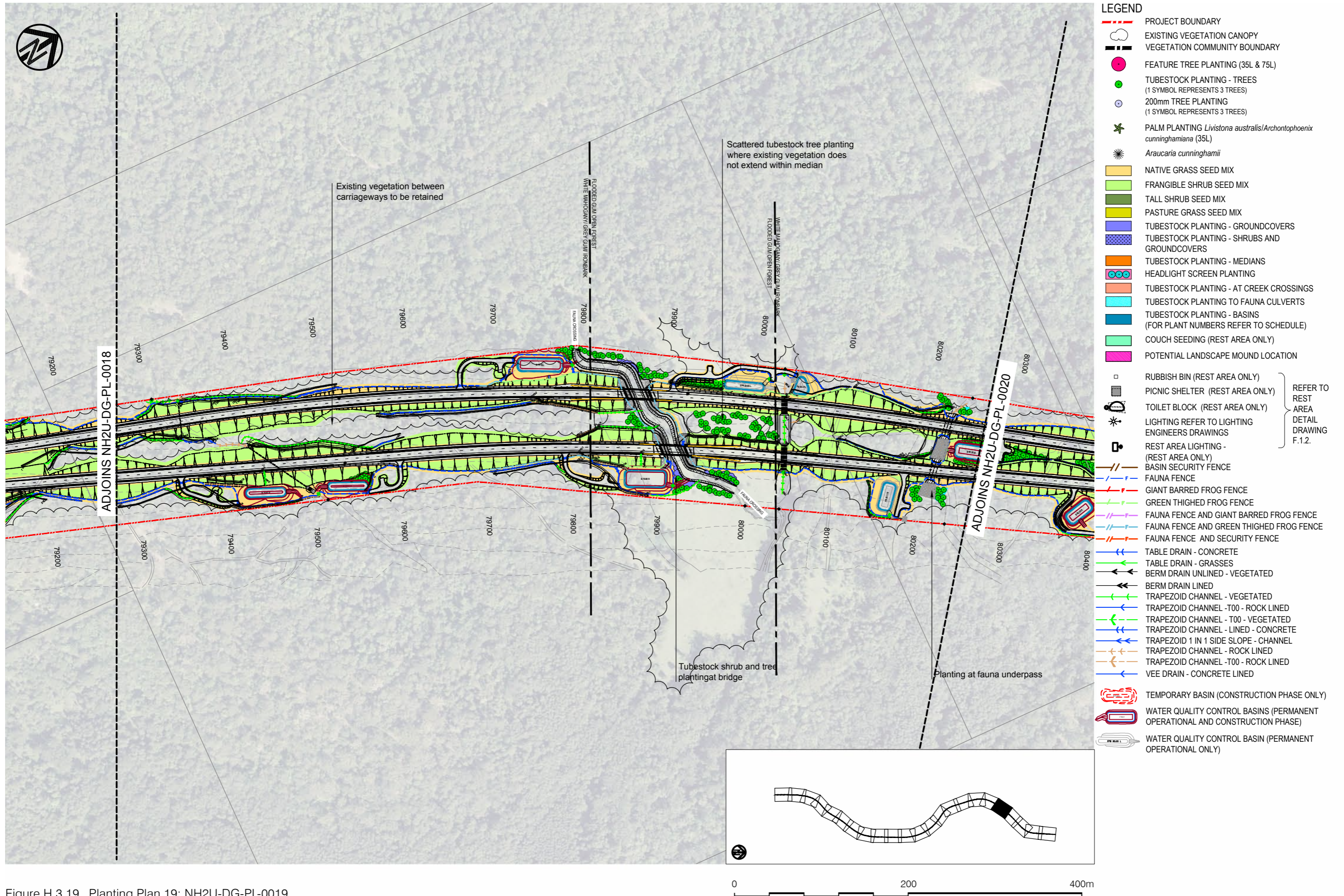


Figure H.3.19 Planting Plan 19: NH2U-DG-PL-0019



- LEGEND**
- PROJECT BOUNDARY
 - EXISTING VEGETATION CANOPY
 - VEGETATION COMMUNITY BOUNDARY
 - FEATURE TREE PLANTING (35L & 75L)
 - TUBESTOCK PLANTING - TREES (1 SYMBOL REPRESENTS 3 TREES)
 - 200mm TREE PLANTING (1 SYMBOL REPRESENTS 3 TREES)
 - PALM PLANTING *Livistona australis/Archontophoenix cunninghamiana* (35L)
 - Araucaria cunninghamii*
 - NATIVE GRASS SEED MIX
 - FRANGIBLE SHRUB SEED MIX
 - TALL SHRUB SEED MIX
 - PASTURE GRASS SEED MIX
 - TUBESTOCK PLANTING - GROUNDCOVERS
 - TUBESTOCK PLANTING - SHRUBS AND GROUNDCOVERS
 - TUBESTOCK PLANTING - MEDIANS
 - HEADLIGHT SCREEN PLANTING
 - TUBESTOCK PLANTING - AT CREEK CROSSINGS
 - TUBESTOCK PLANTING TO FAUNA CULVERTS
 - TUBESTOCK PLANTING - BASINS (FOR PLANT NUMBERS REFER TO SCHEDULE)
 - COUCH SEEDING (REST AREA ONLY)
 - POTENTIAL LANDSCAPE MOUND LOCATION
 - RUBBISH BIN (REST AREA ONLY)
 - PICNIC SHELTER (REST AREA ONLY)
 - TOILET BLOCK (REST AREA ONLY)
 - LIGHTING REFER TO LIGHTING ENGINEERS DRAWINGS
 - REST AREA LIGHTING - (REST AREA ONLY)
 - BASIN SECURITY FENCE
 - FAUNA FENCE
 - GIANT BARRED FROG FENCE
 - GREEN THIGED FROG FENCE
 - FAUNA FENCE AND GIANT BARRED FROG FENCE
 - FAUNA FENCE AND GREEN THIGED FROG FENCE
 - FAUNA FENCE AND SECURITY FENCE
 - TABLE DRAIN - CONCRETE
 - TABLE DRAIN - GRASSES
 - BERM DRAIN UNLINED - VEGETATED
 - BERM DRAIN LINED
 - TRAPEZOID CHANNEL - VEGETATED
 - TRAPEZOID CHANNEL - T00 - ROCK LINED
 - TRAPEZOID CHANNEL - T00 - VEGETATED
 - TRAPEZOID CHANNEL - LINED - CONCRETE
 - TRAPEZOID 1 IN 1 SIDE SLOPE - CHANNEL
 - TRAPEZOID CHANNEL - ROCK LINED
 - TRAPEZOID CHANNEL - T00 - ROCK LINED
 - VEE DRAIN - CONCRETE LINED
 - TEMPORARY BASIN (CONSTRUCTION PHASE ONLY)
 - WATER QUALITY CONTROL BASINS (PERMANENT OPERATIONAL AND CONSTRUCTION PHASE)
 - WATER QUALITY CONTROL BASIN (PERMANENT OPERATIONAL ONLY)
- } REFER TO REST AREA DETAIL DRAWING F.1.2.

Figure H.3.20 Planting Plan 20: NH2U-DG-PL-0020

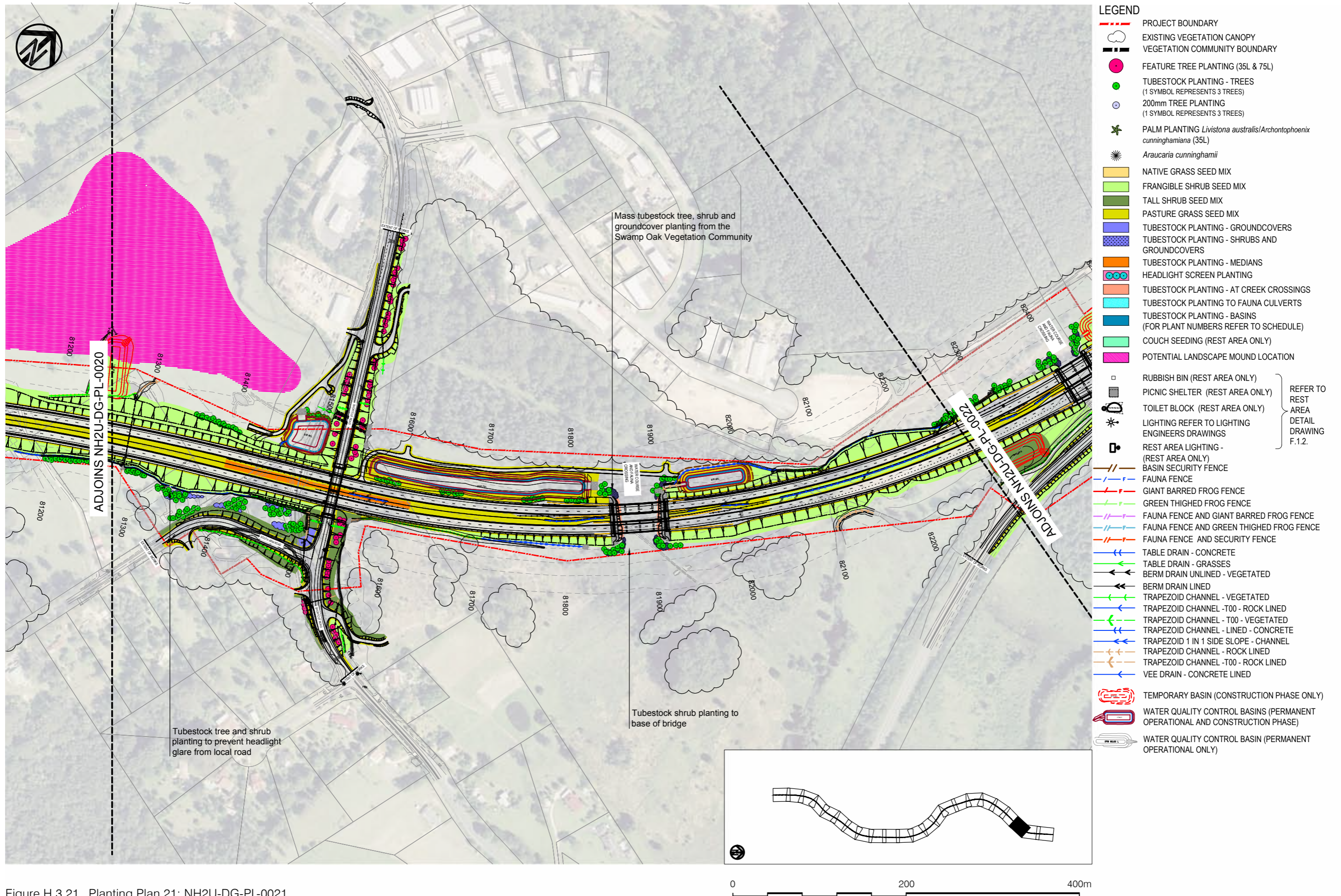


Figure H.3.21 Planting Plan 21: NH2U-DG-PL-0021

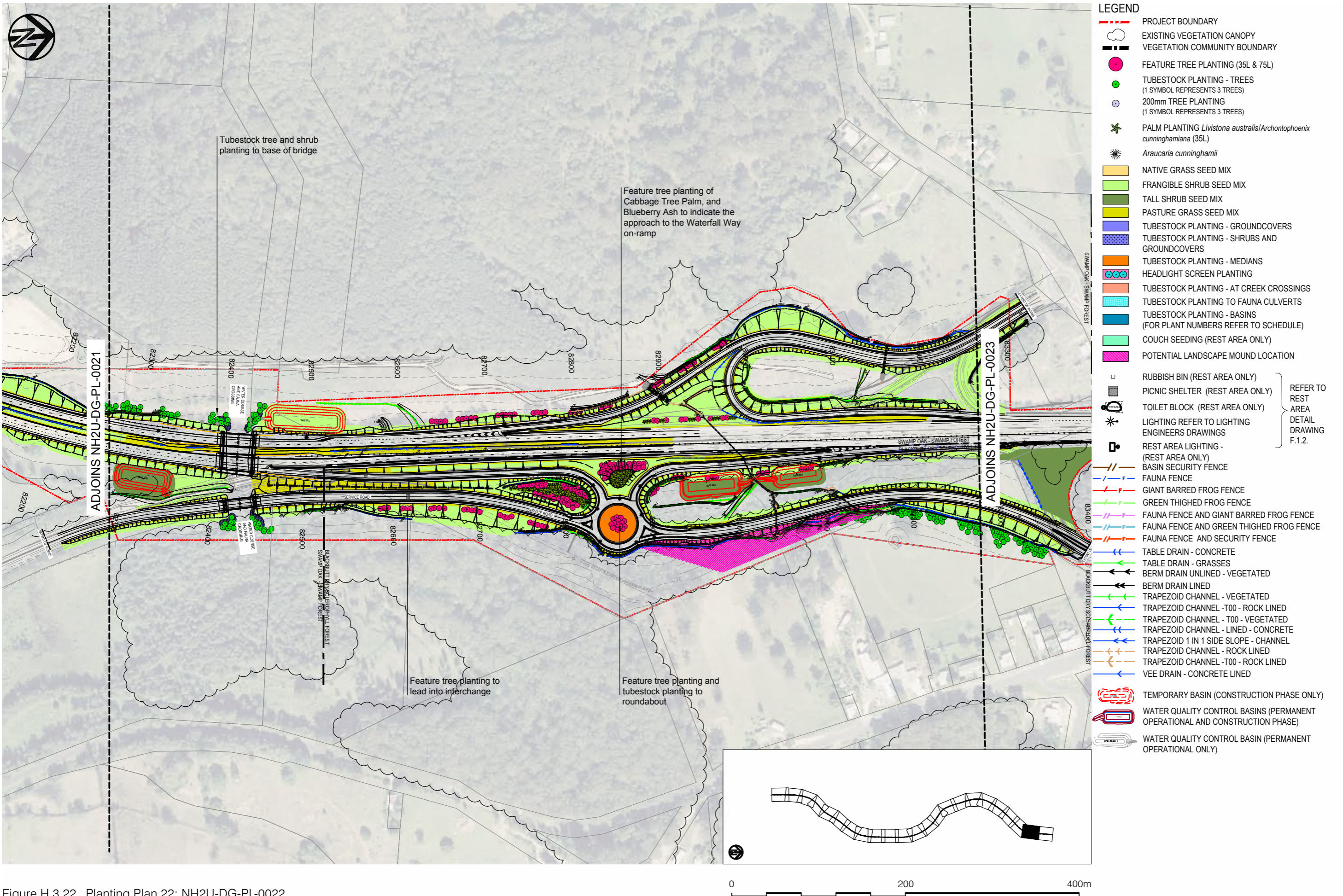


Figure H.3.22 Planting Plan 22: NH2U-DG-PL-0022



Figure H.3.23 Planting Plan 23: NH2U-DG-PL-0023

H.4 PLANTING AND SEEDING SCHEDULES

Table H.4.1 Planting Schedule

Botanical Name	Common Name	Spacing (m ²)	Pot Size	Qty.
Feature Trees				
<i>Araucaria cunninghamii</i>	Hoop Pine	As Shown	75 litre	140
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	As Shown	35 litre	132
<i>Elaeocarpus obovatus</i>	Blueberry Ash	As Shown	35Litre	231
<i>Harpullia pendula</i>	Tullipwood	As Shown	35Litre	148
<i>Livistona australis</i>	Cabbage Tree Palm	As Shown	35Litre	277
<i>Lophostemon confertus</i>	Brush Box	As Shown	35Litre	285
<i>Melia azedarach</i>	White Ceder	As Shown	35Litre	35
Total				1,248
Trees				
<i>Acmena smithii</i>	Lilly Pilly	1/3m ²	NT	162
<i>Acmena smithii</i>	Lilly Pilly	1/3m ²	200mm	78
<i>Acronychia oblongifolia</i>	Common Acronychia	1/3m ²	NT	77
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	1/3m ²	200mm	106
<i>Allocauarina torulosa</i>	Forest She Oak	1/3m ²	NT	253
<i>Alphitonia excelsa</i>	Red Ash	1/3m ²	NT	170
<i>Callicoma serratifolia</i>	Blackwattle	1/3m ²	NT	114
<i>Casuarina glauca</i>	Swamp Oak	1/3m ²	NT	437
<i>Corymbia intermedia</i>	Pink Bloodwood	1/3m ²	NT	370
<i>Elaeocarpus obovatus</i>	Blueberry Ash	1/3m ²	NT	299
<i>Elaeocarpus obovatus</i>	Blueberry Ash	1/3m ²	200mm	78
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	1/3m ²	NT	78
<i>Eucalyptus acmenoides</i>	White Mahogany	1/3m ²	NT	246
<i>Eucalyptus grandis</i>	Flooded Gum	1/3m ²	NT	483
<i>Eucalyptus microcorys</i>	Tallowwood	1/3m ²	NT	385
<i>Eucalyptus pilularis</i>	Blackbutt	1/3m ²	NT	389
<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum	1/3m ²	NT	560
<i>Eucalyptus resinifera</i>	Red Mahogany	1/3m ²	NT	388
<i>Eucalyptus robusta</i>	Swamp Mahogany	1/3m ²	NT	128
<i>Eucalyptus siderophloia</i>	Grey Ironbark	1/3m ²	NT	396
<i>Eucalyptus tereticornis</i>	Blue Gum	1/3m ²	NT	246
<i>Glochidion ferdinandi</i>	Cheese Tree	1/3m ²	NT	437
<i>Guioa semiglauc</i>	Guioa	1/3m ²	NT	47
<i>Guioa semiglauc</i>	Guioa	1/3m ²	200mm	77

