

3.0 CONCLUSIONS

3.1 RAILWAY NOISE

Based upon the railway noise assessment conducted it has been concluded that:

1. The proposed development can comply with Performance Criteria P1 of the *Rockhampton City Plan Rail Noise Code* with the provision of appropriate noise mitigation measures.
2. No acoustic barrier is required to comply with the relevant external railway noise planning levels for residential allotments within Stages 1 to 3. This notwithstanding, Stockland proposes to construct a 5.5 metre high earth mound within the Open Space Corridor south of the Olive Street access point
3. Future residential dwellings within Stages 1 to 3 will require acoustic treatment in accordance with DTMR requirements. The region where railway noise acoustic treatment will be required is shown on **Figure 6**. Air conditioning and/or mechanical ventilation will be required to habitable rooms to allow residents to close doors and windows as desired to minimise railway noise.
4. **Figure 7** depicts zones of Transport Noise Reductions (TNR) required through residential building facades to achieve the 45 dB(A) indoor level.

3.2 BRUCE HIGHWAY NOISE

Based upon the Bruce Highway traffic noise assessment conducted it has been concluded that:

1. The proposed development can comply with the external noise criteria specified in the TMR *Road Traffic Noise Management: Code of Practice* without any requirements for acoustic barriers.
2. The Queensland Development Code MP4.4 acoustic treatment requirements for future residential dwellings due to railway noise will override any road traffic noise requirements.

3.3 INTERNAL ROADWAYS NOISE

Based upon information provided by Cambray the no roadways affecting Stage 1 to 3 residential allotments that will carry over 3,000 vpd. As such, no detailed assessment of noise amenity impacts from internal roads is warranted for the Stages 1 to 3 development.

3.4 INDUSTRY NOISE

Based upon the industry noise assessment conducted it has been concluded that:

1. The outdoor Acoustic Quality Objectives of the Queensland *Environmental Protection (Noise) Policy 2008* will be achieved considering industry noise at Stages 1 to 3 residential allotments.
2. The indoor the Acoustic Quality Objectives of the Queensland *Environmental Protection (Noise) Policy 2008* will be achieved for industry noise for three industry noise affected allotments within Stage 2d due to the overriding railway noise treatment requirements (refer **Figure 8**).

MWA Environmental
31 October 2013



Ref: L04618/BH/11-007

27 February 2018

Stockland Development Pty Ltd
PO Box 361
Deeragun QLD 4818

Attention: Mr Andrew Astorquia

Dear Andrew

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/117-2017

Dated: 12 September 2018

**Re: Response to Rockhampton Regional Council Information Request Noise Issues –
Proposed Stages 1 to 3 Reconfiguration of Lot – ‘Ellida’, Parkhurst North**

MWA Environmental has previously prepared the report *Noise Amenity Assessment – Stages 1 to 3 – ‘Ellida’ - Parkhurst North* (31 October 2013) (“**the noise report**”).

This response has been prepared in response to a Rockhampton Regional Council *Information Request* (10 November 2017) (“**the Information Request**”). Item 5.1 and 5.2 of the Information Request relate to noise issues. The relevant extract from the Information Request is supplied below.

5.0 Environmental Health requirements

5.1 Please provide an updated and current Noise Amenity Assessment which details the expected noise level impact to the proposed development.

Note: The Noise Amenity Assessment submitted as part of the application was prepared in October 2013 with noise measurements undertaken in 2011, and in accordance with the requirements of the superseded Rockhampton City Plan 2005. Council’s preference is for updated noise monitoring data to be provided which reflects the current noise generated from the Bruce Highway and North Coast Railway and in accordance with current laws and policies.

5.2 Based on the updated Noise Amenity Assessment, please provide clarification on the acoustic measures required, if any, to mitigate the impacts of noise on Stages 1 to 3 of the proposed development.

Note: Subject to the outcome of item 2.1 above, the Noise Amenity Assessment will potentially need to incorporate the impacts of the Future Rail Corridor.

The Information Request essentially raises the issues of:

1. Whether updated noise monitoring and assessment is necessary to assess the development application; and
2. Whether the Stages 1 to 3 reconfiguration of lot application satisfies the current Rockhampton Region Planning Scheme 2015 provisions in relation to road traffic and railway noise.

Our advice in response to these issues raised in the Information Request are addressed in the following sections.

1. Whether updated noise monitoring and assessment is necessary to assess the development application.

RESPONSE

It is noted that the noise report was prepared a number of years ago but advice from Stockland Development Pty Ltd and review of aerial imagery indicates that the Bruce Highway and North Coast Railway past the subject site remain as existed at the time the noise report was issued.

No other significant new development that would have the potential to materially change the existing ambient noise environment was identified in proximity to the site.

Considering an annual growth of 3% for Bruce Highway¹ the current 2018 Bruce Highway noise levels would be expected to have increased by approximately 0.9 dB(A) L_{A10} (18 hour) from that measured at the eastern site boundary in March 2011².

Ambient background (LA_{90}) noise levels are not relevant to assessment of Bruce Highway and North Coast Railway noise under the *Rockhampton Region Planning Scheme 2015*. Irrespective, background LA_{90} noise levels would be expected to have changed by significantly less than the L_{A10} (18 hour) at the Stages 1 to 3 site.

Our assessment of the Stages 1 to 3 development against the current *Rockhampton Region Planning Scheme 2015* provisions and the requirements of the *Queensland Development Code Mandatory Part 4.4 – Buildings in a Transport Noise Corridor* (2015) (“**QDC MP4.4**”) as provided in following sections of this letter. **The outcomes of our assessment are not sensitive to the potential minor variations that may be measured through updated noise monitoring at the Stages 1 to 3 site.** As such, despite the timeframe since noise monitoring was undertaken, it is our position that no further noise monitoring is warranted for the purposes of the development assessment in this instance.

¹ Provided by Cambray Consulting Pty Ltd for the noise report

² Based upon calculated total 23% traffic increase over the 7 year period

2. Whether the Stages 1 to 3 reconfiguration of lot application satisfies the current Rockhampton Region Planning Scheme 2015 provisions in relation to road traffic and railway noise.

RESPONSE

The *Rockhampton Region Planning Scheme 2015* Reconfiguring a Lot Code includes Performance Outcome PO14 relating to noise from arterial roadways and rail corridors, as follows:

Table 9.3.5.3.1 Development outcomes for assessable development (part)

Performance outcomes	Acceptable outcomes
<i>Provisions applicable to all other reconfiguring a lot applications</i>	
<i>Development near infrastructure corridors</i>	
<i>PO14</i> <i>Lots near a rail corridor or a regional arterial, sub-arterial or distributor road are of sufficient size and depth to ensure that noise attenuation measures can be facilitated to ensure that future dwellings are not exposed to road or rail noise greater than 63dB La10 (18 hours).</i>	<i>No acceptable outcome is nominated.</i>

MWA Environmental notes that the North Coast Railway past the subject site does not carry a sufficient number of trains per day³ to generate noise over a sufficient period of time to have a significant influence on the L_{A10} (18 hour) noise statistic⁴.

The October 2011 noise monitoring measured an average existing L_{A10} (18 hour) noise level of 53.6 dB(A) over eleven days at a free-field location adjacent the eastern property boundary. The noise datalogger location was setback the following approximate distances from the nearest North Coast Railway line and Bruce Highway through-traffic lane:

Noise Datalogger Setback to North Coast Rail:	37 metres
Noise Datalogger Setback to Bruce Highway:	122 metres

Assessment of the current Stages 1 to 3 reconfiguration of lot proposal plan (refer **Figure 1**) indicates that the following setback distances are relevant from the nearest North Coast Railway line and Bruce Highway through-traffic lane to a proposed residential allotment:

Nearest Residential Allotment Setback to North Coast Rail:	60 metres
Nearest Residential Allotment Setback to Bruce Highway:	124 metres

³ approximately 10 train movements per day in 2011 with no significant increase understood to have occurred in the following years

⁴ Relates to the loudest 10th percentile of the time period, equivalent to 6 minutes per hour or 108 minutes over the 18 hour period 6am to midnight and the train noise is not audible for 108 minutes between 6am and midnight

It is evident that the nearest proposed residential allotments are setback a similar distance from the Bruce Highway as was the October 2011 eastern boundary noise monitoring location. The nearest residential allotment is setback further from the North Coast Railway line compared to the noise monitoring location. On this basis, **the October 2011 eastern boundary noise monitoring location is considered to be a conservative basis for the assessment of potential transportation noise levels at the nearest proposed residential allotments within Stages 1 to 3 without any noise mitigation structure.**

If it is assumed that both Bruce Highway traffic growth and train traffic growth were to occur at the rate of 3% per annum then it has been calculated that the potential **noise levels measured at the eastern site boundary may have increase by approximately 0.9 dB(A) L_{A10} (18 hour) between 2011 and 2018.**

Although not specified by PO14, **if a 10 year design horizon is considered to the year 2029 then overall L_{A10} (18 hour) noise levels are estimated to increase a further 1.4 dB(A) to by 2029.**

Although not specified by PO14, **if the L_{A10} (18 hour) noise criterion is assessed as a façade reflection adjusted level at a building façade then a noise levels are expected to be approximately 2.5 dB(A) higher than at a free-field monitoring location.**