NT = Native Tubestock

Botanical Name	Common Name	Spacing (m ²)	Pot Size	Qty.
<i>Litsea reticulata</i>	Brown Bolly Gum	1/3m ²	NT	55
<i>Livistona australis</i>	Cabbage Tree Palm	1/3m ²	200mm	108
<i>Lophostemon confertus</i>	Brush Box	1/3m ²	NT	44
<i>Lophostemon suaveolens</i>	Swamp Turpentine	1/3m ²	NT	257
<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	1/3m ²	NT	259
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	1/3m ²	NT	383
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	1/3m ²	NT	502
<i>Sloanea woollsii</i>	Yellow Carabeen	1/3m ²	200mm	77
<i>Syncarpia glomulifera</i>	Turpentine	1/3m ²	NT	294
<i>Synoum glandulosum</i>	Scentless Rosewood	1/3m ²	NT	30
<i>Synoum glandulosum</i>	Scentless Rosewood	1/3m ²	200mm	77
<i>Syzygium francisii</i>	Giant Water Gum	1/3m ²	200mm	78
Total				8,168
Shrubs				
<i>Callistemon salignus</i>	Willow Bottlebrush	1/m ²	NT	2877
<i>Leptospermum polygalifolium</i>	Tantoon	1/m ²	NT	603
<i>Melastoma affine</i>	Native Lasiandra	1/m ²	NT	710
Total				4,190
Groundcovers, tussocks, grasses and sedges				
<i>Baumea articulata</i>	Jointed Twig-rush	4/m ²	NT	502
<i>Baumea juncea</i>	Bare Twig-rush	4/m ²	NT	945
<i>Baumea rubiginosa</i>	Soft Twig-rush	4/m ²	NT	1420
<i>Carex appressa</i>	Tall Sedge	4/m ²	NT	2561
<i>Crinum pedunculatum</i>	Swamp Lily	4/m ²	NT	8004
<i>Dianella caerulea</i>	Flax Lily	4/m ²	NT	6566
<i>Gahnia aspera</i>	Rough Saw-sedge	4/m ²	NT	502
<i>Gahnia clarkei</i>	Tall Saw-sedge	4/m ²	NT	10097
<i>Juncus usitatus</i>	Common Rush	4/m ²	NT	1919
<i>Lepidosperma laterale</i>	Variable Saw-sedge	4/m ²	NT	590
<i>Lomandra hystrix</i>	Mat Rush	4/m ²	NT	3742
<i>Lomandra longifolia</i>	Mat Rush	4/m ²	NT	7644
<i>Schoenus apogon</i>	Common Bog-rush	4/m ²	NT	1420
<i>Schoenus melanostachys</i>	Black Bog-rush	4/m ²	NT	590
Total				46,502

NT = Native Tubestock

Botanical Name	Common Name	% of Species per Area	Spacing (m ²)	Pot Size	Qty.
Creek Crossings - Tubestock Planting					
Tussocks, grasses and sedges					
<i>Baumea juncea</i>	Bare Twig-rush	10%	2/m ²	NT	1036
<i>Juncus usitatus</i>	Common Rush	10%	2/m ²	NT	1036
<i>Crinum pedunculatum</i>	Swamp Lily	10%	2/m ²	NT	1036
<i>Gahnia clarkei</i>	Tall Saw-sedge	20%	2/m ²	NT	2071
<i>Lomandra hystrix</i>	Mat Rush	50%	2/m ²	NT	5178
Total	100%				10355
Shrubs					
<i>Backhousia myrtifolia</i>	Carroll	25%	As Shown	NT	68
<i>Callistemon salignus</i>	Willow Bottlebrush	25%	As Shown	NT	68
<i>Archirhodomyrtus beckleri</i>	Rose Myrtle	25%	As Shown	NT	68
<i>Eupomatia laurina</i>	Bolwarra	25%	As Shown	NT	69
Total	100%				273
Fauna Path under Bridges and Fauna Culverts Tubestock planting					
<i>Carex appressa</i>	Tall Sedge	30%	1/m ²	NT	1912
<i>Lomandra hystrix</i>	Mat Rush	70%	1/m ²	NT	2544
Total	100%				4456
Rest Area Median Planting					
			Area (m ²)		4074
<i>Crinum pedunculatum</i>	Swamp Lily	20%	4/m ²	150mm	3259
<i>Gahnia clarkei</i>	Tall Saw-sedge	25%	4/m ²	150mm	3259
<i>Dianella caerulea</i>	Flax Lily	25%	4/m ²	150mm	3259
<i>Lomandra hystrix</i>	Mat Rush	10%	4/m ²	150mm	1304
<i>Lomandra longifolia</i>	Mat Rush	20%	4/m ²	150mm	1043
Total	100%				12124
Frog Ponds Planting					
<i>Carex appressa</i>	Tall Sedge	N/A	N/A	NT	160
<i>Fimbristylis dichotoma</i>	Common Fringe Sedge	N/A	N/A	NT	160
<i>Lomandra hystrix</i>	Mat Rush	N/A	N/A	NT	160
<i>Philydrum lanuginosum</i>	Frogmouth	N/A	N/A	NT	160
Total					640
Headlight/Visual Screen Planting					
			Area (m ²)		494
<i>Acmena smithii</i>	Lilly Pilly	20%	0.5	200mm	49
<i>Callistemon salignus</i>	Willow Bottlebrush	20%	1	200mm	99
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	20%	0.5	200mm	49
<i>Lomandra hystrix</i>	Mat Rush	40%	3	200mm	593
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	As Shown	As Shown	25L	45
Total	100%				835
Median Planting					
			Area (m ²)		4468
<i>Carex appressa</i>	Tall Sedge	N/A	4/m ²	NT	5942
<i>Crinum pedunculatum</i>	Swamp Lily	N/A	4/m ²	NT	11756
<i>Lomandra hystrix</i>	Mat Rush	N/A	4/m ²	NT	5814
Total					23512

Botanical Name	Common Name	% Species per area	Spacing (m ²)	Pot Size	QTY																			
Basin Planting - Tubestock Planting																								
Basin Number					B61.37R	B61.63L	B61.75L	B62.60R	B62.78R	B62.95R	B63.02R	B63.50R	B63.73R	B64.48R	B64.58R	B64.82L	EB65.10L	EB65.34L	B65.50L	B66.31L	B66.887L	B67.12L	B67.21L	B67.88L
Area (m²)					269.77	217.76	263.4	725.31	220.96	196.8	233.03	562.15	412.98	338.88	212.42	394.78	654.85	743.91	418.81	257.49	294.73	256.33	307.59	444.19
<i>Baumea rubiginosa</i>	Soft Twig-rush	20%	1.5/m ²	NT	81	65	79	218	66	59	59	169	124	102	64	118	196	223	126	77	88	77	92	133
<i>Ficinea (Isolepis) inundata</i>	Swamp Club-rush	20%	1.5/m ²	NT	81	65	79	218	66	59	59	169	124	102	64	118	196	223	126	77	88	77	92	133
<i>Juncus usitatus</i>	Common Rush	20%	1.5/m ²	NT	81	65	79	218	66	59	59	169	124	102	64	118	196	223	126	77	88	77	92	133
<i>Philydrum lanuginosum</i>	Frogmouth	20%	1.5/m ²	NT	81	65	79	218	66	59	59	169	124	102	64	118	196	223	126	77	88	77	92	133
<i>Schoenoplectus mucronatus</i>	Deergrass	20%	1.5/m ²	NT	81	65	79	218	66	59	59	169	124	102	64	118	196	223	126	77	88	77	92	133
Basin Number					B68.20R	B68.36R	B68.56L	B69.07L	B69.25R	B69.56R	B69.82L	B70.08L	B70.34L	B70.46L	B71.52R	B71.69R	B72.00L	B73.06M	B73.30L	B73.36R	B73.42L	PB73.45R	B74.58L	B74.76L
Area (m²)					352.89	234.57	300.55	300.2	269.03	234.49	205.46	235.56	230.89	369.77	253.8	272.55	223.98	170.03	242.22	217.38	143.83	78.357	610.38	260.83
<i>Baumea rubiginosa</i>	Soft Twig-rush	20%	1.5/m ²	NT	106	70	90	90	81	70	62	71	69	111	76	82	67	51	73	65	43	24	183	78
<i>Ficinea (Isolepis) inundata</i>	Swamp Club-rush	20%	1.5/m ²	NT	106	70	90	90	81	70	62	71	69	111	76	82	67	51	73	65	43	24	183	78
<i>Juncus usitatus</i>	Common Rush	20%	1.5/m ²	NT	106	70	90	90	81	70	62	71	69	111	76	82	67	51	73	65	43	24	183	78
<i>Philydrum lanuginosum</i>	Frogmouth	20%	1.5/m ²	NT	106	70	90	90	81	70	62	71	69	111	76	82	67	51	73	65	43	24	183	78
<i>Schoenoplectus mucronatus</i>	Deergrass	20%	1.5/m ²	NT	106	70	90	90	81	70	62	71	69	111	76	82	67	51	73	65	43	24	183	78
	TOTAL	100%																						
Basin Number					B74.96R	B75.14R	B75.22L	B75.37R	B76.08L	B76.29R	B76.42R	B76.62R	B76.92R	EB77.13R	EPB77.14L	EPB77.50L	EB77.51R	EB77.85L	EB78.06L	B78.38L	B78.76R	B78.85R	B78.97R	B79.08R
Area (m²)					196.95	214.27	185.11	227.19	178.32	230.21	220.41	231.71	211.41	464.52	530.96	761.9	473.08	304.32	901.05	243.42	266.64	172.32	211.84	236.45
<i>Baumea rubiginosa</i>	Soft Twig-rush	20%	1.5/m ²	NT	59	64	56	19	53	69	66	70	63	139	159	229	142	91	270	73	80	52	64	71
<i>Ficinea (Isolepis) inundata</i>	Swamp Club-rush	20%	1.5/m ²	NT	59	64	56	19	53	69	66	70	63	139	159	229	142	91	270	73	80	52	64	71
<i>Juncus usitatus</i>	Common Rush	20%	1.5/m ²	NT	59	64	56	19	53	69	66	70	63	139	159	229	142	91	270	73	80	52	64	71
<i>Philydrum lanuginosum</i>	Frogmouth	20%	1.5/m ²	NT	59	64	56	19	53	69	66	70	63	139	159	229	142	91	270	73	80	52	64	71
<i>Schoenoplectus mucronatus</i>	Deergrass	20%	1.5/m ²	NT	59	64	56	19	53	69	66	70	63	139	159	229	142	91	270	73	80	52	64	71
	TOTAL	100%																						
Basin Number					B79.42R	B79.52R	B79.78L	B79.88R	EPB80.00L	PB80.08L	PB80.17R	B80.26M	B80.39R	B80.50R	B81.01R	B81.48L	EB81.70L	B81.99L						
Area (m²)					209.99	207.48	250.5	252.36	204.9	121.1	172.54	200.82	169.35	300.52	257.47	276.65	1009	306.5						
<i>Baumea rubiginosa</i>	Soft Twig-rush	20%	1.5/m ²	NT	63	62	75	76	61	36	52	60	51	90	77	83	303	92						
<i>Ficinea (Isolepis) inundata</i>	Swamp Club-rush	20%	1.5/m ²	NT	63	62	75	76	61	36	52	60	51	90	77	83	303	92						
<i>Juncus usitatus</i>	Common Rush	20%	1.5/m ²	NT	63	62	75	76	61	36	52	60	51	90	77	83	303	92						
<i>Philydrum lanuginosum</i>	Frogmouth	20%	1.5/m ²	NT	63	62	75	76	61	36	52	60	51	90	77	83	303	92						
<i>Schoenoplectus mucronatus</i>	Deergrass	20%	1.5/m ²	NT	63	62	75	76	61	36	52	60	51	90	77	83	303	92						
	TOTAL	100%																						

TOTALS		
<i>Baumea rubiginosa</i>	Soft Twig-rush	6476
<i>Ficinea (Isolepis) inundata</i>	Swamp Club-rush	6102
<i>Juncus usitatus</i>	Common Rush	6102
<i>Philydrum lanuginosum</i>	Frogmouth	6102
<i>Schoenoplectus mucronatus</i>	Deergrass	6102

Table H.4.2 Seeding Schedule

Botanical Name	Common Name	Application Rate of Seed Kg/Ha	Total (Kg)
Native grass seeding mix			
<i>Austrostipa scabra</i>	Speargrass	1	23.4
<i>Capillipedium spicigerum</i>	Scented-top Grass	1	23.4
<i>Chloris truncata</i>	Windmill Grass	1	23.4
<i>Fimbristylis dichotoma</i> #	Common Fringe Sedge	0.6	14.0
<i>Imperata cylindrica</i>	Blady Grass	0.7	16.4
<i>Juncus usitatus</i> #	Common Rush	0.6	14.0
<i>Lepidosperma laterale</i> #	Variable Saw-sedge	0.6	14.0
<i>Schoenus apogon</i> #	Common Bog-rush	0.5	11.7
<i>Schoenus melanostachys</i> #	Black Bog-rush	0.5	11.7
<i>Themeda triandra</i>	Kangaroo Grass	1.5	35.1
	Total	8	187.1
Frangible shrubs seeding mix -			
<i>Austrostipa scabra</i>	Speargrass	0.35	20.8
<i>Bothriochloa macra</i>	Red Grass	0.35	20.8
<i>Capillipedium spicigerum</i>	Scented-top Grass	0.35	20.8
<i>Chloris truncata</i>	Windmill Grass	0.35	20.8
<i>Gahnia aspera</i>	Rough Saw-sedge	0.35	20.8
<i>Imperata cylindrica</i>	Blady Grass	0.35	20.8
<i>Lomandra hystrix</i>	Spiny Head Mat Rush	0.35	20.8
<i>Lomandra longifolia</i>	Mat Rush	0.35	20.8
<i>Themeda triandra</i>	Kangaroo Grass	0.6	35.6
<i>Acacia falcata</i>	Wattle	0.4	23.8
<i>Acacia longissima</i>	Long leaved Wattle	0.4	23.8
<i>Acacia myrtifolia</i>	Red-stemmed Wattle	0.3	17.8
<i>Bursaria spinosa</i>	Sweet Busaria	0.2	11.9
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	0.2	11.9
<i>Dianella caerulea</i>	Flax Lily	0.2	11.9
<i>Dodonaea triquetra</i>	Hop Bush	0.2	11.9
<i>Gompholobium pinnatum</i>	Pinnate Wedge Pea	0.4	23.8
<i>Hardenbergia violaceae</i>	False Sarsaparilla	0.4	23.8
<i>Indigofera australis</i>	Austral Indigo	0.2	11.9
<i>Jacksonia scoparia</i>	Native Broom	0.2	11.9
<i>Leptospermum polygalifolium</i>	Tantoon	0.2	11.9
<i>Ozothamnus diosmifolius</i>	Rice Flower	0.2	11.9
<i>Pultenaea retusa</i>	Notched Bush-Pea	0.4	23.8
<i>Pultenaea villosa</i>	Hairy Bush-Pea	0.4	23.8
<i>Sannantha similis</i> (<i>Baeckea virgata</i>)	Tall Baeckea	0.2	11.9
<i>Zieria smithii</i>	Zieria	0.1	5.9
	Total	8	475.0

Sedges

Botanical Name	Common Name	Application Rate of Seed Kg/Ha	Total (Kg)
Tall shrubs seeding mix			
<i>Austrostipa scabra</i>	Speargrass	0.1	1.5
<i>Bothriochloa macra</i>	Red Grass	0.1	1.5
<i>Capillipedium spicigerum</i>	Scented-top Grass	0.1	1.5
<i>Chloris truncata</i>	Windmill Grass	0.1	1.5
<i>Gahnia aspera</i>	Rough Saw-sedge	0.1	1.5
<i>Imperata cylindrica</i>	Blady Grass	0.1	1.5
<i>Lomandra hystrix</i>	Spiny Head Mat Rush	0.1	1.5
<i>Lomandra longifolia</i>	Mat Rush	0.1	1.5
<i>Themeda triandra</i>	Kangaroo Grass	0.1	1.5
<i>Acacia falcata</i>	Wattle	0.1	1.5
<i>Acacia longissima</i>	Long leaved Wattle	0.1	1.5
<i>Acacia myrtifolia</i>	Red-stemmed Wattle	0.1	1.5
<i>Bursaria spinosa</i>	Sweet Busaria	0.1	1.5
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	0.1	1.5
<i>Dianella caerulea</i>	Flax Lily	0.1	1.5
<i>Dodonaea triquetra</i>	Hop Bush	0.1	1.5
<i>Gompholobium pinnatum</i>	Pinnate Wedge Pea	0.1	1.5
<i>Hardenbergia violaceae</i>	False Sarsaparilla	0.1	1.5
<i>Indigofera australis</i>	Austral Indigo	0.1	1.5
<i>Jacksonia scoparia</i>	Native Broom	0.2	3.1
<i>Leptospermum polygalifolium</i>	Tantoon	0.2	3.1
<i>Ozothamnus diosmifolius</i>	Rice Flower	0.2	3.1
<i>Pultenaea retusa</i>	Notched Bush-Pea	0.4	6.1
<i>Pultenaea villosa</i>	Hairy Bush-Pea	0.2	3.1
<i>Sannantha similis</i> (<i>Baeckea virgata</i>)	Tall Baeckea	0.2	3.1
<i>Zieria smithii</i>	Zieria	0.5	7.6
<i>Acacia binervata</i>	Two-veined Hickory	0.5	7.6
<i>Acacia concurrens</i>	Curracabah	0.5	7.6
<i>Acacia floribunda</i>	White Sally Wattle	0.5	7.6
<i>Acacia irrorata</i>	Green Wattle	0.5	7.6
<i>Acacia longifolia</i>	Sydney Golden Wattle	0.5	7.6
<i>Banksia integrifolia</i>	Coast banksia	0.5	7.6
<i>Callistemon salignus</i>	Willow Bottlebrush	0.4	6.1
<i>Hibiscus heterophyllus</i>	Native Rosella	0.4	6.1
<i>Melaleuca linariifolia</i>	Snow-in-Summer	0.4	6.1
	Total	8	122.2

Sedges

Botanical Name	Common Name	Application Rate of Seed Kg/Ha	Total (Kg)
Pasture grasses seeding mix			
<i>Axonopus fissifolius</i>	Carpet Grass	5	158.7
<i>Cynodon dactylon</i>	Unhulled Couch	5	158.7
	Total	10	317.4
Couch Seeding (Rest Area Only)			
<i>Cynodon dactylon</i>	Unhulled Couch	10	2.5
	Total		2.5
Cover crop seeding mix (All disturbed areas identified to be hydromulched) cover crop may be applied separately or in conjunction with all other hydromulch mixes			
<i>Echinochloa itilis</i> (Sep-Mar) or <i>Secale cereale</i> (Apr-Aug)	Japanese Millet or Rye Corn	15	1950.3
<i>Lolium multiflorum</i> (All Year)	Eclipse Rye	15	1950.3
	Total		3,900.6

Sedges

NOTE: Fertilizer to be Organic Slow release for natives (Low P) at at rate of 250Kg/Ha

H.4.1 Strategy and principles to maximise retention of existing vegetation and methodology to protect existing vegetation

Due to the presence of Endangered Ecological Communities and other intact vegetation communities of good quality, it is imperative to minimize the construction footprint in order to maximize the retention of existing vegetation and in addition, to provide a methodology for those carrying out the work to implement in order to protect existing vegetation.

In general, the construction footprint beyond the toe of batters or top of cuts will be restricted to four metres. At drainage structures the footprint will be limited to two metres.

The effect of minimising the construction footprint has consequences and impacts upon the design of the landscape. These impacts can include:

- Steeper embankments and cuttings (not less than 2H:1V); and
- More extensive use of wire rope barriers.

The advantages of retaining the existing vegetation as close as possible to the carriageways are not only environmental. Retention of existing vegetation also provides better visual and economic outcomes.

The following summarises the procedures to protect and maximise retention of existing vegetation and is given as a guide only. Where any of the following recommendations are not consistent with the Construction Environment Management Plan (CEMP) requirements, the CEMP takes precedence:

- Pre clearing assessment is to be undertaken identifying the following: hollow bearing and /or habitat trees; threatened species or endangered ecological communities. Where identified the use of fencing around all threatened species or Endangered Ecological Communities including Freshwater Wetlands, Mixed Floodplain Forest, Lowland Rainforest, Swamp Mahogany/Paperbark – Swamp Forest, and Swamp Oak – Swamp Forest shall be undertaken to ensure construction activities do not encroach into threatened habitats or habitats containing threatened species where disturbance has not been approved.
- Where threatened species are impacted, they will be translocated in accordance with the Draft Warrell Creek to Urunga Threatened Plant Species Management Plan. Seed or cuttings from all threatened plants required to be removed shall be collected once construction approval is obtained to enable potential propagation and re-establishment of threatened species in the area. (*Artanema fimbriatum* is easily grown from cuttings, *Alexfloydia repens* can be carefully translocated and increased by division (although none of this grass is impacted). *Acronychia littoralis* can be grown from cuttings or by seed with difficulty (although no individuals of this species is impacted), and *Niemeyera whitei* from seed. There are two individual *Niemeyera* requiring translocation.
- All vegetation to be retained will be appropriately protected for the duration of construction works. No severing of roots or branches from the trees or shrubs shown to be retained that have a diameter greater than 50mm will be undertaken without written permission from the Environmental Manager.
- Where significant stands of vegetation are to be retained, temporary exclusion fencing will be erected before the commencement of construction.
- Prior to demolition or construction work commencing, all trees to be retained will be marked with non-injurious, easily visible and removable means of identification. All such identification will be removed on completion of works. Groups of trees or shrubs will be bounded or encircled by exclusion fencing.
- Storage of materials, mixing of materials, vehicle parking or stockpiling of materials will not be carried out within the drip line of existing trees to be retained. No bulk materials and / or harmful materials will be placed under or near trees. Spoil, chemicals or construction waste from excavations will not be placed against tree trunks, even for short periods. All measures will be undertaken to prevent windblown materials from harming trees and plants.

- Topsoil will not be added to or removed from within the drip line of existing trees to be retained without approval. Should it be necessary to excavate within the drip line, hand methods such that root systems are preserved intact and undamaged will be used.
- No encroachments into adjacent nominated bushland or vegetation will be permitted for access of machinery, for traffic control or for the stockpiling of material required for construction.
- Activities prohibited within existing fenced areas will include:
 - » entry of machinery or people;
 - » storage of building materials;
 - » parking of any kind;
 - » erection or placement of site facilities;
 - » removal of stockpiling of soil or site debris;
 - » disposal of any liquid waste including paint and concrete wash;
 - » excavation or trenching of any kind, including for irrigation or electrical connections;
 - » attaching signs or any other objects to trees;
 - » placement of waste disposal or skip bins; and
 - » pruning and removal of branches, except by a qualified Arborist.
- Where necessary a qualified Arborist will be appointed to advise on specific aspects of tree protection prior to commencement of demolition or construction.

Sites of Biodiversity

In addition to the above, where clearing is undertaken adjacent to EECs, clearing will be undertaken so as to avoid trees falling into the protected vegetation. Where trees are entwined the ecologist may request the tree to be removed by an arborist. Where vegetation is to be retained, and construction buffer zones are to be enforced to restrict the movement of plant and machinery outside the allowed area, and limit Project works, delineation and signage will be erected to serve this purpose, before clearing commences.

Control measures would be implemented to prevent and minimise construction impacts in riparian zones and to ensure that appropriate rehabilitation is undertaken.

Such measures may include:

- Establishing a vegetated 'buffer' area along the waterway where possible; Existing trees, grasses and other ground cover will be retained as far as possible within 15 metres of rivers, creeks and watercourses and in all drainage lines immediately before construction commences in an area
- Fencing off mature trees (especially those with hollows) and vegetation for protection;
- Minimising the footprint of temporary works including crossings;
- Ensuring that snags and other aquatic habitat features are not disturbed;
- Clearly identifying stockpile and storage locations;
- Providing erosion and sediment controls around stockpiles;
- Restricting the entry of plants and persons to the banks of the waterway to prevent damage and instability;
- Rehabilitating disturbed or degraded areas with appropriate native species;
- Trees within 5m of the banks; and
- of any stream or other waterway are to be cleanly cut off between 300 and 600mm above the adjacent ground level to ensure stable vegetation is retained on the banks.

Translocation of Endangered Species

Removal and relocation (called translocation) of threatened species present within the disturbed areas, including the tree called Rusty Plum (Formerly *Amorphospermum whitei*, since renamed *Niemeyera whitei*) and other species identified in Appendix 14 of the SWTC will be managed and protected according to the requirements of the "Warrell Creek to Urunga Upgrade Threatened Flora Species Management Plan" and under the supervision of the Project ecologist. All translocation will be carried out to the requirements of Appendix 14 as a minimum which will build upon successes achieved with translocation of the same species at Bonville.

The translocation plan has been structured according to the format and content recommended in the *Guidelines for the Translocation of Threatened Plants 2nd Edition, Australian Network for Plant Conservation (2004)*

H.4.2 Seed Availability

The seed list includes only seed occurring within the vegetation communities occurring throughout the alignment and are all hardy and fast growing species for use in revegetation. It has been refined with input from the seed collector and local ecologist consulted for the project to ensure commercially available seeds.

Early comment from local ecologists suggests that some species listed in the preliminary schedule may be difficult to purchase in the quantity required, therefore the long list allows for some species to be dropped out while the quantity of seed of others are increased (but the quantum of seed remains the same). The list will be refined and updated during the course of the design in consultation with the ecologist and collector.

A seed list for all plants to be re-introduced via seeding has been prepared based upon the PDD (note that this list does not include seed required for growing-on plants in pots. A separate schedule will be provided for these):

Table H.4.2.1 Seed List

Botanical Name	Common Name	Total Qty (Kg)
For seeding mixes only		
<i>Acacia binervata</i>	Two-veined Hickory	7.6
<i>Acacia concurrens</i>	Curracabah	7.6
<i>Acacia falcata</i>	Wattle	25.3
<i>Acacia floribunda</i>	White Sally Wattle	7.6
<i>Acacia irrorata</i>	Green Wattle	7.6
<i>Acacia longifolia</i>	Sydney Golden Wattle	7.6
<i>Acacia longissima</i>	Long leaved Wattle	25.3
<i>Acacia myrtifolia</i>	Red-stemmed Wattle	19.3
<i>Austrostipa scabra</i>	Speargrass	45.7
<i>Banksia integrifolia</i>	Coast banksia	7.6
<i>Bothriochloa macra</i>	Red Grass	22.3
<i>Bursaria spinosa</i>	Sweet Busaria	13.4
<i>Callistemon salignus</i>	Willow Bottlebrush	6.1
<i>Capillipedium spicigerum</i>	Scented-top Grass	45.7
<i>Chloris truncata</i>	Windmill Grass	45.7
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	13.4
<i>Dianella caerulea</i>	Flax Lily	13.4
<i>Dodonaea triquerta</i>	Hop Bush	13.4
<i>Fimbristylis dichotoma</i> #	Common Fringe Sedge	14.0
<i>Gahnia aspera</i>	Rough Saw-sedge	22.3
<i>Gompholobium pinnatum</i>	Pinnate Wedge Pea	25.3
<i>Hardenbergia violaceae</i>	False Sarsaparilla	25.3
<i>Hibiscus heterophyllus</i>	Native Rosella	6.1
<i>Imperata cylindrica</i>	Blady Grass	38.7
<i>Indigofera australis</i>	Austral Indigo	13.4
<i>Jacksonia scoparia</i>	Native Broom	14.9
<i>Juncus usitatus</i> #	Common Rush	14.0
<i>Lepidosperma laterale</i> #	Variable Saw-sedge	14.0
<i>Leptospermum polygalifolium</i>	Tantoon	14.9
<i>Lomandra hystrix</i>	Spiny Head Mat Rush	22.3
<i>Lomandra longifolia</i>	Mat Rush	22.3
<i>Melaleuca linariifolia</i>	Snow-in-Summer	6.1
<i>Ozothamnus diosmifolius</i>	Rice Flower	14.9
<i>Pultenaea retusa</i>	Notched Bush-Pea	29.9
<i>Pultenaea villosa</i>	Hairy Bush-Pea	26.8
<i>Sannantha similis</i> (<i>Baeckea virgata</i>)	Tall Baeckea	14.9
<i>Schoenus apogon</i> #	Common Bog-rush	11.7
<i>Schoenus melanostachys</i> #	Black Bog-rush	11.7
<i>Themeda triandra</i>	Kangaroo Grass	72.2
<i>Zieria smithii</i>	Zieria	13.6

Sedges

Botanical Name	Common Name	Total Qty (Kg)
		Total 784.3
Pasture grasses seeding mix		
<i>Axonopus fissifolius</i>	Carpet Grass	35.8
<i>Cynodon dactylon</i>	Unhulled Couch	35.8
<i>Echinochloa itilis</i> (Sep-Mar) or <i>Secale cereale</i> (Apr-Aug)	Japanese Millet or Rye Corn	250.8
<i>Lolium multiflorum</i>	Eclipse Rye	143.3
<i>Trifolium pratense</i>	Red Clover	35.8
		Total 501.5
Cover crop seeding mix (All disturbed areas identified to be hydromulched) cover crop may be applied separately or in conjunction with all other hydromulch mixes		
<i>Echinochloa itilis</i> (Sep-Mar) or <i>Secale cereale</i> (Apr-Aug)	Japanese Millet or Rye Corn	2564.8
<i>Lolium multiflorum</i> (All Year)	Eclipse Rye	1282.4
<i>Trifolium pratense</i> (All Year)	Red Clover	641.2
		Total 4488.4

Sedges

H.5 DRAFT LANDSCAPE MANAGEMENT PLAN

A Landscape Management Plan (LMP) is required to be prepared as part of the design documentation and will detail all landscape maintenance actions for the upgrade. The landscape maintenance works will be monitored and maintained by a suitably qualified landscape specialist. The Landscape Maintenance Period commences from the Date of Construction Completion and is for a period of 36 months. Thereafter landscape maintenance is by Roads and Maritime (Pacific Highway Corridor Nambucca Heads to Urunga corridor) and Nambucca and Bellingen Shire Councils (Local service roads, roundabouts and intersections and public areas immediately outside of highway corridor).

Any required remediation measure(s) will be implemented to maintain landscaping works as required by Appendix 15 of the SWTC.

The landscaping will be cost effective; minimise ongoing maintenance requirements and utilise native species, dense planting, bold simple planting designs and rapid planting establishment.

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1.0 Introduction

1.0 Purpose of this Report

This Landscape Management Plan (LMP) is required by the Roads and Maritime to promote the cost effective and consistent management of roadside landscape vegetation established for Nambucca Heads to Urunga.

For contractual requirements of the Landscaping Maintenance refer to the Project Deed Section 14 Landscape Maintenance and the Scope of Works and Technical Criteria section 2.2.2 Nature and Extent of Landscape Maintenance

This LMP promotes a standard approach to the maintenance of landscape plantings, both in technique and frequency.

To avoid duplication and to highlight the specific maintenance requirements of some landscape types, the LMP details the required maintenance actions into two categories:

- All Areas; Those maintenance actions that apply to every section of the landscape.
- Specific Landscape Types; Those maintenance actions specific to the different landscape types present.

The Landscape Maintenance Period commences from the Date of Construction Completion and is for a period of 36 months

1.1 Where This Report Applies

This LMP applies to Pacific Highway Upgrade - Nambucca Heads to Urunga between Station 61km265, just south of the North Coast Railway crossing to Station 83km400, just south of the off-ramps to Waterfall Way

The approximate locations of the scope of works is illustrated Figure 1.

Figure 1: Location of the scope of works



1.2 Landscape Maintenance Responsibility

Three agencies are responsible for the maintenance of roadside landscapes within this LMP:

Agency	Extent of responsibility on Nambucca Heads to Urunga.
Council	Local service roads, roundabouts and intersections and public areas immediately outside of highway corridor. Council is responsible for mowing verges and rubbish removal during the Landscaping Maintenance period.
Roads and Maritime	Pacific Highway Corridor Nambucca Heads to Urunga corridor
Lend Lease	All- from the commencement of construction until the date of construction completion and for 36 months post completion (The Landscape Maintenance Period).

1.3 Landscape types to be maintained

Five main landscape types are present. These are:

Grass Areas (Mown)



- Road edge mowing strip
- Path edge mowing strip
- Rest Area picnic area
- Fauna fence maintenance track and clear zone.

The contractor is required to mow grass during establishment only. Thereafter mowing is by others

Vegetation Areas (Hydromulching or Hydroseeding with rice straw hydromulching over);



Trees, shrubs and groundcovers are seeded using Hydroseeding method followed by rice straw hydromulching or hydromulching alone. Species mix varies according to location.

The design intent is to allow an easy, quick and repeatable method of establishing vegetation cover with particular concern for soil stability. Where a vegetated area fails (ie scouring, land slippage) the soil profile is reconstructed and re-Hydroseeded to re-establish vegetation cover. At specific locations the Hydroseeding vegetation is over planted with Tubestock tree species. Hydroseeding areas show the following variations, based on the plant species used in specific areas:

- Pasture grasses
- Native Grasses
- Frangible shrubs
- Trees and tall shrubs

Planting (Tubestock)



Mass planting using tubestocks of tree/tall shrub, frangible shrubs and groundcover species. Planting of tubestocks show the following variations, based on location, function and plant species used in individual areas:

- Massed tubestocks planted in hydroseeded areas;
- Massed tubestocks in ponds, wetlands, frog ponds, creek corridors and fauna underpasses
- Massed tubestocks feature planting in roundabouts, at bridges and sightline zones.

Landscape Planting Beds;



Landscape planted beds. These vary in appearance from mass plantings of single species (eg. Lomandra sp; Dianella sp) to more complex beds containing advanced trees, low and tall shrubs and ground covers.

Planting size includes tubestock - 150mm, 200mm, 25, 35 and 75 litres.

Areas of Special Consideration;



These spaces may vary in appearance and function and have specific maintenance requirements in addition to other landscape types listed.

- Batter Re-Vegetation Management Strategy
- Native Grasses
- Fauna Underpasses
- Fauna Fence
- Rest Area
- Water Quality ponds and detention basins
- Riparian Zones
- Frog Ponds
- Glider Crossings

The exact extent of these landscape types is illustrated on the landscape planting and seeding plans.

Myrtle Rust

Myrtle rust (*Puccinia psidii* s.l.) is a newly described fungus that is closely related to the Eucalyptus/Guava rusts. These rusts are serious pathogens which affect plants belonging to the family Myrtaceae including Australian natives like bottle brush (*Callistemon spp.*), tea tree (*Melaleuca spp.*) and eucalypts (*Eucalyptus spp.*) and is widespread on the eastern seaboard.

Myrtle rust is distinctive in that it produces masses of powdery bright yellow or orange-yellow spores on infected plant parts. It infects leaves of susceptible plants producing spore-filled lesions on young actively growing leaves, shoots, flower buds and fruits. Leaves may become buckled or twisted and may die as a result of infection. Sometimes these infected spots are surrounded by a purple ring. Older lesions may contain dark brown spores. Infection on highly susceptible plants may result in plant death.

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Now that myrtle rust is established in NSW responsibilities for its management and control have broadened beyond the Department of Primary Industries and active ongoing management of myrtle rust in NSW is the responsibility of land managers. Myrtle rust has serious implications for the landscaping on the NH2U project because many species proposed are from the Myrtle family and hence susceptible to infection. There is also a serious risk of spread from the project works into adjacent state forests and nature reserves.

National parks, local councils and other organisations that manage tracts of natural vegetation continue to implement biosecurity measures to protect threatened plant species and vegetation communities and to ensure the risk of spread to new areas by workers and visitors is reduced. New hosts and detections in previously uninfected areas of NSW must be referred to the Department of Primary Industries because myrtle rust remains a notifiable pest under the Plant Diseases Act. The final landscape Management Plan will detail measures to prevent the spread of Myrtle rust.

1.4 Summary table of maintenance required

Maintenance Actions	Tasks	Timeframes / Frequency						As Required	As Specified Below
		Weekly	Monthly	Seasonal					
				Su	Au	Wi	Sp		
All Areas	(Summarised from Section 2 of this LMP)								
1. Pruning of Vegetation for Safety	Maintaining driver and pedestrian sightlines								
	Vegetation in intersection traffic islands								
	Pruning trees over carriageways, roads, paths and cycle ways.								
2. Management of Non Frangible Vegetation	Remove woody "non-frangible" vegetation in setbacks								Annually, as needed
3. Noxious Weed Control	Treat noxious weeds according to control category								
4. Rubbish Removal	All rubbish left by contractors to be removed. Site to be left in a clean and tidy condition.								
5. Auditing and Reporting	Audit and report on maintenance and additional works								
Grassed Areas (Mown) Only	(Summarised from Section 2 of this LMP)								
1. Mowing	Mow grass to a minimum height of 5cm/ maximum height of 10cm								Every 4 weeks
									Every 6 weeks
									Every 12 weeks
									Every 6 weeks

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Maintenance Actions	Tasks	Timeframes / Frequency						As Required	As Specified Below
		Weekly	Monthly	Seasonal					
				Su	Au	Wi	Sp		
									weeks
2. Replacement of Damaged Grass	Re-establish damaged turf.								
3. Weed Control in Grass	Control weeds in turf areas using selective biodegradable herbicides.								
4. Watering	Turf must not be allowed to dry out during the establishment period.								
Hydroseeding areas	(Summarised from Section 2 of this LMP)								
1. Weeding	Weed garden beds (manual or biodegradable herbicide) before weed seed set.								Use biodegradable herbicide only
	Replace landscape plants damaged or killed by herbicide.								Should this happen it suggests improper use. Review manufacturer instructions and application method
2. Herbicide Spraying	Comply with requirements specified in 3.1.1 'Herbicide Spraying' in RMS D&C R178 – Vegetation.								
3. Mulching	Maintain an adequate level to 75mm								
4. Remove Dead/Dying Vegetation	Cut back and remove dead, dying planting or planting with poor growth planting material. Do not pull root out. Replace topsoil as required. Prepare topsoil by loosening surface. Ensure topsoil depth is even across affected area and has a smooth transition into the existing vegetation.								
5. Replacement Hydroseeding	Reapply Hydroseeding as per specification. Hydroseeding seed mix as per vegetation plans and equal to what has been applied previously. Apply sufficient Hydroseeding to achieve consistent								When possible, apply Hydroseeding during optimum seasonal conditions

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Maintenance Actions	Tasks	Timeframes / Frequency							As Required	As Specified Below
		Weekly	Monthly	Seasonal						
				Su	Au	Wi	Sp			
	vegetation cover over affected area									
Tubestock areas	(Summarised from Section 2 of this LMP)									
1. Weeding	Weed planting area (manual or biodegradable herbicide) before plant flowers.								Use biodegradable herbicide only	
	Herbicide application. After spraying lop any dead weeds flush with the ground surface and dispose of cuttings.									
	Replace landscape plants damaged or killed by herbicide.								Should this happen it suggests improper use. Review manufacturer's instructions and application method	
2. Disease and Insect Control	Spraying must only occur on windless days and records of weed conditions must be retained. Sprays should not be used where there is risk of entering a watercourse or wind could cause drifting outside area to be treated.									
3. Mulching	Re-apply mulch to individual Tubestock and maintain to a depth of 75 mm min Do not apply mulch in areas within water zone ie: ponds, creek lines and wetlands								Every two years	
4. Removal of Dead / Dying Plant Material	Remove dead or dying planting material and replace.									
5. Replacement Plantings	Replace failed plantings with specified species and densities.								Within 28 days of detection	
	Water replacement plantings for 12 weeks.									
6. Timber Stakes	Check and repair timber stakes if damaged or removed prior to plant establishment.									