Based upon the above, it is possible to **predict the resultant L_{A10} (18 hour) transportation noise levels at a dwelling façade on the nearest proposed Stages 1 to 3 allotment at the design horizon year 2029 without any acoustic barrier or mound, as follows:**

Average L_{A10} (18 hour) at eastern property boundary 2011:	53.6 dB(A)
Adjustment for Setback Distance to Allotment:	0 dB(A) (conservative)
Adjustment for Transportation Increase 2011 to 2018:	+0.9 dB(A)
Adjustment for Transportation Increase 2018 to 2029:	+1.4 dB(A)
Adjustment for Façade Reflection:	+2.5 dB(A)
⇒ Predicted 2029 L_{A10}(18 hour) external to Nearest Stages 1 to 3 Dwelling with <u>no acoustic barrier or mound</u>:	
	58.4 dB(A)

Thus, **the predicted 10 year design horizon transportation noise levels at the nearest proposed Stages 1 to 3 residential allotment is more than 4 dB(A) lower than the 63 dB(A) L_{A10} (18 hour) noise criterion specified in PO14 based upon the current Bruce Highway and North Coast Railway.**

MWA Environmental is advised that Queensland Rail is resuming land adjacent the southeastern corner of the Stages 1 to 3 site for the purposes of a realignment of the rail line. The resumption is shown and accommodated in the Stages 1 to 3 proposal plan (refer **Figure 1**). The timeframes for any realignment and the ultimate rail line alignment are uncertain at this time. It is, however, noted that given the alignment of the current line and the limited length of the resumption adjacent the subject site there would not be the potential for the rail line to move significantly closer to the proposed residential allotments within the constraints of feasible rail curvature paths. **The nearest distance considered between a proposed residential allotment and the North Coast Railway line remains valid for anticipated design outcomes within the resumed land.**

MWA Environmental is advised that the Bruce Highway is to be widened past the subject site, with concept plans showing the nearest through lane being approximately 8 metres closer to the subject site than currently exists. If it is conservatively assumed that all Bruce Highway traffic will be located 8 metres nearer to the subject site then the **calculated increase in noise levels as a result of the Bruce Highway widening project is 0.3 dB(A) L_{A10} (18 hour).**

Thus, the predicted 10 year design horizon transportation noise levels at the nearest proposed Stages 1 to 3 residential allotment with the widened Bruce Highway remains more than 4 dB(A) lower than the 63 dB(A) L_{A10} (18 hour) noise criterion specified in PO14.

MWA Environmental notes that Stockland Development Pty Ltd proposed to construct an earth mound / acoustic barrier along the eastern boundary, separating the proposed residential allotments from the Bruce Highway and North Coast Railway. As stated in the noise report this earth mound / acoustic barrier structure is not necessary to achieve acceptable road traffic and railway noise levels but is proposed by Stockland Development Pty Ltd to provide visual and acoustic buffer to provide improved amenity outcomes and minimise costs associated with acoustic treatments to dwellings in accordance with QDC MP4.4 (refer to following section).

From a development assessment perspective, the assessment presented in the noise report and the further analysis presented above in relation to compliance with PO14 of the Reconfiguring a Lot Code **there is no specific requirement for the earth mound / acoustic barrier to be constructed to any specific extent or height.**

In addition to the *Rockhampton Region Planning Scheme 2015* Reconfiguring a Lot Code it is also noted that there are gazetted transport noise corridors associated with the Bruce Highway (refer **Figure 2**) and the North Coast Railway (refer **Figure 3**) adjacent the subject site. Acoustic treatment of houses in accordance with QDC MP4.4 is a building application matter rather than a specific development assessment provision applicable to reconfiguration of lot applications.

Figure 2 demonstrates that the Bruce Highway transport noise corridor does not affect the proposed Stages 1 to 3 residential allotments. As such, at building application stage there are currently no QDC MP4.4 requirements for the acoustic treatment of dwellings to mitigate Bruce Highway traffic noise.

Figure 3 demonstrates that the North Coast Railway transport noise corridor affects the following proposed allotments within Stages 1 to 3:

Stage 2a

- Lots 50 to 58
- Lot 80

Stage 2e

- Part of lot

Stage 2f

- Lot 59
- Lot 79
- Lot 82

At building application stage, houses on the allotments within the North Coast Railway transport noise corridor are to be assessed to ensure that the Purpose of QDC MP4.4 is achieved. This assessment may refer to the default state-government mapping or be based upon a site-specific assessment that considers the proposed house design and any intervening structures such as an earth mound / acoustic barrier proposed to be constructed by Stockland Development Pty Ltd.

SUMMARY

Our advice in response to the Rockhampton Regional Council Information Request may be summarised as follows:

- There is no apparent benefit in undertaking further noise monitoring at the site as no material changes have occurred in the local acoustic environment;
- The Stages 1 to 3 reconfiguration of lot application will satisfy Performance Outcome PO14 of the *Rockhampton Region Planning Scheme 2015* Reconfiguring a Lot Code;
- There is no specific requirement for the earth mound / acoustic barrier proposed to be built by Stockland Development Pty Ltd to be constructed to any specific extent or height; and
- At building application stage, houses on the allotments within the North Coast Railway transport noise corridor are to be assessed to ensure that the Purpose of QDC MP4.4 is achieved.

I trust that the above advice adequately responds to the matters raised in the Information Request. If you require any clarification or additional information please contact the undersigned.

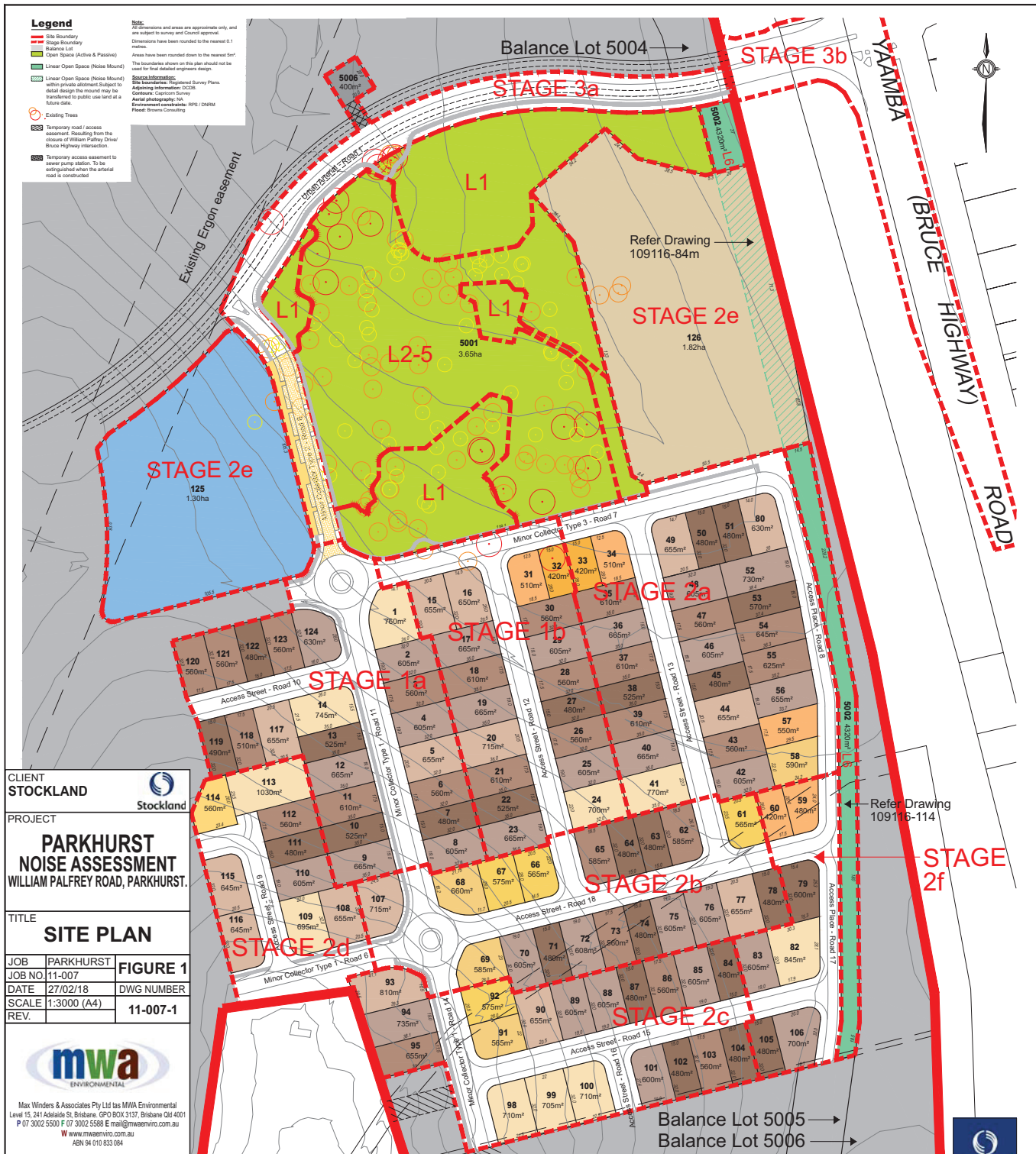
Yours sincerely

A handwritten signature in black ink, appearing to read 'Ben Hyde', with a stylized flourish at the end.