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Maintenance Actions	Tasks	Timeframes / Frequency							As Required	As Specified Below
		Weekly	Monthly	Seasonal						
				Su	Au	Wi	Sp			
	Remove timber stakes.								As required until final removal at 12 months after planting	
7. Fertilising and Pruning	Fertilise all plantings at specified rates.								At time of planting	

Maintenance Actions	Tasks	Timeframes / Frequency							As Required	As Specified Below
		Weekly	Monthly	Seasonal						
				Su	Au	Wi	Sp			
	Prune all plantings in specified manner:								Refer All Areas, Point 1	
Landscape Bed Plantings Only	(Summarised from Section 2 of this LMP)									
1. Weeding	Weed planting area (manual or biodegradable herbicide) before plant flowers.								Use biodegradable herbicide only	
	Herbicide application. After spraying lop any dead weeds flush with the ground surface and dispose of cuttings.									
	Replace landscape plants damaged or killed by herbicide.								Should this happen it suggests improper use. Review manufacturer's instructions and application method	
2. Disease and Insect Control	Spraying must only occur on windless days and records of weed conditions must be retained. Sprays should not be used where there is risk of entering a watercourse or wind could cause drifting outside area to be treated.									
3. Mulching	Reapply mulch to maintain a depth of 75 mm min.									
4. Removal of Dead / Dying Plant Material	Remove dead or dying planting material and									

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Maintenance Actions	Tasks	Timeframes / Frequency							As Required	As Specified Below
		Weekly	Monthly	Seasonal						
				Su	Au	Wi	Sp			
	replace.									
5. Replacement Plantings	Replace failed plantings with specified species and densities.								Within 28 days of detection	
	Water replacement plantings for 12 weeks.									
6. Timber Stakes	Check and repair timber stakes if damaged or removed prior to plant establishment.									
	Remove timber stakes.								As required until final removal at 12 months after planting	
7. Fertilising and Pruning	Fertilise all plantings at specified rates.									
	Prune all plantings in specified manner:									
	Trees								refer All Areas Point 1	
	Tall / Medium / Low Shrubs								After Flowering. Allow to grow to full potential	
	Climbers								Once per year. Allow to grow to full potential	
	Groundcover / Tussocks								After Flowering. Allow to grow to full potential Every 4 years	
Areas of Special Consideration	(Summarised from Section 2 of this LMP)									
1. Refer Section 4										

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2.0 Maintenance Actions

The Roads and Maritime Pesticide Use Notification Plan must be followed prior to herbicide application

A draft plan is available on the Roads and Maritime Website at:

http://www.rta.nsw.gov.au/environment/downloads/pesticide_use_notification_plan_dl1.html

Maintenance actions to be undertaken under this LMP are divided into two categories based on which landscape type is being maintained:

- Actions for All Areas;
 - Actions that apply to ALL landscape types / areas.
- Specific Actions for Different Landscape Types.
 - In addition to actions that apply to all landscape types / areas, these actions are applied to a specific landscape type.

2.1 All Areas

The following maintenance actions are to be implemented by all maintenance authorities (with reference to 5.1.3 Maintenance Responsibilities) across all areas of this LMP.

Pruning of Vegetation for Safety

Carry out all pruning in accordance with AS 4373.

Pruning to maintain driver sight lines; pruning to remove dead wood from over hanging paths, cycle-ways and roads.

Prune to an extent where this will not re-occur as a problem in the period to next routine maintenance without compromising overall form and growth potential of plant.

Actions Required	Frequency
Maintaining driver sight lines	
Within the sightline zone, prune all roadside vegetation, to a height of 300mm, when:	
Vegetation obscures any part of horizontal railing of safety barriers, when viewed from approaching traffic within 300 m of all intersections and access roads.	Monthly
Pruning trees over carriageways, roads, paths and cycle ways	
Prune all roadside vegetation over carriageways, roads, paths and cycle ways when it is:	
Carriageways / Roads:	Lower than 5.5 m above carriageway;
Paths and Cycle ways:	Lower than 3.3 m above path or cycleway
All areas:	Overhanging dead / diseased/ badly damaged trees or limbs

Management of Non Frangible Vegetation

To ensure that non frangible vegetation is removed in dangerous areas in accordance with Roads and Maritime safety standards.

Actions Required	Frequency
Remove woody regeneration / woody weeds (ie. where trunk diameter exceeds 150 mm measured at 300 mm from the ground) in set back area by manual removal if present in the following areas:	Annual
Set backs from edge of travel lane:	

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- With safety rail present:
 - 5.5m.
- With no safety rail present, setback varies as follows:
 - <=60 km/h speed zones: 3 m
 - <=80 km/h speed zones: 5 m
 - <=100 km/h speed zones: 9 m
 - <=110 km/h speed zones: 11 m

Noxious Weed Control

Noxious weeds continuously controlled as per legal requirements.

Actions Required	Frequency
Continuously suppress and destroy, in accordance with their control category, the growth of all declared noxious weeds where present or where they establish. Of particular concern are; The areas planted with Pasture Grass. These areas must remain free of noxious weeds, in particular Giant Parramatta Grass; All areas where site topsoil has been respread. Site topsoil has been noted to contain Lantana seed.	Monthly
Declared noxious weed species within the area are listed in Appendix 2 – Noxious Weed Species and Control Categories.	

Rubbish Removal

Litter and roadside debris removal.

The contractor is not required to remove rubbish during the Landscaping Maintenance Period.

Actions Required	Frequency
No action required The contractor is not required to remove rubbish removal during the Landscaping Maintenance Period except for rubbish left by themselves within the Landscape Planting area. Recycle or dispose of rubbish in a responsible manner. Leave the site in a clean and tidy condition.	Nil As required

Auditing and Reporting

Regular auditing and reporting on maintenance works and additional works required.

Actions Required	Frequency
Inspection of entire site to report on LMP maintenance compliance, report and enact remedial works.	Monthly
An auditing and reporting form is to be provided monthly and submitted within four days of each maintenance inspection. The report must include date of visit, maintenance works completed, maintenance works in progress and maintenance works required. The report must give details of damaged, dead or missing plants and show their locations on the relevant sheets of the Design Documentation. The report must also identify separately any damage to landscape planting which has not been caused by you.	

2.2 Specific Landscape Types

2.2.1 Grassed (Mown) Areas

The following maintenance actions are to be implemented by all maintenance authorities in grassed (mown) areas. The contractor is not required to perform routine mowing of verges.

The extent of grassed (mown) areas are illustrated on the LMP Landscape Plans (Appendix 1).

Mowing

Maintenance of grasses areas for neat appearance and to maintain groundcover.

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Actions Required	Frequency
Remove litter prior to mowing. Mow grass at rest area picnic and transpiration areas to a min height of 50 mm and max height of 100 mm. Do not scalp grass. Clippings to remain where they fall except that: road surfaces, drains, footpaths, picnic areas and cycle paths shall be swept or raked clear of clippings and these clippings shall be removed from site.	Spring – Every 6 weeks Summer – Every 4 weeks Autumn – Every 6 weeks Winter – Every 12 weeks

Replacement of Damaged Grass

Replacement of grass damaged by vehicles or other disturbances.

Actions Required	Frequency
Re-establish grass cover immediately after damage / death / removal. Use originally specified species.	As Required

Weed control in Grass

Ensure that grass remains weed free.

Actions Required	Frequency
Control, through the use of selective herbicides, the establishment and growth of weed species in turf. Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Dye (colour: red) is to be added to herbicides to show extent of treated area.	Monthly

Watering

Actions Required	Frequency
Turf must not be allowed to dry out during the establishment period and must maintain a discernable level of moisture until established.	As required

2.3 Vegetation Areas (Hydroseeding)

The following maintenance issues and actions are to be implemented by all maintenance authorities in vegetation (Hydroseeding) areas.

The extent of vegetation (Hydroseeding) areas is illustrated on the LMP Landscape Plans (Appendix 1)

Weeding

To ensure that environmental and noxious weeds do not reproduce within vegetation (Hydroseeding) areas and compete with vegetation.

Weeding and weed control is considered to be a critical maintenance action.

Actions Required	Frequency
Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m ² area.	Monthly
Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.	
Herbicide use to be in accordance with regulation rates and manufacturers recommendations.	
Dye is to be added to herbicides to show extent of treated area.	
Use of bio-degradable herbicide is encouraged	

Herbicide Spraying

Herbicide use must comply with the requirements as specified in 3.1.1 'Herbicide Spraying' in RMS D&C R178 – Vegetation.

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Mulching

Maintain an adequate level of mulch in planted beds where these are located within otherwise Hydroseeding areas, to maximise soil binding, water conservation and weed suppression.

Actions Required	Frequency
Mulch is applied as part of the Hydroseeding application process. Maintain mulch in planted beds in otherwise Hydroseeded areas to a depth of minimum 75mm through periodic applications.	As required

Removal of Dead / Dying Plant Material

To remove dead or dying plant material from landscapes. May be required as plantings mature, after damage or adverse environmental conditions.

Actions Required	Frequency
Clear dead vegetation from areas showing poor growth or damage and replace all lost topsoil. Remove dead or dying plant material only if contact between re-applied Hydroseeding and ground will not occur. Preference is to slash and leave existing dead or dying plant material to act as additional mulch material	As required.
Replacement of plantings in accordance with actions listed in Replacement Plantings (below)	

Replacement Plantings

To ensure that the density and species of established plant material is maintained.

Actions Required	Frequency
Replace failed, senescent or damaged plantings. Densities and species used are to be in accordance with those specified in the original landscape plans.	As Required
Water replacement plantings for a minimum of 12 weeks after planting. Replace all lost topsoil.	Weekly
The species density and species selections specified for each area of landscape covered by this LMP are provided in Appendix 1 – Landscape Plans	

2.4 Planting Areas (Tubestock)

The following maintenance issues and actions are to be implemented by all maintenance authorities in plantings (Tubestock).

The extent of plantings (Tubestock) are illustrated on the Landscape Planting and Seeding Plans.

Weeding

To ensure that environmental and noxious weeds do not reproduce within planted areas and compete with plantings.

Weeding and weed control is considered to be a critical maintenance action.

Actions Required	Frequency
Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m ² area.	Monthly
Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application. Remove by hand any weeds which cannot be controlled by herbicide. Ensure that the entire weed including all roots is removed. Dispose of the weeds off site.	As required
Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Herbicide use must comply with the requirements as specified in Clause 4.5 Weed Control in RMS D&C R179 – Landscape Planting.	
After spraying, lop any dead weeds flush with the ground surface and dispose of the cuttings.	
Dye is to be added to herbicides to show extent of treated area.	

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Use of bio-degradable herbicide is encouraged

Disease and Insect Control

Plants must be sprayed with pesticides to control disease and insect infestation when and where identified.

Actions Required	Frequency
Spraying must only be undertaken on windless days (wind speeds of less than 10km/hr).	As required.
Records must be retained of the following: Type of chemical to be used; Plant species to be treated; Extent of the infestation and; Timing of the proposed application.	
Spraying must not be undertaken where there is a risk that pesticide could enter into a watercourse or when wind conditions could cause drift outside of the area to be treated.	

Mulching

Maintain an adequate level of mulch in planted beds to maximise water conservation and weed suppression.

Actions Required	Frequency
Maintain mulch depth to min 75 mm though periodic applications. Use same mulch as originally specified in each planting.	As required.
Mulch is to be applied to all existing and new planting (Tubestock).	
Do not apply mulch to those areas of planting (Virotube) with the water line at creek lines, ponds and wetlands	

Removal of Dead / Dying Plant Material

To remove dead or dying plant material from landscapes. May be required as plantings mature, after damage or adverse environmental conditions.

Actions Required	Frequency
Remove dead or dying plant material.	As required.
Replacement of plantings in accordance with actions listed in Replacement Plantings (below)	

Replacement Plantings

To ensure that the density and species of established plant material is maintained.

Actions Required	Frequency
Replace failed, missing, senescent or damaged plantings. Densities, sizes species and varieties used are to be in accordance with those specified in the original landscape plans. Plant all plants in accordance with RMS D&C R179 'Table R179.4 – 'Planting Hole Dimensions' as well as the Landscape Planting Details. Reinststate any disturbed areas.	Within 28 days of detection.
Water replacement plantings for a minimum of 12 weeks after planting.	Weekly.
The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans	

Timber Stakes

To replace Timber stakes when damaged and to remove when no longer required.

Actions Required	Frequency
Replace timber stakes (for trees and shrubs) if damaged or removed prior to plant establishment. Replace with same or equivalent stake.	As required until final removal at 12 months after planting.

2.5 Landscape Bed Plantings

The following maintenance issues and actions are to be implemented by all maintenance authorities in landscape bed plantings.

The extent of landscape bed plantings are illustrated on the Landscape Planting and Seeding Plans.

Weeding

To ensure that environmental and noxious weeds do not reproduce within planted areas and compete with plantings.

Weeding and weed control is considered to be a critical maintenance action.

Actions Required	Frequency
Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m ² area.	Monthly
Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application. Remove by hand any weeds which cannot be controlled by herbicide. Ensure that the entire weed including all roots is removed. Dispose of the weeds off site.	
Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Herbicide use must comply with the requirements as specified in Clause 4.5 Weed Control in RMS D&C R179 – Landscape Planting.	
After spraying, lop any dead weeds flush with the ground surface and dispose of the cuttings.	
Dye is to be added to herbicides to show extent of treated area.	
Use of bio-degradable herbicide is encouraged	

Disease and Insect Control

Plants must be sprayed with pesticides to control disease and insect infestation when and where required.

Actions Required	Frequency
Spraying must only be undertaken on windless days (wind speeds of less than 10km /hr).	As required.
Records must be retained of the following: Type of chemical to be used; Plant species to be treated; Extent of the infestation and; Timing of the proposed application.	
Spraying must not be undertaken where there is a risk that pesticide could enter into a watercourse or when wind conditions could cause drift outside of the area to be treated.	

Mulching

Maintain an adequate level of mulch in planted beds to maximise water conservation and weed suppression.

Actions Required	Frequency
Maintain mulch depth to min 75 mm through periodic applications. Use same mulch as originally specified in each planting.	As required.
Mulch is to be applied to beds at edges of roads, paths and verges.	

Removal of Dead / Dying Plant Material

To remove dead or dying plant material from landscapes. May be required as plantings mature, after damage or adverse environmental conditions.

Actions Required	Frequency
Remove dead or dying plant material.	As required.
Replacement of plantings in accordance with actions listed in Replacement Plantings (below)	

Replacement Plantings

To ensure that the density and species of established plant material is maintained.

Actions Required	Frequency
Replace failed, missing, senescent or damaged plantings. Densities, sizes species and varieties used are to be in accordance with those specified in the original landscape plans. Plant all plants in accordance with RMS D&C R179 Table R179.4 – ‘Planting Hole Dimensions’ as well as the Landscape Planting Details. Reinstatement any disturbed areas.	Within 28 days of detection.
Water replacement plantings for a minimum of 12 weeks after planting.	Weekly.
The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans	

Timber Stakes

To replace timber stakes when damaged and to remove when no longer required.

Actions Required	Frequency
Replace timber stakes (for trees and shrubs) if damaged or removed prior to plant establishment. Replace with same or equivalent stake.	As required until final removal at 12 months after planting.

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3.0 Horticultural Maintenance of Plantings

Horticultural maintenance of advanced plantings to ensure the long life and maintenance of form.

The following tables outline the standards required for pruning and fertilising all Landscape Planter Bed or Feature Plantings.

3.1 Feature Planting-Trees

Botanic Name	Common Name	Pruning Type
<i>Allocasuarina torulosa</i>	Forest She Oak	B
<i>Araucaria cunninghamii</i>	Hoop Pine	A
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	N/A
<i>Elaeocarpus obovatus</i>	Hard Quandong	A
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	B
<i>Eucalyptus grandis</i>	Flooded Gum	A
<i>Corymbia maculata</i>	Spotted Gum	A
<i>Eucalyptus microcorys</i>	Tallowwood	A
<i>Eucalyptus pilularis</i>	Blackbutt	A
<i>Eucalyptus robusta</i>	Swamp Mahogany	A
<i>Livistona australis</i>	Cabbage Tree Palm	N/A
<i>Lophostemon confertus</i>	Brush Box	A

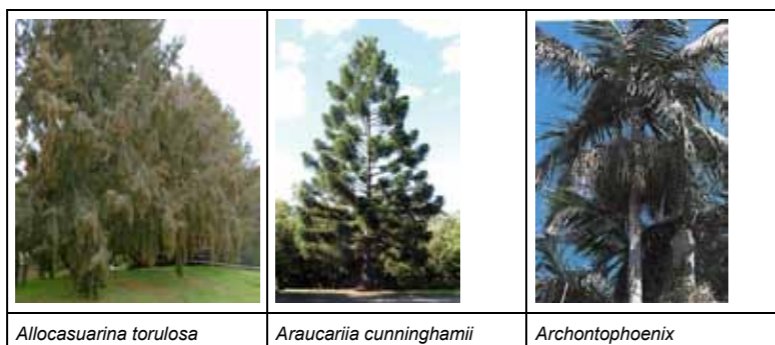
Table 1: For all tree species, the following fertilising and pruning is required:

Apply the following fertiliser to all species:

Fertilising	Frequency
60 grams slow release fertiliser per plant. N:P:K ratio- 18:3:10	Annually. Applied Late Spring.

Prune species as per appropriate type:

Pruning	Frequency
A Prune to remove split leaders, remove dead limbs, and remove heavily damaged limbs. As maturity permits prune lower branches to collar to 5.5 m above ground level where these overhang carriageways and roads. In other areas, prune lower branches to 3.3m above ground level.	As required.
B Prune to remove split leaders, remove dead limbs, and remove heavily damaged limbs. As maturity permits prune lower branches to 1 m above ground level	As required.



Allocasuarina torulosa *Araucaria cunninghamii* *Archontophoenix*

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<i>Elaeocarpus obovatus</i>	<i>Elaeocarpus reticulatus</i>	<i>Araucaria cunninghamiana</i>
<i>Eucalyptus grandis</i>	<i>Eucalyptus microcorys</i>	<i>Eucalyptus pilularis</i>
<i>Corymbia maculata</i>	<i>Livistona australis</i>	<i>Lophostemon confertus</i>
<i>Acmena smithii</i>		

3.2 Feature Planting-Shrubs

Botanic Name	Common Name	Pruning Type	Max. Height (m)
<i>Archirodomyrtus beckleri</i>	Rose Myrtle	C	4
<i>Backhousia myrtifolia</i>	Carroll	C	5
<i>Ptilidostigma glabrum</i>	Plum Myrtle	C	4

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<i>Tabernaemontana pandacaqui</i>	Banana Bush	C	2.5
<i>Callistemon salignus</i>	Willow Bottlebrush	C	2.5
<i>Cordyline stricta</i>	Narrow-leaved Palm Lily	C	2
<i>Leptospermum polygalifolium</i>	Lemon-scented Tea-tree	C	2.5
<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	C	6
<i>Wilkea huegeliana</i>	Veiny Wilkea	C	4

Table 2: For all shrub species, the following fertilising and pruning is required:

Apply the following fertiliser to all species:

Fertilising	Frequency
20 grams slow release fertiliser per plant. N:P:K ratio– 18:3:10	Annually. Applied Late Spring.

Prune species as per appropriate type:

Pruning	Frequency
C Prune evenly to promote compact shape (to specified max. height). Remove 200 to 300mm (depending on vigour of previous plant growth) length of branches all around the plant. Only required where specimens exhibit "legginess"	Annually. Late Spring

<i>Archirhodomyrtus beckleri</i>	<i>Backhousia myrtifolia</i>	<i>Ptilidostigma glabrum</i>
<i>Tabernaemontana pandacaqui</i>	<i>Callistemon salignus</i>	<i>Cordyline stricta</i>
<i>Leptospermum polygalifolium</i>	<i>Melaleuca linariifolia</i>	<i>Wilkea huegeliana</i>

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	<i>Zieria smithii</i>
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3.3 Feature Planting-Ground Covers / Low Tussocks

Botanic Name	Common Name	Pruning Type
<i>Carex appressa</i>	Tall Sedge	D
<i>Crinum pedunculatum</i>	Swamp Lily	D
<i>Dianella caerulea</i>	Spreading Flax Lily	E
<i>Gahnia clarkei</i>	Tall Saw-Sedge	D
<i>Isolepis inundata</i>	Swamp Club-rush	E
<i>Juncus usitatus</i>	Common Rush	E
<i>Lepidosperma laterale</i>	Variable Saw-sedge	E
<i>Lomandra longifolia</i>	Spiny-headed Mat-Rush	E
<i>Lomandra hystrix</i>	Mat Rush	E
<i>Phylidrum lanuginosum</i>	Frogmouth	E
<i>Schoenus melanostachys</i>	Black Bog-rush	E
<i>Eleocharis sphacelata</i>	Tall Spike Rush	E
<i>Fimbystylis dichotoma</i>	Common Fringe Sedge	E

For all groundcover and low tussock species, the following fertilising and pruning is required:

Apply the following fertiliser to all species:

Fertilising	Frequency
10 grams slow release fertiliser per plant. N:P:K ratio– 18:3:10	Annually. Applied Late Spring.

Prune species as per appropriate type:

Pruning	Frequency
D Prune evenly to a height of 300mm above ground.	Every 2 years in April.
E Mowing	Refer Native Grasses in areas of special consideration

<i>Carex appressa</i>	<i>Crinum pedunculatum</i>	<i>Gahnia clarkei</i>

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<i>Dianella caerulea</i>	<i>Isolepis inundata</i>	<i>Juncus usitatus</i>
		
<i>Lomandra hystrix</i>	<i>Lomandra longifolia</i>	<i>Phylidrum lanuginosum</i>

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Actions Required	Frequency
Remove litter prior to mowing. Mow grass at rest area picnic and transpiration areas to a min height of 50 mm and max height of 100 mm. Do not scalp grass. Clippings to remain where they fall except that: road surfaces, drains, footpaths, picnic areas and cycle paths shall be swept or raked clear of clippings and these clippings shall be removed from site.	Spring – Every 6 weeks Summer – Every 4 weeks Autumn – Every 6 weeks Winter – Every 12 weeks

Replacement of Damaged Grass

Replacement of grass damaged by vehicles or other disturbances.

Actions Required	Frequency
Re-establish grass cover immediately after damage / death / removal. Use originally specified species.	As Required

Weed control in Grass

Ensure that grass remains weed free.

Actions Required	Frequency
Control, through the use of selective herbicides, the establishment and growth of weed species in turf. Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Dye (colour: red) is to be added to herbicides to show extent of treated area.	Monthly

Watering

Actions Required	Frequency
Turf must not be allowed to dry out during the establishment period and must maintain a discernable level of moisture until established.	As required

2.3 Vegetation Areas (Hydroseeding)

The following maintenance issues and actions are to be implemented by all maintenance authorities in vegetation (Hydroseeding) areas.

The extent of vegetation (Hydroseeding) areas is illustrated on the LMP Landscape Plans (Appendix 1)

Weeding

To ensure that environmental and noxious weeds do not reproduce within vegetation (Hydroseeding) areas and compete with vegetation.

Weeding and weed control is considered to be a critical maintenance action.

Actions Required	Frequency
Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m ² area.	Monthly
Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.	
Herbicide use to be in accordance with regulation rates and manufacturers recommendations.	
Dye is to be added to herbicides to show extent of treated area.	
Use of bio-degradable herbicide is encouraged	

Herbicide Spraying

Herbicide use must comply with the requirements as specified in 3.1.1 ‘Herbicide Spraying’ in RMS D&C R178 – Vegetation.

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where burning may replace mowing as a management tool) may be maintained by controlled / planned fire according to ecological and catchment requirements; in some communities, no planned fire will be applied, but in other areas fire will be applied within a defined fire frequency range and prescription.
The action must be co-ordinated with ROADS AND MARITIME, Rural Fire Service and Local Council.

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans

4.3 Fauna Underpasses

To ensure that the integrity of the fauna overpass is maintained.

Actions Required	Frequency
Remove all plant growth from fence ie; vine growth	As required
Remove all fallen branches and tree limbs that are leaning or resting on or against the fence	As required
Maintain the grassed access path to maintain height to 300mm max.	As required
Provide surveillance for evidence of predators such as foxes, cats and wild dogs and report to DEC if suspected.	monthly
Maintain fauna refuge poles poles, frog pipes and ponds in good condition and repair where necessary	As required

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans

4.4 Fauna Fence

To ensure that the integrity of the fauna fence is maintained.

Actions Required	Frequency
Remove all plant growth from fence ie vine growth	As required
Remove all fallen branches and tree limbs that are leaning or resting on or against the fence	As required
Maintain height of planting to maximum 300mm in height within 4 metres of the non-road side of the fence	As required
Maintain height of planting to maximum 300mm in height within 3m on the road side of the fence except where shown on plan.	As required
Remove all naturally occurring tall shrub and tree species within 3 metres either side of the fence.	As required

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans

4.5 Water Quality Ponds and Detention Basins

To ensure that the integrity of the transpiration area is maintained.

Actions Required	Frequency
Maintain grass species as per Grassed (Mown) Areas	Refer Grassed (Mown) Areas
Macrophyte Zones should require no special attention except through periods of prolonged drought when local tree species may colonise the basins and affect their performance. Remove tree species from basins	As required

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans

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4.6 Threatened Species

Actions Required	Frequency
Care is to be taken not to harm threatened flora within the road corridor. The location of all the threatened species is to be documented along with a monitoring report as per Appendix 14 of the SWTC to be issued of all individual threatened species covered in the EMP which is part of the project Maintenance Manual	Annually

4.7 Site Works

There are a number of areas on the landscape plans that state “Extent of works to be confirmed on site” This work is documented below.

Actions Required	Frequency
1. Batch Plants 2. Compounds 3. Stockpiles 4. Other areas	
Adjust extent of landscape works on site to suit. Some sites listed above will be in place during the maintenance period, after which they will be the subject of further landscape remediation	Completion of works

4.8 Rest Area

To ensure that the integrity and standard of the rest area is maintained for public amenity.

Actions Required	Frequency
Remove all rubbish to prevent the blocking of castellated kerb. Remove rubbish from vegetated swales.	As required
Remove all fallen branches and tree limbs that are leaning or resting on or against water quality pond fences	As required
Maintain grassed areas as per “mowing”	As per “mowing”
Maintain grassed septic absorption area as per mowing to maintain grass and removing clippings	As per “mowing”
Visually inspect amenities and alert Roads and Maritime to any actions (such as vandalism or inoperable equipment) required outside the scope of the landscape maintenance	As required

The species density and species selections specified for each area of landscape covered by this LMP are provided in the Landscape Plans

4.9 Riparian Zones

To ensure that integrity of riparian zones is maintained for resilience to flooding.

Actions Required	Frequency
Remove all rubbish and fallen branches to prevent the blocking of bridges or culverts. Remove rubbish from vegetated zones.	As required
Inspection following abnormal rainfall events to assess any damage caused by increased flows. Take remedial action as for All Areas, replacement plantings, horticultural maintenance of plantings and batter re-vegetation management strategy.	As required

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Repair organic fibre mesh where damage or lifting has occurred.	As required
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The species density and species selections specified for each area of landscape covered by this LMP are provided in the Landscape Plans – refer Appendix A.

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Appendices

Appendix 1 – Landscape Plans

- To be provided during final design period.

Appendix 2 – Noxious Weed Species

- To be provided during final design period.

Appendix 3 – Monthly Maintenance Report

- To be provided during final design period.

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I ROAD FURNITURE

I.1 LIGHTING AND LIGHT FIXTURES

Introduction

The Design provides roadway lighting at various locations along the Route and Rest Area lighting. Compliance with the SWTC Appendix 15 requirements is included under Appendix A.

I.1.1 Road Lighting

Roadway lighting is required at intersections and interchanges as follows:

Table I.1.1.1 Roadway Lighting Locations and Descriptions

Station (approx.)	Description	Pole Locations
61km700 to 62km950	Nambucca Heads Interchange	Ramps, Roundabout, Local Roads
64km100 to 64km200	Valla Road Intersection	Local Road
67km650 to 67km750	East West Road intersection	Local Roads & Service Road
72km400 to 72km500	Ballards Road Interchange	Local Roads & Service Road
81km500 to 81km550	Shortcut Road & South Arm Road (North) Intersection	Local Road
82km350 to 83km350	Waterfall Way Interchange	Ramps, Roundabout

The typical pole is 10.5m tall and the integrated curved outreach arm is generally 1.5m. They are steel with a galvanised finish. The pole is circular, tapered and has a "slip base", which allows it to fall under collision impact. It is an Roads and Maritime approved item supplied by Ingal EPS or Roads and Maritime approved equivalent. The typical luminaire is a 250W HPS Roadster supplied by Sylvania Lighting or Roads and Maritime approved equivalent.



Roadway pole and outreach arm, luminaire and "slip base".

I.1.2 Rest Area Lighting

Lighting is located adjacent to the pathways with 10 poles each leading to the toilet block only as per RMS nominated requirements. The lighting selected provides low level vandal resistant security lighting illumination. The lighting selected by the landscape designers is the Versalux, Lesage post top LED luminaries with 4 metre pole. Both pole and luminaire are to be matching powder-coated black. This is not preferred by the lighting designers who have selected a non-LED luminaire (Kim Lighting Archetype luminaire). However as the Street Lighting package is not currently advanced past DCD phase, the final lighting selection/locations within the rest area amenity zone is not yet confirmed.



1 x 36w fluorescent IP54 vandal-proof surface-mounted light will be provided on the wall at the back of the toilet block.


For confirmation of all Lighting for entry and exit to the rest areas and surrounding the amenity areas refer to Street Lighting Package.



Rest area luminaire and pole.

Table I.1.2.1 Rest Area Materials Schedule

Item	Description	Quantity
	Rubbish Bin (240lt) S203 -Surface Two (S2) Bin 240L - HUB Street Equipment P/L - or approved equivalent Hot dipped Galvanised Panels, Linished S/S (304) Chute and Bead Blasted S/S (304) Side Plate Detail and hot dipped mild gavanised Steel Frame. L:830mm W:700mm H:1280 Rubbish bin designed to fit a standard 240lt wheelie bin. Litter Bins to have warning signs 'identifying the possible consequential impacts of leaving rubbish lying around the rest area and not placing it in the bins' attached to the rubbish bins. Sign to be 500x200mm to be UV stabilised	12 units
	Lesage Post Luminaire Versalux Lighting Systems or approved equivalent 1 x 36w LED Lesage Versalux fitting or approved equivalent complete with 4m pole and foundation Pole and pole to be powder coated black	Refer to electrical lighting package 10
	1 x 36w Fluorescent IP54 vandal proof, Surface mounted to back of toilet block	1
	250w Sylvania Roadster 12m Pole (to be located at Entry/Exit of Rest Area)	2
	Picnic Shelters + Picnic Settings	6 units

Item	Description	Quantity
4 Cubicle Unisex Toilet Block	As specified in accordance with RTA Toilet No.6 Drawings Richard Goodwin - Dwgs: FT.02 - FT.22 inclusive, IGT.01A - IGT 03.A Structural Drawings - Michael Johnson Drafting services S-001 to S-0012 inclusive. Slab and footing drawings - Partridge Partners S1B, S2A, S3B and S4B Flushing toilets to be provided in accordance with Roads and Maritime prototype toilet - flushing toilet system toilet 6 specification.	1 unit
Pathways	Concrete: 1200 mm wide suitable for wheelchair access Refer to pavement drawings	Refer to pavement drawings
24hr Driver Reviver	Rectangular concrete hard stand area with layback kerb (15x 8m Min) Refer to pavement drawings	1 Refer to pavement drawings
	Potable Water Fountain DF4 - Arqua Fountain (Street Furniture Australia) or approved equivalent Body : Stainless Steel with Anti Graffiti coating Spout and Button: Marine Grade Stainless Steel 316 Mounting: Surface mounting Warning Sign 'water suitable for drinking'	2 units 1 sign per Water Fountain
Interpretation Signage	To Future Detail	1 unit
Turf - couch seeding	Unhulled couch	2457m ²

I.2 CYCLISTS AND PEDESTRIANS

A shared path will be constructed in accordance with Figure 8.1 of the NSW Bicycle Guidelines (2005) at each roundabout providing safe access to cyclists and foot traffic via a 2.0m to 3.0m wide concrete path with pram ramps at crossings. At the Nambucca Heads Interchange the shared path provides cyclist and pedestrian access from the existing Pacific Highway to the low speed environment of the rest area.

The rest area is provided with 1.2m wide paths connecting parking areas, picnic shelters, driver reviver and amenities.

On the Pacific Highway main alignment, a 2.5m wide sealed shoulder has been provided along the outside of the travel lanes to cater for cyclists. Signposting and crossing points will be at the entry and exit ramps.

The bridge over the highway at Nambucca Heads Interchange is provided with a separated 2.5m path with cycle rail which is designated a shared path for use by pedestrians and cyclists. The bridge over East West Road is provided with a 2m wide path suitable for pedestrians only.

APPENDIX 1: SWTC COMPLIANCE TABLES

Appendix 15: Urban Design Performance and Design Requirements

SWTC Requirement	Developed Concept Design
15.1 GENERAL	
(a) <i>The Project Works must:</i>	Complies. Refer to Section B, C and Section D of this Report. Section D in particular documents the overall design.
(i) <i>be consistent with the urban and landscape design concepts contained in the Environmental Documents;</i>	
(ii) <i>be consistent with the urban and landscape design vision, objectives and principles contained in "RTA Pacific Highway urban design framework: Urban design guidelines for the SH10 from Hexham to Tweed Heads", RTA April 2005;</i>	
(iii) <i>be sensitive and responsive to the character of the landscape through which the Project Works pass, including the built, natural and community qualities;</i>	
(iv) <i>maintain a diverse and scenic driving experience and preserve the fine grained rural and urban character of the Existing Highway and other Local Roads;</i>	
(v) <i>provide a visually attractive artefact in the landscape;</i>	
(vi) <i>provide a road corridor that is well vegetated, with planting that matches the character of the local landscape and adjoining vegetation communities and retains good views to the surrounding landscape;</i>	
(vii) <i>retain and enhance quality views from the Project Works, protecting key vistas and long distance views, and maximise the potential for views to existing landmarks and other prominent features, including the Kalang River and Deep Creek;</i>	
(viii) <i>identify and highlight the positive features and experiences of the Nambucca Heads to Urunga section of the Pacific Highway upgrade which are unique and significant;</i>	
(ix) <i>maximise landscaping opportunities between separate carriageways, including between the Main Carriageways, between Ramps and the Main Carriageways, and at Connections, to ensure that the landscape remains the most important visual element;</i>	
(x) <i>have a consistent urban and landscape design quality throughout the Project Works and be compatible with the Pacific Highway upgrade in general; and</i>	
(xi) <i>conform to the performance requirements for safety, cost effectiveness and sustainability as required by section 1.4 of "Beyond the Pavement RTA urban design policy procedures and design principles", RTA August 2009.</i>	
(b) <i>Connections and interchanges with associated Ramps and roundabouts and the taller and more visible elements of the Project Works, including bridges, cuttings, embankments and noise barriers are key elements of the Project Works that are significant in the landscape and require a high quality urban and landscape design to meet the project objectives.</i>	Complies. There are no noise barriers. Refer to Section D for interchange design. Refer to Section E for bridges. Refer to Section G for cuttings and embankments.