Ben Hyde
Environmental Engineer



FIGURES



LEGEND - RP'S TRANSPORT NOISE CORRIDORS
 (State Controlled Road - Mandatory Area)

Category 0: Noise Level < 58 dB(A)

Category 1: 58 dB(A) < Noise Level < 63 dB(A)

Category 2: 63 dB(A) < Noise Level < 68 dB(A)

Category 3: 68 dB(A) < Noise Level < 73 dB(A)

Category 4: Noise Level > 73 dB(A)

DRAWING REFERENCES

-16 STATE OF QUEENSLAND (DEPARTMENT OF TRANSPORT AND MAIN ROADS) 2017, STATE CONTROLLED ROADS INC. ACT 2017, STATE CONTROLLED ROADS INC. REGULATIONS 2017

-GOOGLE EARTH PRO 2017

-RP'S PROPOSED SUBDIVISION STAGES 1-3 ALLOTMENT LAYOUT DWG 109116-50 ROL



CLIENT STOCKLAND
 PROJECT STOCKLAND

PARKHURST NOISE ASSESSMENT
 WILLIAM PALFREY ROAD, PARKHURST.

BRUCE HIGHWAY TRANSPORT NOISE CORRIDOR

JOB PARKHURST
 JOB NO 11-007
 DATE 27/02/18
 SCALE 1:2500 (A3)
 REV. 11-007-2

FIGURE 2
 DRAWING NUMBER
 11-007-2

mwa
 ENVIRONMENTAL
 New South Wales & Queensland Pty Ltd
 Level 15, 151 Pitt Street, Sydney NSW 2000
 P 02 3002 5000 F 02 3002 5088 E mwa@mwaenv.com.au
 W www.mwaenv.com.au
 100 541 511 510 511



LEGEND
SPP TRANSPORT NOISE CORRIDORS (Rail Network)
 Category 1: 70 dB(A) - 74 dB(A)
 Category 2: 75 dB(A) - 79 dB(A)
 Category 3: 80 dB(A) - 84 dB(A)
 Category 4: Noise Level >= 85 dB(A)

DRAWING REFERENCES
 - STATE OF QUEENSLAND 2017 SPP INTERACTIVE
 - THE STATE OF QUEENSLAND 2018 QLODGE
 - SPP PROPOSED SUBDIVISION STAGES 1-3 ALIGNMENT
 LAYOUT DWG 10916-90 ROL



0 25 50 75 100m

CLIENT STOCKLAND
 PROJECT STOCKLAND

**PARKHURST
 NOISE ASSESSMENT**
 WILLIAM PALFREY ROAD, PARKHURST.

TITLE
 NORTH COAST RAILWAY
 TRANSPORT NOISE
 CORRIDOR

JOB PARKHURST
JOB NO 11-007
DATE 27/02/18
SCALE 1:2500 (A3)
REV. 11-007-3

FIGURE 3
DRAWING NUMBER
11-007-3

mwa
 ENVIRONMENTAL
 New South Wales & Queensland
 Level 15, 151 Pitt Street Sydney NSW 2000
 P 02 9250 5000 F 02 9250 5088 E mwa@mwa.com.au
 W www.mwa.com.au
 1000 011 111 111





APPENDIX P

REHABILITATION MANAGEMENT PLAN

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/117-2017

Dated: 12 September 2018



Rehabilitation Management Plan

William Palfrey Road, Parkhurst

Prepared by:

RPS AUSTRALIA EAST PTY LTD

743 Ann Street
PO Box 1559
FORTITUDE VALLEY QLD 4006

T: +61 3237 8899
F: +61 3237 8833
E: kelly.matthews@rpsgroup.com.au
W: rpsgroup.com.au

Prepared for:

STOCKLAND DEVELOPMENT PTY LTD

PO BOX 10160
Level 9,99 Melbourne Street
SOUTH BRISBANE QLD 4101

T: +617 3305 8643
F: +617 3181 8643
E: jacqui.carter@stockland.com.au
W: stockland.com.au

Report Number: 01022013_PR107225_8_Parkhurst_RMP
Version / Date: Final

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
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B	Draft	KM	KM	15/01/2013
C	Final	DH	KM	04/03/2013

Approval for Issue

Name	Signature	Date
Kelly Matthews		04/03/2013

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1.0 Introduction

1.1 Background

RPS Australia East (RPS) has been commissioned by Stockland Pty Ltd to prepare a Rehabilitation Management Plan (RMP) to accompany other management plans pertaining to the Development Application (DA) for the proposed residential development located at William Palfrey Road, Parkhurst.

This RMP has been undertaken to report the Preliminary Approval to Rockhampton Regional Council (RRC) that is required for the provision of a RMP for the first 200 lots of the approved Reconfiguration of Lot (ROL) application.

The RMP also considers additional works required by RRC, as such, the RMP needs to be read in conjunction with other management plans, associated figures and design drawings to ensure council compliance.

Other reports that are to be submitted to RRC as part of the DA, include:

- Ecological Assessment (EA) (RPS, 2013a);
- Bushfire Management Plan (BMP) (RPS, 2013b); and
- Vegetation Management Plan (VMP) (RPS, 2013c).

1.2 Site Description and proposed development

The site covers approximately 278ha and is generally considered to have a low undulating hill topography associated with Lots 37 and 38 on RP600698, Lot 1 on RP602376 and Lot 2 on RP608099, Lots 5 and 6 on SP238731, Lot 41 on SP226571, Lots 22 and 23 on SP134380 and Lot 49 on SP129857 (**Figure 1.1**). The site is bounded to the north by Ramsay Creek, to the east by the North Coast Rail Way and the Bruce Highway, to the south grazing lands and to the west by residential dwellings. The site occurs on either side of William Palfrey Road at Parkhurst.

The site is generally unconstrained, however a series of electrical (overhead power line) easements traverse the property and a small area to the north-west of the property is mapped as being inundated in a 100 year flood event. Existing infrastructure on the site includes access tracks, residential dwellings, storage sheds and small farm dams also occur across the site.

Ramsay Creek is located to the north of the site and, while infested by declared weeds, is in relative good ecological condition. The site is currently used for grazing purposes. The dominant geology of the site is Carboniferous mudstone, siltstone, feldspathic and lithic arenite, and conglomerates.

The proposed action involves development of a residential master planned community with residential dwellings, neighbourhood centre, possible school and district recreational park. **Figure 1.2** shows the proposed Ellida Master Plan for the Parkhurst Community.

Figure 1.3 illustrate the Ramsay Creek Environmental Corridor and the Ramsay Creek Open Space Corridor. The Ramsay Creek Environmental Corridor includes natural woodland and riparian vegetation which comprises a 30m buffer along Ramsay Creek. This corridor will be subject to rehabilitation works to maintain ecological functions of the creek and be used as a fauna corridor to enhance the overall condition and habitat values of the site. It will also allow for the restoration and retention of Squatter Pigeon (*Geophaps scripta scripta*) habitat within the site.

The Ramsay Creek Open Space Corridor also establishes a green corridor along Ramsay Creek and provides protections to the 30m riparian corridor by including linear parkland for stormwater quality management and appropriate passive recreation outcomes.

1.3 Scope of Works/Objectives

The primary objective of this RMP is to provide a direction on the required rehabilitation works within areas disturbed as a result of the Ellida Master Plan. The RMP provides for the extensive rehabilitation of the Ramsay Creek Environmental Corridor which contains riparian vegetation of Ramsay Creek and a 30m vegetated buffer.

The aim of the RMP is to enhance the ecological and scenic values of the reach of Ramsay Creek that occurs on the site, in order to recreate a riparian corridor that is typical of the pre-disturbed vegetation community and perform the following functions:

- Provide habitat and movement corridor for native fauna species;
- Provide refugia, breeding and feeding place for native Australian wildlife;
- Provide a buffer from the adjoining development to minimize runoff to the creek;
- Provide a visual buffer from adjoining development;
- Increase the quality of the water to meet healthy waterways requirements;
- Link fragmented patches of vegetation;
- Protect and enhance existing native vegetation;
- Minimise erosion; and
- Reduce edge effects such as weed invasion along the creek corridor.

The scope of the RMP includes the following:

- A description of the proposed rehabilitation, including methods and objectives;
- Details of the proposed rehabilitation schedule, including staging, plant species names, stock size, quantities and planting locations;
- Details of special habitat features for the enhancement/restoration of habitat values; and
- Specification of planting methods, mulching and soil preparation.

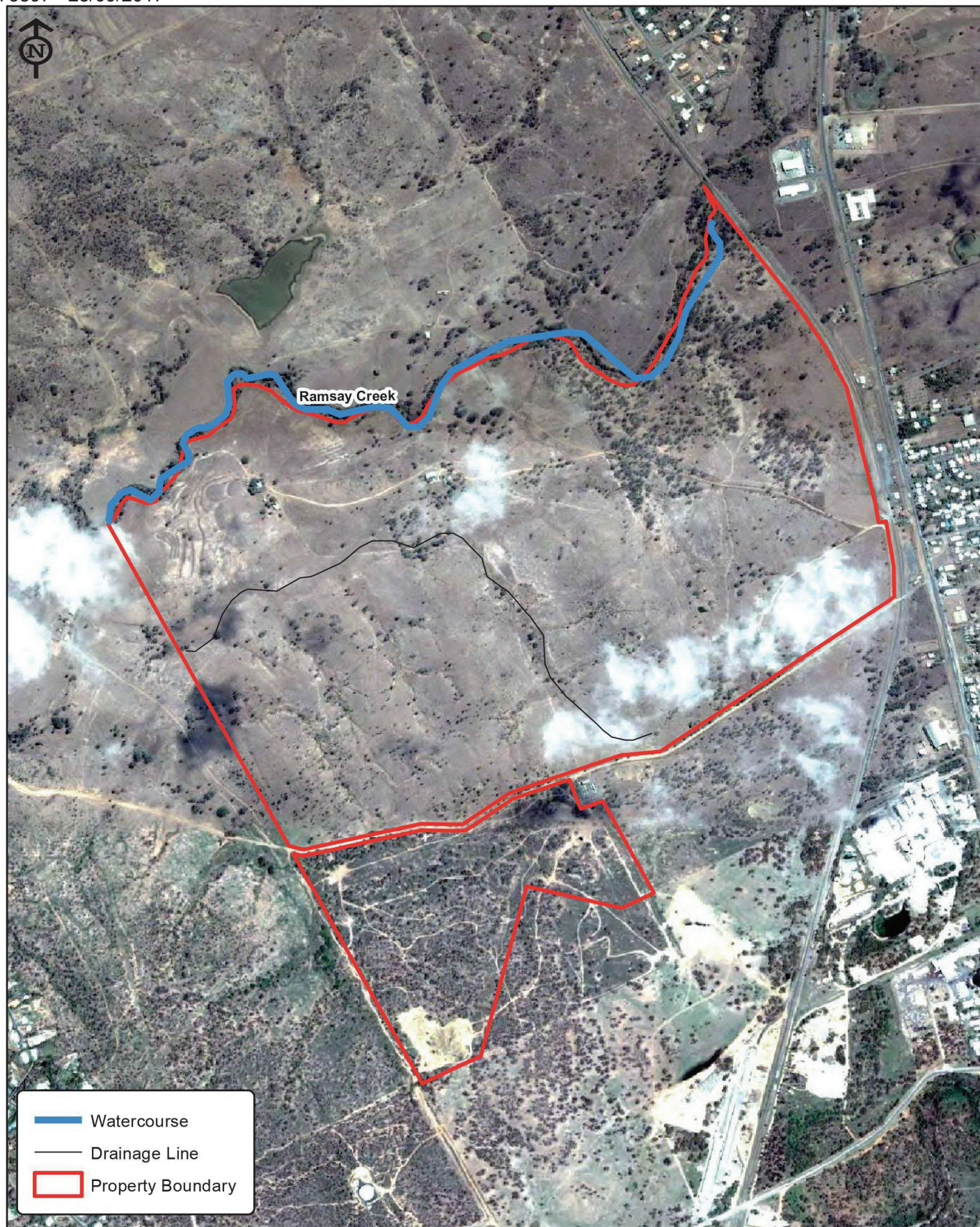


Figure 1.1 - Aerial Imagery

Client: Stockland Development Pty Ltd


Date: 01/02/2013	Compiled by: DH	Project Manager: KM	Scale@A4 1:15,000	GDA 94, MGAz56	Ref: Figure 1.1
			<p>0 255 510 1,020 Meters</p> <p>Source: Google Earth Pro</p>		

Figure 1.2 ELLIDA MASTER PLAN

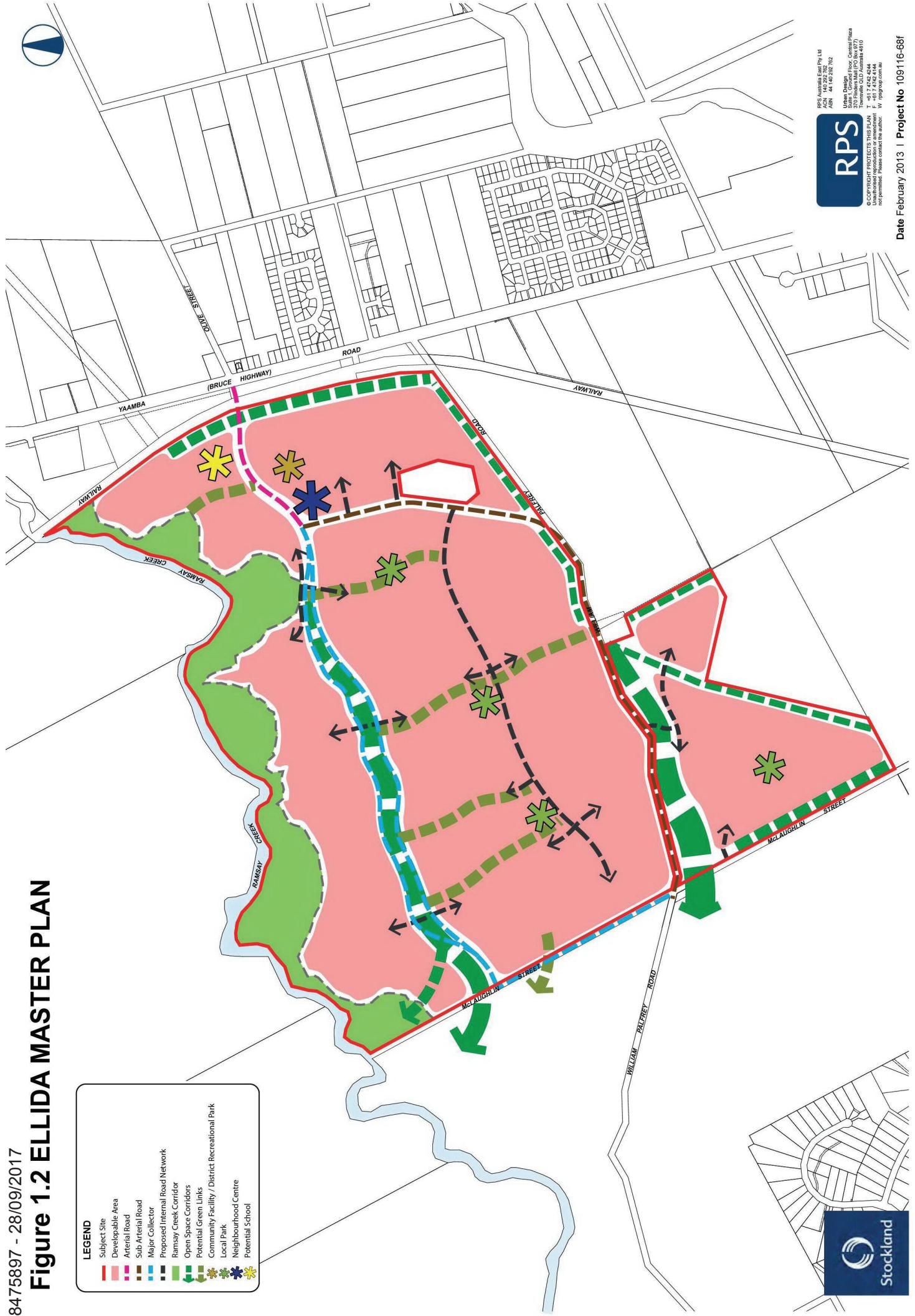
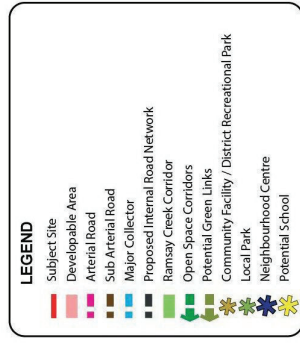


Figure 1.3 ELLIDA OPEN SPACE PLAN

LEGEND

Subject Site

Proposed Road Network

District Recreation Park

Ramsay Creek Environmental Corridor

Ramsay Creek Open Space Corridor

Open Space Corridors

Potential Green Links

Local Park

Ramsay Creek Active Node

Community Facilities



RPS
 RPS Australia East Pty Ltd
 ACN 140 282 782
 ABN 44 140 282 782
 Urban Design
 370 Flinders Mail (PO Box 977)
 Townsville QLD Australia 4810
 T +61 7 4762 4444
 F +61 7 4762 4444
 E info@rps.com.au
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2.0 Site Vegetation

2.1 Current Vegetation Communities

The development area consists of five vegetation communities. A detailed vegetation survey was undertaken in February 2011 and a complete description of the five vegetation communities is provided within the Vegetation Management Plan developed by RPS dated November 2013.