SWTC Requirement	Developed Concept Design
(c) <i>The design of bridges must be simple, refined and provide elegant structures to fit in with or complement the landscape and scenic quality of the corridor.</i>	Complies. Refer to Section E.
(d) <i>The design of cuttings and embankments must address the shaping, stabilisation and treatment of cuttings and embankments to ensure that they fit in with the local landform and the character of the natural landscape and ensure that cuttings and embankments</i>	Complies. Refer to Section G.
(e) <i>Interchanges must be designed to:</i>	Complies. Refer to Section D.
(i) <i>achieve a seamless physical link between the Main Carriageways and the Local Roads and adjoining road network;</i>	
(ii) <i>address the quality and continuity of local vehicular, bicycle and pedestrian access and circulation for local communities and minimise conflict between local traffic and inter-capital and regional traffic on the Main Carriageways; and</i>	
(iii) <i>minimise their footprint, fit in with the landform, and appear distinctive and appropriate to their context in their form, including built and landscape elements.</i>	
(f) <i>The location, form and design of noise mitigation structures must be integrated into the urban and landscape design and must match the quality of design of such elements on the rest of the Pacific Highway upgrade. Noise mitigation structures must be designed so that they:</i>	Not Applicable. There are no noise mitigation structures.
(i) <i>are not visually intrusive in the natural and rural north coast environment; and</i>	
(ii) <i>do not affect the short distance and panoramic views of the landscape, the visual relationship of communities</i>	
(g) <i>Signposting, including the directional signposting detailed in Appendix 16 of this Scope of Works and Technical Criteria, must be integrated with the urban and landscape design. Signposting, variable message signs and variable speed limit signs must be designed and located so that they:</i>	To be further investigated after Developed concept Design for Package RFI submitted.
(i) <i>are not visually intrusive in the natural and rural north coast environment;</i>	
(ii) <i>do not affect the short distance and panoramic views of the landscape, the visual relationship of communities to the Project Works or the quality of community environments; and</i>	
(iii) <i>are compatible with, and integrated with the design of, other structures such as bridges.</i>	
(h) <i>The use of visible shotcrete must be avoided wherever possible in the design of cutting faces and retaining structures, but where unavoidable through alternative design measures, shotcrete must be moulded with the landform, textured to appear as rock, its colouration blended with that of the landscape, and vegetation or re-vegetation must be used to complement and screen the shotcrete.</i>	Complies. Refer to Sections D and G.4.

SWTC Requirement	Developed Concept Design
(j) <i>The Contractor must include qualified and experienced urban designers and landscape architects in the design team for the Project Works. The urban designers and landscape architects must:</i>	HBO+EMTB Urban and Landscape Design has been engaged by Abigroup for this project.
(i) <i>be integrated into the design organisation and with all the various design disciplines to ensure an integrated engineering and urban design outcome from the Project Works;</i>	
(ii) <i>be involved in the ongoing development, detailing and finalisation of the urban and landscape design and all its elements;</i>	
(iii) <i>regularly attend the Construction Site during the construction activities, at a minimum frequency of six visits per annum, and at key milestone points in the implementation of the Contractor's Work to monitor the implementation and effectiveness of the urban and landscape design;</i>	
(iv) <i>review, advise on and concur with all design issues, design development and modifications affecting the urban and landscape design during the construction period before they are implemented to ensure that the required urban design outcomes are delivered in accordance with the minimum requirements of Appendix 31 of the SWTC; and</i>	
(v) <i>work with the Contractor's Landscape Representative to oversee the landscape work.</i>	
(j) <i>The urban design must be 'best urban design practice', as this requirement is detailed and required by the following Reference Documents:</i>	Complies
(i) <i>"Pacific Highway urban design framework: Urban design guidelines for the SH10 from Hexham to Tweed Heads", RTA, April 2005;</i>	
(ii) <i>"Beyond the Pavement – RTA urban design policy, procedures and design principles, Policy PN 204", RTA, August 2009;</i>	
(iii) <i>"Noise wall design guideline: Design guidelines to improve the appearance of noise walls in NSW", RTA, February 2007;</i>	
(iv) <i>"Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW", RTA, January 2004;</i>	
(v) <i>"Shotcrete Design Guidelines: RTA guidelines to avoid, minimise and improve the appearance of shotcrete", RTA, June 2005; and</i>	
(vi) <i>"Landscape Guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding", RTA, April 2008.</i>	

SWTC Requirement	Developed Concept Design
15.2 BRIDGES	
15.2.1 Requirements for all bridges, overbridges and underpasses	
(a) Bridges must present smooth, clean lines and have a minimum structural depth that is consistent with their spans and method of construction. The design of the bridges, including the parapets and other critical elements, must address the slenderness ratio of the structures. The bridges for the Project Works must be designed to be a consistent family of bridges, with consideration to adjoining sections of the Pacific Highway upgrade where relevant.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2 Bridge design elements directly reference the Bonville and Kempsey Bypass projects and are similar in design and appearance with minor refinements. Local Access Road overbridge at Station 78km510 is treated as feature bridge.
(b) The thickness of bridge superstructures / bridge decks must be minimised. On larger spans consideration must be given to the use of smoothly tapered haunched girders rather than single depth beams, and girders and associated shadow lines must be designed to reduce the perceived thickness. Except for haunched or arched bridges, the depth of the bridge superstructure must be constant for all spans on a bridge.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2 Designs minimise deck depth and keep constant depth for all spans.
(c) The number of bridge piers must be minimised by maximising span lengths.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2 Minimal piers –typically one central pier on Main Carriageway Overbridges which are the most visible bridges. Balance sought between span lengths and superstructure depth.
(d) Noise barriers located on bridges must: (i) be integrated with the design of the bridge as a whole (ii) be constructed from a transparent and shatter proof material only and be provided with markings and/or symbols to reduce the likelihood of bird strike; and (iii) extend a minimum distance of 25m from the bridge abutments into the bridge approaches.	Not Applicable as there are no noise walls in this tender design.
(e) Safety screens located on bridges must be integrated with the design of the bridge as a whole. Post spacing must be designed to have a pleasing and ordered visual relationship with other bridge details, including safety barrier posts, lighting columns and parapet joints. Post spacing must be equivalent to, or a fraction of, the parapet joint spacing, with posts either aligned with parapet joints or spaced so that the parapet joint is located midway between the posts.	Complies. Refer to Figures E.2.0.1 to E.2.0.3 and E.2.1.1 to E.2.6.2
(f) Signage must not be located on bridges or overbridges, except for bridge name plates, overpass bridge road names, clearance markers and navigation markers.	Noted and will be further developed in detail design documentation.
(g) Connections between road and bridge traffic barriers must be neat and simple.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2

SWTC Requirement	Developed Concept Design
(h) Bridge parapets must: (i) be elegant and attractive with neat, evenly spaced joints, smooth even lines and consistent high quality surfaces and colour; (ii) extend parallel to the road surface for the full length of the bridge, extending generously beyond the bridge abutments to a distance in accordance with the aesthetic requirements of the structure but not less than one parapet segment length; (iii) have outside faces that are slanted slightly outwards to catch the sunlight, such that the bottom of the parapet is furthest from the centreline of the bridge; (iv) have a top surface that angles downwards towards the road to channel rainwater onto the bridge and minimise staining of the outside face of the parapet; (v) have neat, straight and sharp edges to help define them against the backdrop; (vi) where the parapets are constructed using precast concrete units, have the adjoining parapet units installed plumb to ensure that the completed parapets present smooth, continuous lines parallel to the road surface for the full length of the bridge; (vii) for curved bridges be designed on a smooth curve irrespective of the alignment of the girders; (viii) have a bottom surface which: A. extends below the underside of the bridge deck slabs (including girder flanges) by a minimum of 200mm; and B. covers any drainage pipes by at least 50mm; C. be sculpted to be self-cleaning; and D. be integrated with traffic barriers.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.0.1 and E.2.0.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2 The parapet design comprises a 5 degree outward slope to the outside face, consistent with the Macleay River Bridge, Kempsey Bypass and Bonville Upgrade parapet designs. The bottom surface extends below the underside of the deck slab and covers drainage pipes.
(i) Where bridge barriers are of different heights to adjoining traffic barriers on the approaches to, or departures from the bridge, barriers must be provided with transitions of 15:1 or flatter between the adjacent barriers.	Complies. Refer to Figures E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(j) Traffic barriers on bridges must consist of a metal two rail and post system mounted on top of a concrete parapet in order to maximise road user views to the landscape.	Complies. Refer to Figures E.1.1.1; E.1.1.2; E.2.0.1 and E.2.0.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(k) The bridge deck draining systems must be discreet and concealed from view. Drainage pipes, Services and future provisions for Services must not be visible except from directly underneath the bridges. The thickness of the bridge deck structure or parapets must not be increased above the minimum that is structurally required to accommodate drainage systems, Services and provisions for Services.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(l) Spill through abutments provide transparency and must be provided in preference to walled abutments. Where spill through abutments are utilised, abutment treatments must extend 1m beyond the parapet line. Abutment treatments must extend into the horizontal portion of the abutments by at least 1.5m.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; (ii)2.1.1 to (ii)2.6.2; (ii)3.2.1 to (ii)3.15.2; and (ii)4.1.1 to (ii)4.3.2 Spill through abutments are utilised on all overbridges, which are the project's most visible bridges. Walled abutments are used on the twin bridges over the North Coast Railway Line only (specific design requirements).

SWTC Requirement	Developed Concept Design
(m) Where retaining wall abutment structures are utilised, they must return back to the bridge alignment to form buttresses, except at the Twin bridges over North Coast Railway Line where retaining wall abutments must be parallel to the railway line. Retaining wall abutment structures must be finished in concrete panels and must be designed so that the horizontal joints are accentuated to provide strong horizontal banding and the vertical joints are minimised and less accentuated. Abutments must visually relate to other retaining structures in the Project Works.	Generally complies. Refer to Figures E.3.1.1 and E.3.1.2. The RSW panels are plain off-form concrete with a false joint midway across each panel to provide horizontal banding which minimises vertical joints in the wall.
(n) Retaining wall abutment structures perpendicular to the centrelines of bridges must tilt outwards from the base of the wall at an angle of no less than 5 degrees from the vertical. Walls parallel to the centrelines of bridges must be recessed from the front face of the parapet face by a minimum of 250mm by cantilevering the parapet.	Complies. Refer to Figures E.3.1.1 and E.3.1.2.
(o) Bridge abutments must be designed such that they are easily maintainable and do not promote vagrancy or graffiti. Methods of providing safe access for maintenance activities must be integrated into the overall design of the bridge.	Complies. Spill through abutments are used on all overbridges, which are the most visible bridges, and all highway bridges except for the twin bridges over the North Coast Railway Line. Spill through abutments are less prone to graffiti attack than retaining wall abutments. Where maintenance access is required to inspect the bridge bearings, access steps will be constructed in the same material as the abutment hard surfacing. Refer to Figures E.1.1.1 and E.1.1.2; E.2.1.1 to E.2.6.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2.
(p) Unless required to be retaining wall abutments, batter slopes and surfacing must be graded no steeper than 1.5:1. Where batter slopes steeper than 2:1 are provided, batter slopes must be finished in a paved or hard surface. Abutment hard surfacing treatments must be designed to be aesthetically pleasing, vandal resistant and to reinforce the aesthetics of the Project Works. Abutment hard surfacing areas must be edged to reduce future crumbling and to form a neat interface. Other than hard-surfaced abutments, embankments must be vegetated to reduce erosion. Where fauna access is not required under bridges, hard erosion-resistant treatments must be applied to the areas which are shaded or are sheltered from rainfall.	Complies. Batter slopes for overbridges are faced with concrete pavers. Refer to Figures E.2.1.1 to E.2.6.2. Batter slopes for highway bridges are generally finished with stone boulder scour protection. Refer to Figures E.1.1.1 and E.1.1.2; E.3.2.1 to E.3.15.2; and E.4.1.1 to E.4.3.2.
(q) Further to the requirements of section 15.1(h) of this Appendix, exposed shotcrete must not be used around the curtilage of the bridges, unless the location is not visible to road users or surrounding land users.	Complies. There is currently no requirement for shotcrete around bridges in the current design.
(r) Abutment walls must, wherever possible, utilise natural materials and/or colours which are representative of the structure's natural setting.	Applies to twin bridges over the North Coast Railway Line only. Abutment walls utilise a natural concrete finish consistent with the finish on the Bonville and Kempsey Bypass Upgrades. The same finish is anticipated on the upgrades immediately to the south of Nambucca Heads
(s) Pile caps on land must be concealed below finished ground surface.	Complies. All pile caps are located below finished ground surface.
(t) Where there are adjacent fauna fences, fauna fences must be provided in the medians between the abutments of new bridges.	Complies. Refer to Figures E.1.1.1 and E.1.1.2; and E.3.1.1 to E.3.15.2.

SWTC Requirement	Developed Concept Design
(u) <i>The requirements of sections 15.2.2, 15.2.3 and 15.2.4 are additional to, and to the extent of any discrepancy or inconsistency with this section 15.2.1, take precedence over this section 15.2.1.</i>	Noted.
15.2.2 Twin Bridges over Kalang River	
(a) <i>As identified in the Environmental Documents, the Twin Bridges over the Kalang River will sit in a Bellingen Shire Council Conservation Area which is an area of high scenic value. The scale of the road and height of the bridge and embankments are such that they will have high character and visual impact. The design of the twin Bridges over the Kalang River and approach embankments must address this impact and mitigate it by providing an elegant, neat sensitively designed bridge sitting in a well designed landscape.</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2; Chapter H; and text above.
(b) <i>The Twin Bridges over the Kalang River must meet the following requirements:</i> (i) <i>The bridges must be slender and refined;</i> (ii) <i>Shadowing of the girders and span lengths should be maximised;</i> (iii) <i>Abutments and approach embankments should be minimised: a long bridge with short embankments is preferable to a shorter bridge with longer embankments; and</i> (iv) <i>Piers must be simple and refined without headstocks and without visible pilecaps on land.</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2. The design minimises superstructure depth and keeps it constant for all spans. Bridge length includes service roads on each river bank. There are no pilecaps.
(c) <i>The approach road embankments must be feathered into the landform and vegetated to fit the character of the area and must provide views from the road to the landscape.</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2; and Chapter H. Vegetation on embankments is an extension of the adjoining floodplains. It's low height ensures good views from the highway
15.2.3 Bridges over the Main Carriageways	
<i>Bridges over the Main Carriageways must be simple and refined and as similar in appearance to each other as possible. The bridges must integrate with their environment and other key related components of Project Works. Bridges over the Main Carriageways must be consistently designed as a suite or family of bridges with consideration to adjoining sections of the Pacific Highway upgrade where relevant. As a minimum, the bridges must meet the following requirements:</i>	Complies. Except for the piers of the Local Access Road overbridge at 78km510, which is a feature bridge, all overbridges are similar in appearance, adopting the same detail for parapet, pier and screen posts systems and are similar in appearance to the Bonville and Kempsey Bypass Overbridges. Refer to Figures E.2.1.1 to E.2.6.2.
(a) <i>Span lengths must be maximised. Elegant and thin leading edges, parapets, refined piers and supporting structures and integrated open twin rail safety barriers and safety screens must be used to increase the transparency of bridges.</i>	Complies. Refer to Figures E.2.1.1 to E.2.6.2.
(b) <i>Piers must be of the column or wall type without headstocks which protrude into the bridge superstructure elevation. Bridge elements, including piers, sill beams, abutments and leading edges, must be fully integrated.</i>	Complies. Refer to Figures E.2.1.1 to E.2.6.2.
(c) <i>In the transverse direction to the bridge centre lines, the bridge decks must extend beyond the limits of the substructures, including abutments, so as to avoid staining to the substructures and to produce shadow lines. The designs must incorporate drip lines to the soffits and flanges of the bridges to reduce staining.</i>	Complies. Refer to Figures E.2.1.1 to E.2.6.2.

SWTC Requirement	Developed Concept Design
(d) <i>Structural methods which maximise shadowing of the superstructure, elegant thin leading edges and parapets, refined supporting structures and integrated open twin rail safety barriers and safety screens must be used to increase the apparent slenderness of the bridges.</i>	Complies. Refer to Figures E.2.1.1 to E.2.6.2.
(e) <i>Batter slopes of abutments under the bridge must be finished in a paved or hard surface. Abutment hard surfacing treatments must be designed to be aesthetically pleasing, vandal resistant and to complement the context and aesthetics of the Project Works. Abutment hard surfacing areas must be edged to reduce future crumbling and to form a neat interface with the adjoining landform. Where maintenance access is required to inspect the bridge bearings, access steps must be constructed in the same material as the abutment hard surfacing.</i>	Complies. Batter slopes are finished with concrete pavers and concrete edge strips. Where maintenance access is required to inspect the bridge bearings, access steps are to be constructed with the same finish. Refer to Figures E.2.1.2, E.2.2.2, E.2.3.2, E.2.4.2, E.2.5.2 and E.2.6.2.
(f) <i>Parapets must extend beyond abutments with a generous overlap (minimum of 5m) so as to visually anchor the bridge to the surrounding landscape and make the parapet longer and the dominant visual element.</i>	Complies. Refer to Figures E.2.1.1, E.2.2.1, E.2.3.1, E.2.4.1, E.2.5.1 and E.2.6.1.
(g) <i>Safety screens on bridges must be:</i> (i) <i>integrated with the design of the bridge as a whole;</i> (ii) <i>designed with post spacings that provide a pleasing and ordered visual relationship with other bridge details, including safety barrier posts, lighting columns and parapet joints;</i> (iii) <i>terminated by tapering their ends towards the parapet. Screens must extend the full length of the abutment to at least the following distances:</i> A. <i>on bridges with spill-through abutments screens must match the extent of the bridge parapets; and</i> B. <i>on bridges with retaining wall abutments, the screens must extend at least to align with the extent of the parapets.</i> (iv) <i>provided with fixing points which are in line with the double rail barrier to minimise visual clutter. Safety screens, including posts, must not be attached to or obscure the outer faces of the parapets and must be integral with the shape and form of the parapets, including the traffic barrier railing system and any skirt systems to hide services or drainage pipes.</i>	Safety Screens are integrated with the parapet and overall bridge appearance in elevation. Safety screen posts are in line with twin rail barrier posts and located halfway between precast parapets joints with posts attached to the twin rail barrier base plate. Screens have a three panel tapering termination and extend to the final twin rail barrier post to achieve a neat and orderly composition at each end of the bridge. Refer to Figures E.2.1.1, E.2.2.1, E.2.3.1, E.2.4.1, E.2.5.1 and E.2.6.1.
(h) <i>Planting must complement the bridge designs with the aim of enhancing the appearance of the bridge, framing the structure not obscuring the piers and abutments.</i>	Complies. Planting on embankments or cuttings on either side of the bridge compliments the bridge design and does not obscure piers and abutments. Refer to Figures E.2.1.1 to E.2.6.2. and Chapter H