Figure 2.1 illustrates the five vegetation communities which are summarised below:

- (1) Vegetation community one – *Eucalyptus populnea* Woodland is dominated by Poplar Box (*Eucalyptus populnea*), with Narrow-leaved Ironbark (*Eucalyptus crebra*) and Kurrajong (*Brachychiton populnea*) also occurring. This area is cognisant of Regional Ecosystem (RE) 11.11.15, described as *Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics.
- (2) Vegetation community two – *Eucalyptus crebra* Woodland occurs within the southern portion of the site, and scattered across the northern portion of the site. This community is similar to vegetation community 1 but its species composition varies slightly. The canopy dominated by Narrow-leaved Ironbark, with occasional Cabbage Gum and Silver-leaved Ironbark (*Eucalyptus melanophloia*). Red-barked Bloodwood (*Corymbia erythrophloia*) also occurs.
- (3) Vegetation Community three – Disturbed Riparian Woodland occurs along Ramsay Creek, and within the creeks floodplains, and is mapped as Of Concern regrowth vegetation. This vegetation community is heavily infested with weed species, particularly Rubber Vine (*Cryptostegia grandiflora*). This community is complex in composition and structure, as species dominance is dependent on cross-sectional position. This community can essentially be divided into two sub-communities:
 - (a) The first sub-community is associated with the bed, banks and up to one meter landwards of the top of the bank. The area is dominated by canopy trees such as silver-crowned paperbark (*Melaleuca quinquinervia*), Queensland blue gum (*Eucalyptus tereticornis*), river she-oak (*Casuarina cunninghamii*) and swamp box (*Lophostemon suaveolens*).
 - (b) The second sub community is associated with the flood plains and riparian vegetation greater than one meter from the top of the bank. These areas are dominated by Morton Bay ash (*Corymbia tessellaris*) and Queensland Blue Gum. The sparse shrub layer of these areas is dominated by Sally Wattle (*Acacia salicina*), Mimosa Bush (*Acacia farnesiana*) and Rubber Vine. Ground cover consists of Creeping Lantana (*Lantana montevidensis*), Black Spear Grass (*Heteropogon contortus*), and Kangaroo Grass (*Themeda triandra*).
- (4) Vegetation Community four – *Eucalyptus tereticornis* Woodland occurs on the lower lying areas of the site associated with overland flow paths and floodplains of Ramsay Creek. The canopy is comprised of Queensland Blue Gum, Narrow-leaved Ironbark and Rough-barked Apple (*Angophora floribunda*). The shrub layer includes Prickly Acacia (*Acacia nilotica*), Mimosa Bush and Rubber Vine. This Vegetation Community is considered to be analogous to RE 11.3.25 (Least Concern).
- (5) Vegetation Community five – Pastures with Scattered Trees is the balance lot on **Figure 2.1**. It supports grasslands for livestock grazing that are dominated by common introduced pasture species including Black Speargrass, Buffel Grass (*Cenchrus ciliaris*), and Woodland Lovegrass (*Eragrostis sororia*). Low lying areas of the site support Water Chestnut (*Eleocharis dulcis*) and Prince's Feather (*Persicaria orientalis*). Scattered trees occur throughout this portion of the site, including narrow-leaved ironbark, silver-leaved ironbark and cabbage gum.

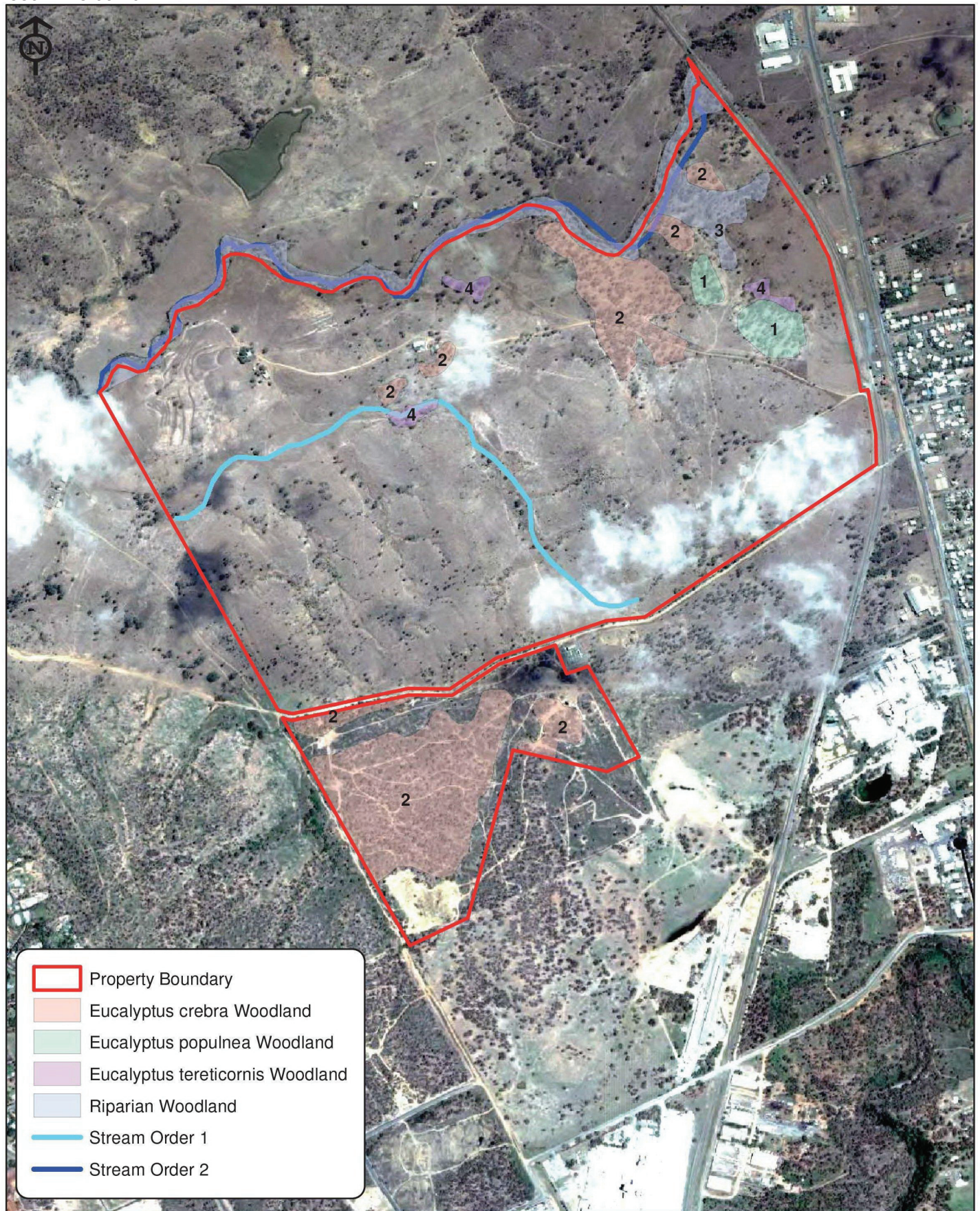


Figure 2.1 - Vegetation Communities

Client: Stockland Development Pty Ltd

Date: 10-5-2010 Compiled by: HR Project Manager: BD Scale@A4 1:15,000 GDA 94, MGAz56 Ref: 103701_Figure 4.1_RevA

RPS

Source: Google Earth Pro;
DERM Regrowth Mapping (V2)

0 255 510 1,020
Meters

2.2 Wetland and Waterway

Ramsay Creek is an ephemeral waterway with deep pools and riffle habitats and as such supports the greatest volume of biodiversity at the site and has high habitat values. The creek is located along the northern boundary of the subject site and runs from the West to the East (**Figure 2.2**). According to *Rockhampton Regional Council Overlay Mapping*, Ramsay Creek is mapped as an environmentally sensitive area.

Throughout the outer extremities of the site, along Ramsay Creek, the condition of vegetation decreases significantly due to some exotic plant infestations. This reduces the structural diversity and habitat values of the site. Several declared weed species listed under the *Land Protection (Pest & Stock Route Management) Act 2002 (LP Act)* were recorded on site. A list of all flora species recorded on site is provided in **Appendix A**.

3.0 Rehabilitation Strategy

A number of broad rehabilitation methods are necessary for the rehabilitation of the Ramsay Creek Environmental Corridor and the Ramsay Creek Open Space Corridor. The proposed rehabilitation method involves a range of weed control treatment, assisted natural regeneration, tree planting and minor earth works. Four rehabilitation zones have been identified for the rehabilitation of the Ramsay Creek Environmental Corridor and the Ramsay Creek Open Space Corridor, using combinations of the methods outlined above. Each rehabilitation method is further described in **Sections 3.1 – 3.4**.

3.1 Weed Management

The invasion and spread of weeds through sensitive environmental areas such as riparian zones can significantly impact upon the ability of these areas to perform their ecological function. Weeds occurring along Ramsay Creek Environmental Corridor includes declared species listed under the *LP Act* were recorded on the site and summarised in **Table 3.1**.

Table 3.1: LP Act Declared Species Identified On Site

Scientific Name	Common Name	LP Act ¹ Classification	Treatment Method
<i>Acacia nilotica</i>	Prickly Acacia	Class 2	Mechanical treatment is recommended during drought periods prior to seed dispersal. After wet season chemical treatment is recommended through basal bark spraying for stems up to 100mm or cut stumping larger stems.
<i>Bryophyllum delagoense</i>	Mother of Millions	Class 2	Mechanical treatment is recommended for small infestations. For larger infestations chemical treatment is recommended at any time of the year however during flowering in the winter months treatment is most effective.
<i>Cryptostegia grandiflora</i>	Rubber Vine	Class 2	Combination of Biological control followed by fire is the most cost-effective control. The biological control is a rust causing leaf drop, which opens up infestations and allows grasses to grow underneath. Combined with the rubber vine leaf litter, these grasses can provide the perfect environment for fires.
<i>Lantana camara</i>	Lantana	Class 3	A range of methods including herbicides, mechanical removal, fire, biological control and revegetation should be used. Best results are obtained by working from areas of light infestation towards heavier infestation, and long term follow-up control is required after initial attempts.
<i>Lantana montevidensis</i>	Creeping Lantana	Class 3	A range of methods including herbicides, mechanical removal, fire, biological control and revegetation should be used. Best results are obtained by working from areas of light infestation towards heavier infestation, and long term follow-up control is required after initial attempts.
<i>Opuntia tomentosa</i>	Velvety Tree Pear	Class 2	Plants can be controlled biologically using the cochineal insect, <i>Dactylopius opuntiae</i> . Felling of large plants once cochineal is established often results in more rapid control compared with unfelled plants.
<i>Ziziphus mauritiana</i>	Chinee Apple	Class 2	Effective control can be achieved through a combination of mechanical and herbicide treatments, or by herbicide treatment alone. All areas treated must be periodically checked and any regrowth treated or the initial treatment efforts will be wasted. Follow-up is essential to ensure a successful control program.

¹ - Declared plants must be managed according to their classification as follows:

Class 1 – plants will cause adverse economic, environmental or social impact and are subject to eradication;

Class 2 – landholders are required by law to attempt to keep their land free of these species; and

Class 3 – landholders may be required to control these species if their land is located adjacent to ‘environmentally significant species’ such as national parks or reserves.

A comprehensive list of flora and weed species present on the entire site is given in **Appendix A**. This list is provided to give further information on weed infestation that may occur in the future within the provided rehabilitation zone in order to allow pro-active action and appropriate control to take place where necessary.

Weed control is proposed in the retained vegetation along Ramsay Creek, within the 30 metre riparian buffer zone. Three broad methods are recommended to treat weed invasion; mechanical removal, chemical treatment and biological control. The use of each control technique will be identified on site during a preliminary site visit and will depend on the type of infestation (individual tree or large area infested). The appropriate removal / control method selected must not directly or indirectly negatively influence the surrounding vegetation, native fauna, or the water quality of Ramsay Creek. Only herbicides registered for use in aquatic applications will be used within the 30 m of the waterway centreline.

A combination of mechanical and chemical methods can be utilized to remove and control ground and layer weeds dependent upon the individual species to be treated. Where possible, mechanical control should be used, however a combination of methods may be applied for optimal results.

Waste vegetation should be placed in a disposal bag and disposed of offsite. Clipping from mown areas as well as exotic tree species should not be chipped or used as mulch in revegetation areas. Burning of cleared exotic vegetation is not a permitted disposal technique.

3.2 Assisted Natural Regeneration

Assisted Natural Regeneration aims to restore remnant vegetation communities through the ecosystems ongoing natural processes. Approaches that trigger this method is considered as part of an integrated approach to rehabilitation in the long-term. This approach can also include the removal of competing and non native vegetation to encourage regeneration of residual natives, soil stored seed and rootstocks. Through encouraging any residual species to regenerate, species diversity is likely to be greater than can be achieved through direct seeding and revegetation alone.

3.3 Revegetation

In order to restore connectivity between patches of remaining vegetation, revegetation of the Ramsay Creek Environmental Corridor and Ramsay Creek Open Space Corridor will be undertaken. Areas where there is little or no cover of native vegetation, or regrowth of native species is not evident, planting of suitable vegetation species is required. Species selection for the rehabilitation has been made according to:

- Naturally occurring vegetation in the area;
- The description for regional ecosystems present on site as described in the VMP (RPS, 2013c);
- The individual growth form of species;
- The ecological and growing function of flora species;
- The provision and availability of endemic native species to the area, local provenance where available; and
- The structural role species perform in the natural forest community.

3.3.1 Site Preparation

The successful growth of plants will rely on careful and appropriate preparation of the area prior to planting. The following issues will be addressed:

- The boundaries of the rehabilitation area will be determined and signed noting that the area is a 'Native Plant Rehabilitation Area'. All contractors (and other personnel where appropriate) will be made aware of restrictions applying to the rehabilitation zones. All signage should be in place before the planting commences;
- The planting area will be clearly marked on site and a plan provided to all relevant site workers;
- Weeds will be treated using appropriate methods prior to any supplementary planting within the treated area;
- Existing rubbish, other foreign material and any old fencing (especially barb wire) will be removed;
- In areas where natural ground cover, such as leaf litter and woody debris coincide with supplementary planting locations, a circular area 60cm in diameter will be carefully cleared; and
- The ground cover will not be discarded; rather it will be replaced as natural mulch after planting.

3.3.2 Planting schedule

Plantings schedule considers current established native plants and occur at the densities identified within each of the rehabilitation zones described in **Section 4.0**. These densities may be amended slightly following detailed ground – truthing for each rehabilitation zone.

Species planted are to be selected in consultation by the appointed rehabilitation contractor, local nursery owners, and consulting Restoration Ecologist or Landscape Architect, and will be derived from those described in the **Section 4.0**. When deciding on suitable species for seeding or planting within a site, the following was considered:

- Species that naturally occur within the area (preferably of local provenance);
- Vegetation community characteristics of each the rehabilitation zones;
- Individual growth form and growth rate of species (e.g. species which are quick to establish and/or provide quick establishment of sub-canopy and shrub layers thereby providing cover for weed suppression, contribute to soil stability through binding by root system, have good fruiting and/or flowering traits);
- Ecological function of species (e.g. species which provide habitat and food for fauna) ; and

All planting stock should be:

- Preferably local provenance;
- Healthy and displaying signs of active growth. Plants should be rejected if displaying nutritional or physiological disorders, leaf or stem damage, pests and diseases, root curling or showing signs of being pot bound or have weed species in the container;
- A minimum of 20 cm tall for (75 mm) tubestock (larger for potted stock) and must have a well-developed root system; and
- Sun-hardened.

Planting stock is to be randomly planted (i.e. not in rows) to reflect the natural composition/layout of the original ecosystem. Seedlings must be moist at time of planting, preferably treated by soaking in a seaweed or fish emulsion solution for 15-20 minutes prior to planting to protect against transplant shock. Seedlings are to be watered in with a minimum of 5-10 L of water each at time of planting. A description of the detailed

processes of supplementary planting (i.e. site preparation, selecting plant stock etc) is contained within the following sections.

The planting holes should be at least twice the width and half as deep as the pot size. In the case of tube-stock, plants should be placed in a hole deeper than the pot, with the root ball just below the soil surface after planting.

Immediately before planting, each hole will be filled with water which is then allowed to drain away. Water-holding crystals will be added to each hole and mixed with the back fill soil to ensure that roots are not in direct contact with concentrated fertilizer. Plants will be tapped from their container and any pot-bound or circular roots loosened. The plant will be placed in the centre of the hole, filled in with loose crumbly soil, then firmed with the hands to create a shallow watering depression. Firming in the plant is very important for settling the roots in and providing a stress free start for each plant and also for minimizing erosion.

3.3.3 Mulching

Site generated mulch from chipped trees and other vegetation and/or other non weed-bearing mulch will be used around all planted trees. Each tree is to be mulched to a radius of 1m surrounding the plant at a depth of 100mm. Mulch should not touch the plant stems. Mulch can also be used in areas awaiting rehabilitation to suppress weed growth.

3.3.4 Fertilizing

Each plant is to be fertilized with a 10g slow release fertilizer pellet (Agriform or similar). The fertilizer pellet is to be placed adjacent to but not in contact with the root ball at 2-4cm below the soil surface and under the mulch. Species such as sedges and aquatic species are not to be fertilized.

3.3.5 Watering

All trees will be watered at planting (approximately 5-10L). On completion of the planting activities, the plants will require water at least once per week for the first month, then once a fortnight for another two months and then monitoring will be in place to measure the amount of water require due to climactic variance.

3.3.6 Fauna Habitat

The rehabilitation of the zones will help to protect and enhance the site's fauna and fauna habitat resources. Specific measures that will benefit fauna include:

- The retention of hollow logs, tree branches and other such habitat elements where possible;
- Additional habitat and refuge niches created through supplementary planting and the addition of hollow logs etc salvaged from the clearing of vegetation during the construction of the proposed development;
- Provision of habitat resources for locally significant species; and
- Erection of a minimum of 20 nest boxes to replace loss of any large hollow-bearing trees as part of the proposed development. The nest box will be design for gliders, possum and parrots. The placement has been placed on the **Figure 4.1** however this placement is flexible as it depends on the availability and health of the vegetation at the time of installation. All nest boxes must be monitored and maintenance for the period of this rehabilitation plan.