SWTC Requirement	Developed Concept Design
15.2.4 Bridges over creeks, fauna crossings and local roads	
<i>Bridges over creeks, fauna corridors and local roads (underpasses) must be attractive and designed as an integral part of the Project Works consistent with the details and quality of all bridges and must:</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2 Key design elements such as integrated parapets and twin rail barriers are consistent for all underbridges.
(a) <i>complement the landform of fill embankments;</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(b) <i>maximise natural light penetration;</i>	Complies. Spill through abutments and separate carriageway bridges maximise light penetration. Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(c) <i>where required for fauna access, allow natural systems and ecology to pass through by the use of natural materials below the bridges and in the underpass. The design of abutment treatments must consider and address fauna and fish friendly access requirements;</i>	Complies. Stone boulder scour protection is required for most underbridges. Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(d) <i>Maximise visibility for motorists and natural surveillance by the community of pedestrians and cyclists; and</i>	Complies. Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2
(e) <i>Have abutments which are neatly designed so that they are symmetrical, easy to maintain and do not promote vagrancy or graffiti.</i>	Generally complies. Abutment walls to twin bridges over the North Coast Railway Line will receive anti-graffiti coating. Refer to Refer to Figures E.1.1.1 and E.1.1.2; E.3.1.1 to E.3.15.2; and E.4.1.1 to E.4.3.2

SWTC Requirements	Developed Concept Design
15.3 EARTHWORKS, LAND FORM AND SLOPE STABILISATION	
<i>The earthworks and stabilisation treatments must be integrated with the local landform and must, as a minimum, include the following features:</i>	Complies. See Section G.1
(a) <i>The vertical and horizontal alignment of the Works must be flowing and responsive to the landform and landscape.</i>	
(b) <i>Where possible, independent grading of the carriageways should be considered to minimise earthworks on steep hillsides and create a more topographically responsive design.</i>	Complies. Carriageways are independently graded where widened medians occur. See Section G.1
(c) <i>Further to the requirements of section 15.1(h) of this Appendix the need for and the use of shotcrete must be avoided wherever possible in accordance with the principles set down in "Shotcrete Design Guidelines. RTA guidelines to avoid, minimise and improve the appearance of shotcrete", RTA, June 2005, including by laying back cuttings, allowing sufficient space at the base of cutting for a protective fence or safe debris fall, or by utilising alternative stabilisation methods.</i>	Complies. See Section G.3
(d) <i>Where shotcrete is unavoidable and is visible from the road, or surrounding land:</i> (i) <i>the extent of the shotcrete must be minimised;</i> (ii) <i>the edges of the shotcrete must be masked off to avoid overspray;</i> (iii) <i>the colour and texture of the shotcrete must be adjusted to match the colour of the surrounding rock, where the batter is visible, or be a dark recessive colour;</i> (iv) <i>a surface finish must be applied to areas of shotcrete wider and/or longer than 1000mm, so that the stabilised cutting appears in texture and colour to match the texture and colour of the surrounding rock batter; and</i> (v) <i>test panels must be provided in accordance with RMS D&C R68 to demonstrate compliance of the shotcrete with the requirements of the SWTC.</i>	Complies. See Section G.3
(e) (Not Used)	
(f) <i>The tops and bottoms of batters must be rounded and feathered into the adjacent landform. The ends of cuttings must be rounded off and feathered into the adjacent landform to avoid an artificial character. The ends of batters in cuttings must be rounded and the batter slope progressively flattened over an appropriate distance, but not less than 50m, to blend the batter into the surrounding landform.</i>	Partially complies, except where adjacent to EEC's as rounding and feathering will increase clearing. See Section G and H.
(g) <i>Embankments must be graded out at the bottom to reduce the visual impact of any obvious junctions between the fill embankments and the natural landform and to assist in avoiding an artificial character of embankments.</i>	Complies. See Section G and H.
(h) <i>Cut and fill batter interfaces, roundings, feathering and transitions must be computer modelled with the urban and landscape designer and road MX designers to ensure the best possible integrated solution. The results from this work must be included in the Design Documentation in the relevant road design plans and cross-sections.</i>	Complies. See Section G and H.

SWTC Requirements	Developed Concept Design
(i) <i>The potential for successful and ongoing vegetation establishment must be treated as integral to the design of cuttings and embankments in order to significantly reduce the "engineered" nature of cuttings and embankments and the proportion of slopes exposed to viewers from any one angle.</i>	Complies. See Section G.1
(j) <i>The slopes of batter faces must vary in response to the existing landform. The slopes of batters must be flatter where the existing landform is shallowest and steeper where existing landform is steepest. Other than for cuttings in rock, batter slopes and benches in cuttings must be treated with a weed free topsoil and vegetation to visually soften them.</i>	Generally does not comply as most batter slopes are 2:1 although some local road batters are flatter than 2:1. Flatter batters than 2:1 would impact EEC's in floodplain areas by introducing a larger clearing footprint.

SWTC Requirements	Developed Concept Design
15.4 REQUIREMENTS FOR DRAINAGE	
(a) <i>A system of water sensitive drainage devices must be used to drain and cleanse runoff. Such devices must include swales / ponds / basins to control the intensity of, and remove pollutants from, stormwater runoff from locations where it leaves the pavement or bridge surface to the locations where it is discharged into receiving environments;</i>	Vegetated channels and Water Quality Basins to treat highway runoff.
(b) <i>Landform for swales, water treatment ponds, detention basins and other permanent drainage landforms must be informal and 'natural' in appearance and not be geometric and rectangular in shape. Weed free topsoiling, planting and seeding must be used to help integrate drainage elements with the local landscape.</i>	The requirement for natural shape will be developed during detail design. Complies with regard to Planting and Seeding.
(c) <i>Concrete or shotcrete must not be used in drainage channels that are visible to road users and adjoining residents where practical alternative means of scour protection are available. The use of natural materials as drainage channel stabilisation materials, including stone in wire mattresses, must be maximised in these situations.</i>	Where drainage channels are visible, they will be screened and or darkly coloured as in (d) below.
(d) <i>Where concrete or shotcrete channels are unavoidable and visible from the road or residences, the location and line of the channel must minimise visual impacts and planting must be designed to screen the channel. The lining material must be darkly coloured to achieve an unobtrusive consistent colour which is consistent with the local natural rock colours.</i>	Visible concrete channels or shotcrete will be assessed during detail design and be treated with a dark coloured dye.

SWTC Requirement	Developed Concept Design
15.5 LANDSCAPE	
15.5.1 General	
(a) <i>The landscape and planting design must:</i> (i) <i>be in accordance with "RTA Landscape Guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding", RTA, April 2008;</i> (ii) <i>provide an attractive approach and departure to the developed areas along the Project Works;</i> (iii) <i>match to the existing spatial sequence of the landscape adjoining the Project Works;</i> (iv) <i>reinforce enclosure when passing through forest and woodland areas;</i> (v) <i>provide long distance views for road users when such views are available;</i> (vi) <i>retain existing district views for residents;</i> (vii) <i>reduce the visibility of the Project Works from townships, farms and homesteads;</i> (viii) <i>reflect adjoining landscape and vegetation patterns identified in the Environmental Documents in order to integrate the road landscape, create a varied sequence of views and enclosure and to reduce the linear effect of the upgraded highway so as to provide visual interest and enjoyment and to reduce the potential for driver fatigue;</i> (ix) <i>use tree planting along local access roads to create the character of a country lane or avenue while allowing filtered views of the surrounding country side;</i> (x) <i>fulfil the environmental, safety and functional requirements, including minimised whole of life maintenance costs, identified in the Environmental Documents and the Scope of Works and Technical Criteria;</i> (xi) <i>provide screening of the road from the viewer locations including screen plantings within individual properties where required and / or identified in the Environmental Documents;</i> (xii) <i>mitigate the visual impact of fauna fencing and overhead power lines;</i> (xiii) <i>revegetate cuttings and embankments to maintain the character of undulating green hills against the horizon line; and</i> (xiv) <i>retain and protect existing roadside vegetation in order to minimise the degree of visual change.</i>	Complies. See Section H
(b) <i>Topsoil or other growing medium used in the landscaping works must be free of weeds or other unintended or undesirable species.</i>	Complies. See Section H.1 Topsoil Management Zones
(c) <i>Distinctive and locally characteristic semi-mature tree plantings must be used to emphasise junctions to local towns and rest areas, or to provide character along the route and to rest areas.</i>	Complies. See Section H.2 Planting Plan

SWTC Requirement	Developed Concept Design
(d) <i>The plant species and mixes of the landscape design must conform to the landscape zones through which the Project Works pass, including agrarian areas.</i>	Complies. See Section H.4 Urban Design Concept Plans
(e) <i>New planting and seeding must integrate with existing vegetation to reinforce local and remnant vegetation patterns and to maintain or enhance existing landscape character.</i>	Complies. See Section H.2 Planting and Seeding Schedules. Planting and seeding mixes use only species from extant vegetation communities
(f) <i>Retention of existing vegetation (including root and above-ground plant mass) must be maximised.</i>	Complies. See Section H.3
(g) <i>Non-frangible planted and seeded areas must conform to clear zone requirements and roadside furniture requirements of the Scope of Works and Technical Criteria.</i>	Complies. See section H.2 Typical Cross sections To be verified in the detail design phase
(h) <i>Safe sight distances and signage must not be obscured by planting and revegetation areas.</i>	Complies. See section H.2 Typical Cross sections To be verified in the detail design phase
(i) <i>Setbacks must be provided for structures, roadside furniture and pathways to enable clear access for maintenance and visual inspections when the landscape matures.</i>	Complies. See section H.2 Typical Cross sections To be verified in the detail design phase
15.5.2 Seeding	
(a) <i>Seeding must be used to revegetate non-planted landscape areas of the Project Works, including batters, verges, medians and other unsealed areas which are not easily accessible for planting and maintenance work. The seed mix must include indigenous non-invasive grass and cover crop seed mix sown at a minimum rate of 8 kg/Ha;</i>	Complies. See Section H.2 Seeding Schedules. Minimum rate is 8kg/Ha
(b) <i>The seed mix for verges must contain ground covers, native grasses, shrubs and trees in a ratio appropriate to the landscape context and adjacent levels, except for areas where open views must be retained, where the seed mix must be grass and groundcover species only.</i>	Complies. See Section H.2 seeding schedule. However no tree seed is used in the seed mixes. It is anticipated that the retained forest at the edge of clearing and within the alignment will disperse seed into landscape areas near the top of batters and at the toe of embankments. There is also extensive tree planting in selected locations to control placement of trees.
(c) <i>Seeding must be used to revegetate non planted cut and fill batters of the Project Works. The seed mix rate must be an indigenous non invasive grass and cover crop seed sown at a minimum rate of 8 kg/Ha.</i>	Complies. See Section H.2 seeding schedule. Minimum rate is 8kg/Ha

SWTC Requirement	Developed Concept Design
15.5.3 Planting	
(a) <i>Planting must be used where trees, shrubs and ground covers are required:</i> (i) <i>for early landscape and visual effect, particularly at intersections, interchanges, Ramps, town approaches and other locations nominated for specific landscape outcomes such as enclosed driving experiences, avenue reinstatement, screening fauna connectivity and riparian zones;</i> (ii) <i>for neat attractive finishes at Construction Completion;</i> (iii) <i>for visual mitigation of noise barriers including mounds;</i> (iv) <i>for air quality filtering to prevent potential hazards to road users such as dust (i) clouds and chemical spray drift;</i> (v) <i>for visual screening to or from properties; and</i> (vi) <i>for early landscape establishment in fauna movement corridors to facilitate safe and attractive fauna movement, and to mitigate the effects of construction clearing on wildlife.</i>	Complies. See Section H.2 Planting Plans
(b) <i>The landscape and planting design must provide a strong emphasis on creating a well-vegetated corridor with lush and distinctive intersections, interchanges, rest areas and place markers. Where planting is used, the planting mix must contain tubestock for indigenous groundcover species, and larger stock for feature / marker plantings.</i>	Complies. See Section H.2 Planting Plans and Rest Area design. Also description of the landscape design Section
(c) <i>The use of trees throughout the Project Works must complement surrounding planting patterns and provide spatial definition, and also as shown in the table below:</i> Tree locations - Tree planting density Planting at severed plantations - Tree planting at equivalent grid spacing of adjacent plantations; generally 5-7m spacings. Avenue plantings - Tree and shrub planting at spacings to match existing avenues along highway and other alignments Rest areas - Tree planting at densities to provide scattered shade of open areas and shade for parking bays. Feature / Marker planting at interchanges and rest areas - No less than 1 tree per 9 square metres. Trees must be 25 litres size or larger. Visual screens and buffers - Tree and shrub planting at 3-5m spacing to provide screens along or within properties as required	Complies See Section H.2. Except that there is no severed plantations

SWTC Requirement	Developed Concept Design
(d) <i>Shrubs, ground covers and native grasses must also be used to complement surrounding planting patterns and provide spatial definition, and also as shown in the table below;</i> Landscape - type Minimum planting density for grasses and shrubs Low planting in medians for screening headlight glare: – Grasses: 6 per m ² (tubestock) – Shrubs: 4 per m ² (tubestock) Planting for noise barriers and headlight screens outside of medians: – Grasses: 4 per m ² (tubestock) – Shrubs: 3 per m ² (tubestock) Noise mounds – All plants: 1 per m ² (tubestock) Specific planting at roundabouts – Grasses: 4 per m ² (150mm container size) – Shrubs: 3 per m ² (150mm container size) Specific planting at fauna underpasses – All plants: 1 per 3m ²	Generally complies at a minimum. See Section H.2. However there is much more planting than at the locations described such as realigned creeks, basins, widened medians and cuttings, etc.
(e) <i>Acacia spp must only be used in the planting mix where an early effect is required and only in combination with other species. The proportion of Acacia spp used in the planting mix must be minimised</i>	Complies. See Section H.2 Planting and Seeding Schedules. Acacias are introduced via seeding only.
(f) <i>Sedges must be used in the ground covers mix in appropriate areas.</i>	Complies. See Section H.2 Planting and Seeding Schedules. Sedges are included in the native grass seeding mix and in planting mixes

SWTC Requirement	Developed Concept Design
15.5.4 Soil	
(a) <i>The Contractor must undertake soil pedology survey and analysis within each soil landscape and vegetation community type. Each soil landscape and vegetation community type must be tested in three locations, each with three sampling depths of A1, A2 and B1 horizon. Soil testing must be undertaken by a National Association of Testing Authorities (NATA) registered laboratory and include pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon / nitrogen.</i>	Complies. See section H.1. Testing to be undertaken during detail design.
(b) <i>Soil testing must be undertaken by a soil scientist, who is appropriately qualified and with expertise in revegetation. The Contractor must obtain recommendations for soil management from this soil scientist, and a copy of these recommendations must be provided to the Environmental Representative and RMS Representative. These recommendations must be used in the selection and design of the landscaping revegetation scheme.</i>	Complies. See Section H.1
(c) <i>All topsoil re-used within landscape areas must be prepared in the following manner:</i> (i) <i>A representative program of soil sampling of all soils to be used in landscape areas to address any soil deficiencies, including soil Ph analysis, must be undertaken during the preparation and development of the Design Documentation and the results of these tests, together with advice from the soil scientist, must be used to determine the requirements for soil improvement and stabilisation to enable the establishment and maintenance of successful long term seed and plant growth and vegetation cover.</i> (ii) <i>All soils must be conditioned or improved to comply with recommendations of the soil scientist;</i> (iii) <i>Prior to the placement of topsoil, the Contractor must continuously eradicate weeds by spraying, and monitor the weed cover four (4) weeks after each spray. When the monitoring indicates that weed cover is reduced to less than 5%, a final eradication spray must be undertaken; and</i> (iv) <i>Subsoils must be ripped and surfaces roughened prior to spreading of topsoil.</i>	Complies. See Section H.1
15.5.5 Biodiversity protection and recovery	
(a) <i>Local bushland characteristics must be adopted in the design of forest, riparian, screening, buffer and other native planted areas, including the use of:</i> (i) <i>species mixtures that reflect local natural species mixes and diversity;</i> (ii) <i>occasional multi-species group plantings to reflect natural closely spaced plant associations; and diversified rather than standardised, spacings between plants, except where planting areas provided for continuation of plantation zones or avenues.</i>	Complies. See Section H.2
(b) <i>Biodiversity protection and recovery must be maximised in the landscape design, including measures to:</i> (i) <i>undertake ecological restoration in riparian areas affected by the Contractor's Work;</i> (ii) <i>protect and create habitat (using ground conditions and vegetation);</i> (iii) <i>recover threatened species;</i> (iv) <i>minimise habitat fragmentation and create habitat linkages;</i> (v) <i>minimise habitat pollution, including pollution due to pesticides, fertilisers and road run-off; and</i> (vi) <i>eliminate invasion by non-endemic species.</i>	Complies. See Section H.2
(c) <i>The landscape design must use appropriate plant species to maximise wildlife habitat connectivity, particularly at creek crossings.</i>	Complies. See Section H.1

SWTC Requirement	Developed Concept Design
15.5.6 Landscape management	
(a) <i>A Landscape Management Plan (LMP) must be prepared as a part of the Design Documentation.</i>	Complies. See Section H.6
(b) <i>The LMP must comply with the requirements described in "RTA Landscape Guideline Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding", RTA, April 2008, and must detail all landscape maintenance actions for the Project Works;</i>	Complies. See Section H.6
(c) <i>The landscape works must:</i> (i) <i>be cost effective;</i> (ii) <i>minimise ongoing maintenance requirements; and</i> (iii) <i>use native species, dense planting, bold simple planting designs and rapid planting establishment to assist in achieving the requirements of sections 15.5.6(c)(i) & 15.5.6(c)(ii).</i>	Complies. See Section H.6
(d) <i>Planting and seeding must be established and thriving with in excess of 30% growth by the end of the Landscaping Maintenance Period.</i>	Complies. See Section H.6
15.6 REQUIREMENTS FOR ROAD FURNITURE	
(a) <i>Fauna fencing must be placed behind plantings and as far as possible away from the Main Carriageways and Local Roads to obscure views to it from the Main Carriageways, Ramps, Connections and Local Roads. Views of fencing on the skyline must be minimised.</i>	Complies. See Section H.2 Except that 3 metre wide strip of native grasses is used to comply with maintenance requirement which in some instances precludes planting which could be used to screen the fauna fence
(b) <i>Where not required for noise attenuation purposes, safety barrier types must be selected to minimise the obstruction of views. Wire rope systems must be used in preference to solid barrier types.</i>	Noted. To be addressed at 85% design.
(c) <i>Signposting must be located to prevent the visual obstruction of good views of the landscape, avoid clutter and minimise views of signs above the skyline</i>	Noted. To be addressed at 85% design.
(d) <i>The design and placement of lighting must minimise visual intrusion and must include the use of slender, simple and refined lighting columns that eliminate unnecessary light spillage</i>	Complies. Refer to images.
(e) <i>Further to the requirements of section 15.1(h) of this Appendix, shotcrete must not be used around the base of light columns or other roadside fittings or furniture</i>	Complies. Details of footings for light poles will be resolved at detailed design stage, but shotcrete will not be used.
15.7 ROAD STRUCTURES GENERALLY	
(a) <i>Road structures, including culverts, underpasses and walls, must be unobtrusive. Visible road structures must be simple, refined and without any unnecessary embellishments;</i>	Complies. Refer Section E.5 and F.
(b) <i>The design of retaining structures must be undertaken in consideration of all other elements such as bridges, noise walls and landscape works and provide a cohesive and unified design outcome.</i>	Complies. Refer Section F.
(c) <i>The appearance of concrete retaining structures associated:</i> (i) <i>with bridges must have a strong horizontal emphasis; and</i> (ii) <i>with retaining walls and noise walls must have a strong vertical emphasis.</i>	Complies. Refer Section F.
(d) <i>Retaining walls over 1m in height, except for culvert headwalls, must be tilted outwards from the base at no less than a 5 degree angle from the vertical.</i>	Complies. Refer Section F.1.