Additionally, the site locality has confirmed occurrences of squatter pigeon (*Geophaps scripta scripta*) inhabiting the grassy understory of the eucalypt woodland. Squatter Pigeons nest on the ground, usually laying two eggs in sheltered positions and forage for seeds on bare ground between sparse grasses (Frith

1982). The species forages for seeds, legumes, herbs and insects within both native and improved pasture. Localities with ready access to water and sheltered positions between grasses are required for breeding. Where reseeding is necessary, it must be undertaken with endemic grass species to the area of impact (**Section 4.0**). Compact soil must be re-spread over bare ground area with crown development, and to ensure natural seed bank regeneration.

3.4 Earthworks

Areas where the natural profile of the creek corridor has been significantly disturbed will require earthwork to return to a condition similar to pre-disturbance. Earthworks within the rehabilitation area will be limited to the disturbed areas and areas outside of this will be protected.

Details of earthwork, if required, will be provided in the earthworks and sediment and erosion control plans at the Operational Stage of the project development. This may involve re-profiling the creek banks to avoid erosion and removing excess material that has been deposited in these areas during previous site uses in order to preserve the natural aspect of the bank. Where these works are undertaken, top soil may also be required to provide a substrate for vegetation to establish and grow.

Planting in the creek bank will be required to help with its stabilization and reduce future potential erosion issues.

3.5 Reporting

Quarterly monitoring reports should be prepared by the Rehabilitation Contractor for the first two years and submitted to the Project Manager and RRC. These reports should summarise the findings of monitoring events and identify the performance of rehabilitation activities with reference to the objectives of this plan. Where the objectives are not being achieved, the report should recommend relevant actions required to amend this situation.

3.6 Responsibilities

Contractors undertaking rehabilitation works must be instructed directly of the requirements of this plan. A copy of this rehabilitation plan is to be retained and displayed on site at all times during rehabilitation activities. The project manager should ensure that all relevant contractual documents specify the rehabilitation plan as a responsibility. The roles and responsibilities assigned to individuals are outlined below in **Table 3.2**.

Table 3.2: Roles and Responsibilities

Position	Responsibilities	Activities
Rehabilitation contractor	Rehabilitation works.	Implement the requirements of the rehabilitation plan throughout the construction phase and monitoring period; and Replace plant mortalities.
Restoration Ecologist or Landscape Architect	Ensure the rehabilitation contractor is implementing the requirements of the rehabilitation plan throughout the construction phase and monitoring period.	Monitoring of rehabilitation works as required to ensure compliance with the rehabilitation plan.
Developer	Ensure the rehabilitation contractor has the necessary access to the site. Ensure the rehabilitation contractor is implementing the requirements of the rehabilitation plan throughout the construction phase.	Review monitoring reports to ensure compliance with the rehabilitation plan.

4.0 Rehabilitation Zones

There are variations in the vegetation and level of disturbance found along Ramsay Creek. The level of disturbance ranges from areas with minimal disturbance to areas devoid of vegetation. Accordingly, four rehabilitation zones have been identified through the development where various treatments are recommended. **Figure 4.1** shows the four separate zones of rehabilitation.

For each rehabilitation treatment zone, a description of the current vegetation and level of disturbance is given. Also provided is the planting schedule for each zone. Detailed planting densities and total number of stock to be planted will be refined following ground-truthing of each zone. Proposed densities will be accommodated on site with existing vegetation.

4.1 Zone I – Riparian Zone

The riparian habitat type is associated with Ramsay Creek and is in part comprised of vegetation community two. This habitat type provides large resources for a range of native faunal groups in particular for sheltering, roosting, nesting and breeding resources for birds, reptiles and amphibians. The majority of bird species were identified in this functioning habitat type including Pacific Baza (*Aviceda subcristata*), Nankeen Night Heron (*Nycticorax caledonicus*) and Channel-billed Cuckoo (*Scythrops novaehollandiae*). Several large hollow bearing trees occur in this habitat type and provide ideal roosting and nesting habitats for birds and micro-bats. It is considered that Squatter Pigeons utilise this resource as part of a more extensive home range.

Table 4.1 provides for the planting schedule for the rehabilitation zone 1 (approximately 11.7Ha).

Table 4.1: Recommended Planting Schedule for the Rehabilitation Zone 1

Scientific Name	Common Name	Planting Densities
Trees		
Angophora floribunda	Rough-barked Apple	1 plant / 10m ²
Casuarina cunninghamii	River She Oak	
Eucalyptus camaldulensis	River Red Gum	
Eucalyptus coolabah	Coolibah	
Eucalyptus tereticornis	Queensland Blue Gum	
Lophostemon suaveolens	Swamp Box	
Melaleuca bracteata	Black Tea-tree	
Melaleuca quinquenervia	Silver-crowed Paperbark	
Melaleuca viminalis	Weeping Bottlebrush	
Shrubs		
Acacia salicina	Sally Wattle	1 plant / 7m ²
Acacia stenophylla	River Myall	
Lysiphyllum carronii	Queensland Ebony	
Grasses, Forbes and Sedges		
Imperata cylindrica	Blady Grass	5 plant / 1m ²
Bothriochloa bladhii	Forest Bluegrass	
Bothriochloa ewartiana	Desert Bluegrass	
Chrysopogon fallax	-	

<i>Cyperus dactylotes</i>	-	
<i>Cyperus difformis</i>	-	
<i>Cyperus exaltatus</i>	-	
<i>Cyperus gracilis</i>	Slender Flat-sedge	
<i>Cyperus iria</i>	Umbrella sedge	
<i>Cyperus rigidellus</i>	Curly Flat-sedge	
<i>Cyperus victoriensis</i>	-	
<i>Dichanthium sericeum</i>	Queensland Bluegrass	
<i>Leptochloa digitata</i>	Umbrella Canegrass	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	

4.2 Zone 2 – Wetlands/ Floodplains

The wetlands occurs south-east of the site, and is ecologically very important as it provides habitat for numerous native migratory and water birds such as Australian Darter (*Anhinga novaehollandiae*), Plumed Whistling Duck (*Dendrocygna eytoni*), Great Egret (*Ardea alba*) and Pied Cormorant (*Phalacrocorax varius*). It is likely that retention and enhancement of Ramsay Creek and the associated wetlands will result in additional habitat and corridors for the above species.

Table 4.2 provides for the planting schedule for the rehabilitation zone 2 (approximately 6.9 ha).

Table 4.2: Recommended Planting for the Rehabilitation Zone 2

Species Name	Common Name	Target Planting Densities
Trees		
<i>Angophora floribunda</i>	Rough-barked Apple	1 plant / 15m²
<i>Casuarina cunninghamii</i>	River She Oak	
<i>Eucalyptus camaldulensis</i>	River Red Gum	
<i>Eucalyptus coolabah</i>	Coolibah	
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	
<i>Eucalyptus tereticornis</i>	Queensland Blue Gum	
<i>Lophostemon suaveolens</i>	Swamp Box	
<i>Melaleuca bracteata</i>	Black Tea-tree	
<i>Melaleuca quinquenervia</i>	Silver-crowed Paperbark	
<i>Melaleuca viminalis</i>	Weeping Bottlebrush	
Shrubs		
<i>Acacia salicina</i>	Sally Wattle	1 plant / 7m²
<i>Acacia stenophylla</i>	River Myall	
<i>Lysiphyllum carronii</i>	Queensland Ebony	
Grasses, Forbes and Sedges		
<i>Imperata cylindrical</i>	Blady Grass	1 plant / m²
<i>Bothriochloa bladhii</i>	Forest Blue Grass	
<i>Bothriochloa ewartiana</i>	Desert Bluegrass	
<i>Bothriochloa decipiens</i>	Ppitted Bluegrass	
<i>Chrysopogon fallax</i>	-	

<i>Cyperus dactylotes</i>	-	
<i>Cyperus difformis</i>	-	
<i>Cyperus exaltatus</i>	-	
<i>Cyperus gracilis</i>	Slender Flat-sedge	
<i>Cyperus iria</i>	Umbrella Sedge	
<i>Cyperus rigidellus</i>	Curly Flat-sedge	
<i>Cyperus victoriensis</i>	-	
<i>Dichanthium sericeum</i>	Queensland Bluegrass	
<i>Leptochloa digitata</i>	Umbrella Canegrass	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	

4.3 Zone 3 – Eucalyptus Woodland

This area is dominated by a eucalypt canopy species and a sparse shrub layer. It provides potential habitat for a range of native fauna species including reptiles, birds and mammals. It is considered to be of a moderate habitat value with sheltering and nesting potential. The ground cover provides habitat for small reptile species and a food source for larger terrestrial herbivores such as the eastern grey kangaroo (*Macropus giganteus*). As previously stated, the grassy woodlands and open forests of this vegetation community are preferred squatter pigeon (*Geophaps scripta scripta*) habitat.

Table 4.3 provides for the planting schedule for the rehabilitation zone 3 (approximately 39.89 ha).