SWTC Requirement	Developed Concept Design
(e) <i>The design of individual retaining walls or classes of walls must respond to their immediate context and their specific role in the Project Works.</i>	Complies. Refer Section F.1.
(f) <i>The design of rock filled gabions, provided for use as retaining walls in areas visible from the road or surrounding properties, must demonstrate consideration of the three-dimensional form of the batter face and the construction of rock filled gabions must use techniques which control appearance of the visible face, including the use of formwork and hand-packing individual stones.</i>	Not applicable to this design.
(g) <i>Structures must be neutral in colour and have non-reflective finishes.</i>	Complies. Refer Section F.
(h) <i>Structures must be designed and placed to minimise visual intrusion and be screened by existing or proposed vegetation to minimise their visibility to road users.</i>	Complies. Refer Section F.
(i) <i>Wall plan layouts must be simple and be straight or have large radius curved alignments sympathetic to the alignment and interfaces with adjoining infrastructure, including roads, pathways and bridges, and environmental features, including creeks and stands of trees, landscape design and the immediate route context. Kinks and bends must not be used in walls in either horizontal or vertical alignments.</i>	Complies. Refer Section F.
(j) <i>Walls must be designed with cappings that neatly finish the wall with smooth flowing lines. Drainage must be diverted and aligned away from wall faces. Cappings, drainage channels, barriers, noise walls, noise mounds and headlight screens must be integrated.</i>	Complies. Refer Section F.
(k) <i>Road structures must be provided with safe access for maintenance purposes.</i>	Complies. Refer Section F.
(l) <i>Structures and joints must be designed and detailed to accommodate movement and settlement over time.</i>	Complies. Refer Section F.
(m) <i>Fixings for retaining structures must be concealed, or expressed as part of the structure's design if concealment cannot be achieved. (n) Retaining walls must be recessed from the front face of the parapet face by a minimum of 250mm by cantilevering the parapet.</i>	Complies. Refer Section F.
(n) <i>Retaining walls must be recessed from the front face of the parapet face by a minimum of 250mm by cantilevering the parapet.</i>	Complies. Refer Section F.
(o) <i>Structures must be designed to minimise graffiti. Whole-of-life costs must be considered in the design of structures and the design must minimise the need for ongoing repair works due to vandalism or graffiti.</i>	Complies. Refer Section F.
(i) <i>Landscape areas must be used to reduce the visual impact of structures.</i>	Complies. Refer Section F.
(q) <i>Protection systems, fencing, safety barriers, noise barriers and headlight screens must be integrated with structures to reduce visual clutter. All joints must align to reinforce the vertical emphasis.</i>	Complies. Refer Figure F.2.1 and F.3.1. There are no noise walls.
(r) <i>Test panels must be provided for cast in-situ concrete retaining walls. The first in-situ concrete pour for each wall finish type must be a test panel. Sufficient time and access must be allowed for the verification of the finished quality of the test panel before full production commences on the tested wall finish type.</i>	Cast-in-situ test panels will be provided before full production.
(s) <i>Retaining walls must be provided with detailing and finishes which are consistent and integrated both for the retaining walls themselves and for the noise walls, to create overall compatibility in wall language.</i>	Not Applicable. There are no noise walls on this project.

SWTC Requirement	Developed Concept Design
15.7.1 Noise barriers and noise mounds	
(a) <i>The approach to noise barrier location and design must be in accordance with "Noise Wall Design Guideline: Design guidelines to improve the appearance of noise walls in NSW" RTA, February 2007;</i>	There are no noise barriers on the project.
(b) <i>The selection of the type of noise barrier, including noise mounds and headlight screens, must be based on the following order of precedence, except where otherwise required by the Environmental Documents:</i> (i) <i>landscaped mound or 'false' cutting;</i> (ii) <i>noise mound and low wall / screen combination to reduce perceived height of noise barriers and integrate them with adjoining cuttings, etc.; and</i> (iii) <i>noise walls or headlight screens.</i>	There are no noise barriers on the project.
(c) <i>Noise walls must be simple, plain structures in their form and utilise a minimum of durable materials and dark recessive colours in general. Noise walls including noise mounds and headlight screens must respond appropriately to the landscape in which they are located. Noise walls and headlight screens must be easily maintainable, durable and aesthetically pleasing and maintain an acceptable standard of appearance over time. Noise walls and headlight screens must enhance the Project Works and surrounding neighbourhood environment. All noise walls and headlight screens must be designed and detailed, including their texture, materials, finishes and colour, to be consistent, contextual and have interesting forms.</i>	There are no noise barriers on the project.
(d) <i>Noise walls must comply, as a minimum, with the following requirements:</i> (i) <i>the appearance of both sides of noise walls must be a vertical concrete panel. Exposed 'Z' clips must not be used in the noise walls.</i> (ii) <i>timber, glass or other fragile or easily damaged materials must not be used for noise walls;</i> (iii) <i>fixing systems and footings must be concealed;</i> (iv) <i>if planted areas are required adjacent to a noise wall, a planted zone with a minimum width of 2 metres, must be provided;</i> (v) <i>the tops of noise walls must not be stepped and must form a continuous flowing line parallel with the vertical alignment of the adjacent carriageways;</i> (vi) <i>the horizontal alignment of the noise walls must be parallel to the outside edge of the carriageways and roads;</i> (vii) <i>noise walls must not start or terminate abruptly with vertical faces. Noise walls must 'emerge' from the ground in a tiered manner or with smooth flowing lines and must have a vertical emphasis;</i> (viii) <i>the appearance of both sides of the noise wall must be equivalent in design quality and must satisfy the expectations of both the residents adjoining the Project Works and the road users;</i> (ix) <i>noise walls must respond to the locality in which they are situated. Noise walls in feature areas must be sculptural, dynamic and interesting;</i> (x) <i>noise walls must be integrated with each other and with other structures, including retaining walls, bridges and landscape works;</i> (xi) <i>noise walls on top of retaining walls must consolidate into one wall;</i> (xii) <i>where noise walls are located close to property boundaries and near neighbourhoods, they must be recessive and simple; and</i> (xiii) <i>noise walls must address and accommodate drainage under the noise walls and include provisions to reduce noise penetration.</i>	There are no noise barriers on the project.

SWTC Requirement	Developed Concept Design
(e) <i>Headlight screens must comply, as a minimum, with the following requirements:</i> (i) <i>timber, glass or other fragile or easily damaged materials must not be used for headlight screens;</i> (ii) <i>fixing systems and footings must be concealed;</i> (iii) <i>where sufficient width is available, a planted zone, with a minimum width of 2 metres, must be provided on both sides of headlight screens;</i> (iv) <i>the tops of headlight screens must not be stepped and must form a continuous flowing line parallel with the vertical alignment of the adjacent carriageways;</i> (v) <i>the horizontal alignment of the headlight screens must be parallel to the outside edge of the carriageways and roads;</i> (vi) <i>headlight screens must not start or terminate abruptly with vertical faces. Headlight screens must 'emerge' from the ground or barriers with smooth flowing lines and must have a vertical emphasis;</i> (vii) <i>the appearance of both sides of headlight screens must be equivalent in design quality and must satisfy the expectations of both the residents adjoining the Project Works and the road users;</i> (viii) <i>headlight screens must be integrated with each other and with other structures, including retaining walls, bridges and landscape works; and</i> (ix) <i>headlight screens must be a recessive colour.</i>	There are no headlight screens on this project.
(f) <i>Headlight screens which would block views to high quality scenery from the living areas of the residences must be avoided.</i>	There are no headlight screens on the project.
(g) <i>The design of headlight screens must include an anti-graffiti strategy, for both sides of the structure, which must be addressed in the Maintenance Plan.</i>	There are no headlight screens on the project.
15.8 Footpaths, shared paths and cycle paths	
(a) <i>The Project Works must provide convenient, safe, visually attractive and suitably lit connectivity across the Works, including pedestrian and cycle paths which are critical for continual access and connectivity of local communities.</i>	Footpaths/ shared paths are only located on some bridges and in the Rest Area. Refer to Section E.2 and D.2.
(b) <i>Footpaths, shared paths and cycle paths must be constructed from a brushed finished concrete with an integral oxide pigmentation, grey in colour equal to Colour Concrete Systems 'Onyx' to reduce glare.</i>	Complies. For Rest Area, refer to Finishes Schedule in Section I.
(c) <i>Where paths are provided on overbridges, paths must be continued beyond the extent of bridge barriers to permit pedestrians to access the road surface or adjacent paths without having to cross any area of turf, bare earth or planting.</i>	Noted. Will be addressed at 85% detailed design.
(d) <i>Urban and landscape design principles for footpaths, shared paths and cycle paths must include:</i> (i) <i>retention of existing mature trees and significant vegetation and provision of further shade tree planting to the paths and a landscape buffer between the carriageways and the paths;</i> (ii) <i>designs of paths to provide the greatest sight distance possible at any given location; and</i> (iii) <i>at intersections and junctions, the provision of terminal devices to minimise potential hazards where cyclists are at risk of hitting cars, highlighting intersections of shared paths with footpaths by the use of contrasting pavement threshold treatments and continuing the shared path treatment across driveway pavements.</i>	Noted. To be addressed at 85% detailed design.

SWTC Requirement	Developed Concept Design
15.9 Requirements for rest areas	
<i>The design of rest areas must:</i>	
(a) <i>incorporate landscape designs that support the overall design of the rest area, provide shade, are attractive, maximise views and require minimal maintenance;</i>	Complies. See Section D.2
(b) <i>provide shade for parked vehicles and minimise expanses of bitumen or concrete in the design of parking and access roads;</i>	Complies. See Section D.2
(c) <i>incorporate shaded seating and tables, potable water fountains, paths, toilet facilities and signage structures to allow placement of local tourist information. All of the above must be located and integrated with the landscape so that an attractive and functional environment is provided; and</i>	Complies. See Section D.2
(d) <i>incorporate interpretation signage that explains the cultural heritage significance and/or history of the surrounding area.</i>	Complies. See Section D.2

Appendix 17: Rest Area Requirements and Design Requirements

SWTC Requirement	Developed Concept Design
17.1 GENERAL	
(a) The Contractor must design and construct a rest area adjacent to the Nambucca Interchange as identified in Figure 9.1 of Appendix 9 of the Scope of Works and Technical Criteria.	Complies. See Section D.2
(b) The rest area must be a combined truck and light vehicle rest area, and must provide separate car and truck facilities as detailed in this Appendix. The rest area must comply with the requirements of: <ul style="list-style-type: none"> (i) "Rest Area Best Practice Design Guide" Version 1.0; (ii) RTA Technical Direction TD 2004/12 – "Rest Area Toilets – Securing Tank Access Openings"; and (iii) RTA Technical Direction TD 2004/13 – "Rest Area Toilets – Underground Tanks – Anchoring Requirements". 	Complies. See Section D.2
(a) The rest area must be provided with: <ul style="list-style-type: none"> (i) separate truck, stock truck and refrigerated truck and light vehicle parking areas; (ii) front to rear parking only in the truck and stock truck and refrigerated truck parking areas, as detailed in Figure 5.6 of RTA's "Rest Area Best Practice Design Guide" Version 1.0; (iii) minimum truck travel lane widths of 6 metres and parallel truck parking bays in the truck parking area and stock truck and refrigerated truck parking area with minimum widths of 4 metres; (iv) 15 no. B-Double parking bays with minimum lengths of 30 metres each in the truck parking area; (v) In addition to (iv) above, 11 no. stock truck and refrigerated truck parking bays with minimum lengths of 20 metres each in the truck parking area; (vi) 20 no. car parking bays with minimum lengths of 7 metres each in the light vehicle parking area; (vii) In addition to (vi) above, 8 no. car and trailer / bus parking bays with minimum lengths of 15 metres each in the light vehicle parking area (viii) a layout developed generally in accordance with the plan provided in Figure 17.1 and typical cross section provided in Figure 17.2 of this Appendix; (ix) a combined shoulder and verge with a minimum width of 1 metre in the parking areas; (x) landscaped separation for noise and visual screening: <ul style="list-style-type: none"> A. between the Main Carriageways and the rest area; and B. between the truck, stock truck and refrigerated truck, car and trailer / bus and car parking bays. (xi) 6 no. sets of picnic shelters, including table and seating that comply with the requirements of section 17. 2 of this Appendix; (xii) infrastructure for a 24 hour driver reviver facility rest area, including as a minimum: <ul style="list-style-type: none"> A. a rectangular trafficable concrete slab hard stand area with minimum dimensions of 15 metres by 8 metres. The slab must be appropriately located to suit efficient pedestrian and vehicle movements, sight distance requirements, access and proximity to amenities and safety requirements; B. lighting of the concrete slab area that complies with AS/NZS 1158 Part 3.1; and C. connections to mains power located in a vandal proof lockable cabinet. 	Complies. See Section D.2

SWTC Requirement	Developed Concept Design
(xiii) a four cubicle unisex toilet block that complies with requirements of section 17. 3 of this Appendix, including: <ul style="list-style-type: none"> A. a connection to mains power; B. four cubicles (two disabled); C. flushing toilets; D. a water supply, suitable for drinking; E. vandal resistant lighting; F. internal fittings; and G. connections to sewer. 	Complies. See Section D.2
(xiv) concrete paths to services and provision of access between all operational and functional areas in the rest area. Concrete paths must be a minimum width of 1.2 metres and be suitable for wheelchair usage;	
(xv) 12 no. garbage bins with a minimum capacity of 200 litres each. Garbage bins must be provided with warning signs identifying the possible consequential impacts of leaving rubbish lying around the rest area and not placing the rubbish in the bins;	
(xvi) a buffalo turfed and landscaped picnic area;	
(xvii) signposting that complies with RTA Technical Direction 2003/RS01 - "Signposting of Rest Areas, Driver Reviver Sites and other Rest Stops";	
(xviii) all other infrastructure necessary to provide for the safe and efficient operation of a truck and light vehicle rest area;	
(xix) dedicated entry and exit to the rest area from Nambucca Heads Interchange Western Roundabout in accordance with the requirements of Appendix 9 of the Scope of Works and Technical Criteria;	
(xx) parking areas which are as level as possible, consistent with providing adequate drainage;	
(xxi) lighting of light vehicle parking areas that complies with AS/NZS 1158 Part 3.1;	
(xxii) low level vandal resistant personal security illumination sufficient to illuminate walkways from parking bays and picnic shelters to toilets that complies with AS/NZS 1158 Part 3.1; and	
(xxiii) trees that provide suitable shade for users of the rest areas. Existing vegetation must be retained where consistent with the functionality, safety and design requirements of the rest area.	
17.2 PICNIC SHELTER & PICNIC SETTING REQUIREMENTS	
(a) Picnic shelters and picnic settings must be provided in accordance with drawing numbers 01.A, 02 to 04, 05.A and 06 to 10 inclusive which are included as an electronic file titled App17.2.pdf on separate disc titled: Design and Construction of Pacific Highway Upgrade Nambucca Heads to Urunga Scope of Works and Technical Criteria Contract No. 11.2544.2629 Electronic Files	Complies. See Section D.2
(b) All steel and concrete used in the construction of the picnic shelters and picnic settings must comply with the relevant RMS D&C specifications.	Complies. See Section D.2
(c) All steel used in the picnic shelters and picnic settings must be hot-dip galvanised.	Complies. See Section D.2

SWTC Requirement	Developed Concept Design
17.3 TOILET BLOCK SPECIFICATION	
(a) Toilet blocks must comply with RTA Toilet Number 6 drawings, numbers FT.02 to FT.22 inclusive, IGT.01.A to IGT.03.A inclusive, numbers S1 to S4 inclusive and numbers S-001 to S-012 inclusive which are included as an electronic file titled App17.3.pdf on separate disc titled: Design and Construction of Pacific Highway upgrade Nambucca Heads to Urunga Scope of Works and Technical Criteria Contract No. 11.2544.2629 Electronic Files	Complies. See Section D.2 Except that the Roads and Maritime is currently reviewing the drawings for DDA compliance
(b) Toilets must be connected to sewer in accordance with Nambucca Shire Council regulations. The sewer pumping system must have a low flow pressure sewer pump station, and must include as a minimum: <ul style="list-style-type: none"> (i) a minimum flow rate of 0.3 litres per second and a maximum flow rate of 1.5 litres per second; (ii) an adequate pumping head for a minimum pumping distance of 1,000 metres and a static head of at least 20 metres; (iii) grinder pumps housed in a dry well; (iv) a dual pumping system with a rotating duty / standby operation; (v) a minimum total storage capacity of 1,500 litres; (vi) a telemetry system with audible and visible alarms capable of sending an SMS to a mobile phone system; and (vii) adequate buoyancy control 	Complies. See Section D.2
17.4 TOILET SPECIFICATION	
Flushing toilets must comply with the "RTA Prototype Toilet - Flushing Toilet System TOILET 6 SPECIFICATION" which is included as an electronic file titled App17.4.pdf on separate disc titled: Design and Construction of Pacific Highway upgrade Nambucca Heads to Urunga Scope of Works and Technical Criteria Contract No. 11.2544.2629 Electronic Files	Complies. See Section D.2
17.5 DESIGN REQUIREMENTS	
The design of all other components including, but not limited to, geometry, drainage, pavements and signposting, must comply with the other relevant requirements of the Scope of Works and Technical Criteria.	Complies. See Section D.2