Table 4.3: Recommended Planting for the Rehabilitation Zone 3

Species Name	Common Name	Target Planting Densities
Trees		
<i>Corymbia clarksoniana</i>	Clarkson's Bloodwood	1 plant / 8m²
<i>Corymbia erythrophloia</i>	Variable-barked Bloodwood	
<i>Corymbia tessellaris</i>	Moreton Bay ash	
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	
<i>Eucalyptus populnea</i>	Poplar Box	
Shrubs		
<i>Acacia bidwillii</i>	Corkwood	1 plant / 4m²
<i>Acacia salicina</i>	Sally Wattle	
<i>Alphitonia excelsa</i>	Soap Tree	
<i>Petalostigma pubescens</i>	Bitter Bark	
Grasses, Forbes and Sedges		
<i>Aristida calycina</i>	Dark Wire Grass	1 plant / m²
<i>Heteropogon contortus</i>	Black Spear Grass	
<i>Themeda triandra</i>	Kangaroo Grass	

4.4 Zone 4 – Pre Cleared Grass Lands with Scattered Trees

The final habitat type consists of scattered canopy trees and shrubs, with pastures and grasses, similar in composition to zone three. This habitat is mostly devoid of canopy and shrub vegetation layers, and lacks important habitat features for native flora and fauna. Accordingly, the species are most likely to be limited to common, generalist species that are able to adapt to significant disturbances. The habitat value of the grassland areas of the site is considered low overall. Despite this, grassland areas would be suitable for foraging for generalist species of birds and mammals as well as providing good habitat and breeding area for Squatter Pigeon. It is recommended that this area be maintained as grassland areas with scattered canopy trees.

Table 4.4 provides for the planting schedule for this rehabilitation zone (approximately 22.7 ha).

Table 4.4: Recommended Planting for the Rehabilitation Zone 4

Species Name	Common Name	Target Planting Densities
Trees		
<i>Corymbia clarksoniana</i>	Clarkson's Bloodwood	1 plant per 50m ²
<i>Corymbia erythrophloia</i>	Variable-barked Bloodwood	
<i>Corymbia tessellaris</i>	Moreton Bay Ash	
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	
<i>Eucalyptus platyphylla</i>	Cabbage Gum	
<i>Eucalyptus populnea</i>	Poplar Box	
Shrubs		
<i>Acacia bidwillii</i>	Corkwood	1 plant / 25m ²
<i>Acacia salicina</i>	Sally Wattle	
<i>Alphitonia excelsa</i>	Soap Tree	
<i>Persicaria orientalis</i>	Princes Feathers	
<i>Petalostigma pubescens</i>	Bitter Bark	
Grasses, Forbes and Sedges		
<i>Aristida calycina</i>	Dark Wire Grass	1 plant / m ²
<i>Bothriochloa bladhii</i>	Forest Bluegrass	
<i>Bothriochloa decipiens</i>	Pitted Bluegrass	
<i>Bothriochloa ewartiana</i>	Desert Bluegrass	
<i>Dichanthium sericeum</i>	Queensland Bluegrass	
<i>Heteropogon contortus</i>	Black Spear Grass	
<i>Imperata cylindrica</i>	Blady Grass	
<i>Themeda triandra</i>	Kangaroo Grass	

4.5 Zone 5 – Constructed Wetland and Flood Storage

This zone includes the stormwater devices including the bioretention basins. Details of the basins, planting and rehabilitation will be provided in the future Landscape Management Plan.

5.0 Monitoring and Maintenance

5.1 Rehabilitation Schedule

This section outlines the required monitoring and maintenance actions, and the person/s responsible for undertaking these tasks, following the initial rehabilitation planting in the zones (**Section 4.0**). The schedule shown in the following **Table 5.1** applies to each of the rehabilitation zones and is considered a guide only. More frequent monitoring and remedial action may be necessary, dependant on the rehabilitation success.

All supplementary plantings are to be monitored to ensure their continued health. Dead or damaged plants will be replaced by similar species and in accordance with **Sections 3.3** and **Section 4.0**. Weed treatment control will be carried out in all rehabilitation zones by suitably experienced persons and in accordance with **Section 3.1**. Re-mulching is recommended in the second growth season.

The rehabilitation will be undertaken in stages and contiguous to future development stages. The **Table 5.1** provides information on the rehabilitation schedule to be undertaken for each per rehabilitation stage.

Table 5.1: Rehabilitation Schedule

Frequency	Task	Remedial Action	Who
Initial (week 1)	Weed control and/or planting inspection.	Identify areas for treatment, rubbish and weeds to be removed, identified weed control techniques, etc.	Restoration Ecologist, or Landscape Architect and Rehabilitation Contractor
Pre-planting (0-3months)	Check fencing and signs are in place. Check appropriate weed removal/control has been implemented. Check the area has been appropriately prepared. Acquire mulch, fertilizer, grow-tubes, sun-hardened seedlings etc. Weed management	Undertake these tasks if not appropriately completed. What is your performance criteria which will help you identifying "not appropriately completed task"?	Rehabilitation Contractor
Weekly for 2 months following the completion of initial planting (24 months)	Check signs. Monitor seedling health. Check for disturbances from pests (e.g. rabbits, vandals etc). Ongoing weed management. Watering.	Replace / repair any damaged fencing / signs. Replace damaged seedlings and erect exclusion fencing around each seedling if necessary. Water daily if rainfall has not been sufficient.	Rehabilitation Contractor

Monthly (24 months)	Check signs and hard-landscaping elements. Monitor seedling health. Check for disturbances from pests. Monitor weeds. Watering.	Replace / repair any damaged signs / landscaping elements. Replace damaged seedlings and erect exclusion fencing if necessary. Treat declared weed species and manage spread of other weeds Water if rainfall had not been sufficient.	Rehabilitation Contractor and Restoration Ecologist or Landscape Architect
Quarterly (0-24 months)	Check mulch. Monitor weeds.	Replenish mulch if necessary. Treat declared weed species and spray to maintain control over spread of other weeds.	Rehabilitation Contractor and Restoration Ecologist or Landscape Architect
Annually	Report success / status of rehabilitation program.	Report to Land Owner and Council where necessary.	Rehabilitation Contractor and Restoration Ecologist or Landscape Architect

The monitoring of the rehabilitation zones will be the responsibility of the rehabilitation contractor. The designed person/s will also be responsible for the maintenance of these zones. A Restoration Ecologist or Landscape Architect will be responsible for the monitoring and maintenance of the rehabilitation area which will continue for 24 months (i.e. 2 years). The rehabilitation contractor will also liaise with the local nursery and the Restoration Ecologist or a Landscape Architect where necessary to ensure the success of the program and implement any necessary modifications.

Formal detailed monitoring and maintenance of the zones will cease after two years and will be maintained by the Local Government in place. The performance criteria (Section 5.2) will be provided for handover of open space to Council for off-maintenance. Stage delivery of the Ramsay Creek Open Space Corridor will be provided and contiguous to future development stages.

5.2 Performance Criteria

Table 5.2 outlines the performance criteria for rehabilitation works within rehabilitation areas. Vegetation maintenance works will be deemed completed and accepted once the following criteria for revegetation are achieved. The performance criteria will be provided for handover of open space to Council for off-maintenance.

Table 5.2: Performance Criteria for Rehabilitation Works

Element	Completion of initial works	Completion of one Year
Environmental woody weeds	75% environmental woody weeds controlled as per treatment area description.	Absent or controlled.
Declared Weeds	90% of declared weeds removed after initial treatment.	100% Removal of original extent of declared weeds.
Mulching	Mulch cover installed around planted species.	Mulch cover maintained around planted species.
Plant Survival	90% survival rate for plantings.	All mortalities replaced to maintain 90% survival rate.

6.0 Conclusion

This Rehabilitation Management Plan outlines the framework for rehabilitation and management works within the proposed Ellida Development area. While infested by exotic flora species, the vegetation along Ramsay Creek plays an essential role in the area's ecological value and habitat resources. It also has local linkages and participates to the broader network of ecological corridors which provides habitat and connectivity for biodiversity.

The Ramsay Creek Environmental Corridor has been divided into four rehabilitation zones. The RMP provides the rehabilitation strategy, planting densities and planting schedule for each zone. Specific guidelines on the planting procedures, required maintenance and monitoring are also provided. The rehabilitation work will be provided in stages and be contiguous to future development stages. Rehabilitation work will be undertaken for a period of two years and will then be maintained by the Rockhampton Regional Council. A staged delivery of the Ramsay Creek Open Space Corridor will be provided and performance criteria will be used for handover of open space to Council.

This RMP meets the specific provisions made by Rockhampton Regional Council - Biodiversity and Nature Code - and will be implemented by Stockland Development Pty Ltd, in consultation with local nurseries, a rehabilitation coordinator and restoration ecologist (or Landscape Architect) where necessary.

7.0 References

Commonwealth Department of the Environment and Heritage and the Queensland Department of Natural Resources and Mines; *Weeds of National Significance, Weed Management Guide, Prickly acacia (Acacia nilotica)*. Available from: <http://www.weeds.gov.au/publications/guidelines/wons/pubs/a-nilotica.pdf> Accessed on 22 November 2012.

Queensland Department of Employment, Economic Development and Innovation; *Weed Busters Weed Management Guide, Mother-of-millions (Bryophyllum delagoense)*. Available from: http://www.dpi.qld.gov.au/documents/Biosecurity_EnvironmentalPests/IPA-Mother-Millions-PP33.pdf Accessed on 22 November 2012.