Appendix J

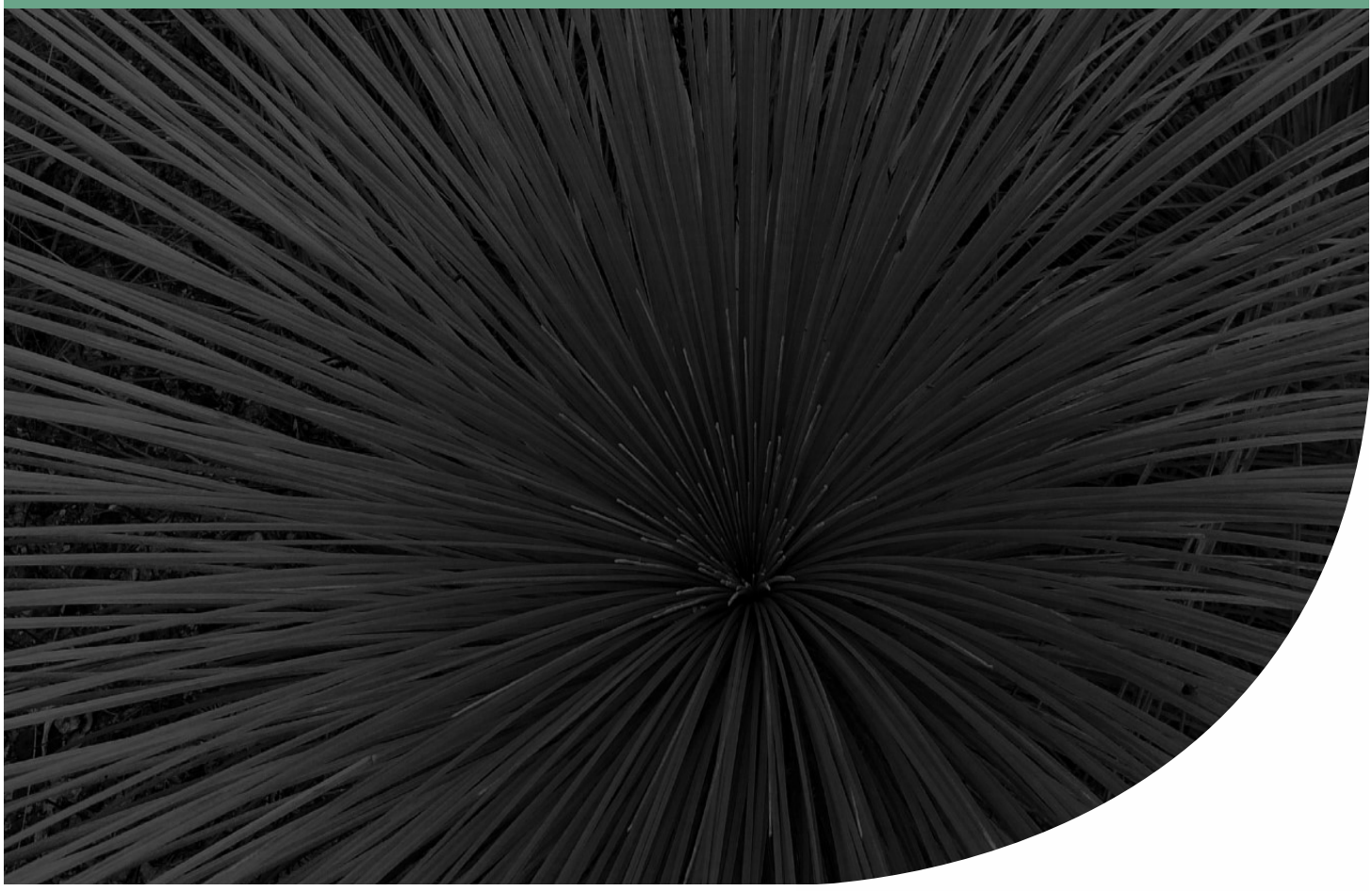
Rehabilitation and Vegetation Management Plan (Emerge Associates 2020)

Rehabilitation and Vegetation Management Plan

Lot 102 Farrall Road, Midvale

Project No: EP16-009(09)

Prepared for Peet Stratton Pty Ltd
February 2020



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Executive Summary

This *Rehabilitation and Vegetation Management Plan* has been prepared to outline the proposed restoration and management of areas of native vegetation within proposed area of public open space in the southern portion of Lot 102 Farrall Road, Midvale, as shown in the approved *Farrall Road Local Structure Plan*.

The goals of the *Rehabilitation and Vegetation Management Plan* include the following:

1. Restore approximately 5,278 m^2 of FCT 20c vegetation in 'degraded' or 'completely degraded' condition[1], such that a vegetation condition rating of 'good' or better is achieved.
2. Manage approximately 4,565 m^2 of FCT 20c vegetation in 'very good' or better condition to maintain its existing condition and restore any 'degraded' portions to 'good' or better condition.
3. Manage approximately 17,036 m^2 FCT 11 vegetation associated with Bush Forever Site 309 to maintain its existing condition and restore any 'degraded' portions to 'good' or better condition.

The *Rehabilitation and Vegetation Management Plan* will be implemented for a minimum of five years and will be handed over to the City of Swan once the goals and objectives have been met.

The proposed implementation schedule for the *Rehabilitation and Vegetation Management Plan* is outlined in **Table E1 below**.

Table E1: Schedule of implementation for rehabilitation and management of the site (southern POS area identified in local structure plan over Lot 102 Farrall Road, Midvale).

Timeframe		Specific Task
Prior	December Year 0/January Year 1	Collect native seed from within Lot 102 Farrall Road
Year 1	Following first rains in late autumn / winter (approx.)	Undertake management area preparations (weed control, scalping, excavation etc.)
		Undertake direct vegetation transfer
		Undertake direct seeding
		Salvage large shrubs (e.g. zamia palms, grass trees)
	July to August	Undertake weed control as required
	November (approx.)	Order plants from specialist nursery
Year 2	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant tubestock in management areas using deep planting method
		Undertake direct seeding (as required)
		Contingency measures (if required)

[1] As defined by Keighery (1994) and DoEE (2016)

Table E1: Schedule of implementation for rehabilitation and management of the site (southern POS area identified in local structure plan over Lot 102 Farrall Road, Midvale) (continued)

Timeframe		Specific Task
Year 2 (cont'd)	June	Evaluate weed cover and requirement for weed control or contingency measures required
	July to August	Undertake weed control
	November (approx.)	Source plants
Year 3	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant supplementary tubestock in management areas using deep planting method (if required)
		Undertake direct seeding (as required)
		Contingency actions (if required)
	June	Evaluate weed cover and requirement for weed control or contingency measures required.
	July to August	Undertake weed control as required
Year 4	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant supplementary tubestock in management areas using deep planting method (if required)
		Undertake direct seeding (as required)
		Contingency actions (if required)
	June	Evaluate weed cover and requirement for weed control or contingency measures required.
	July to August	Undertake weed control as required
Year 5-handover	March	Evaluate management status and confirm on track to meet criteria
	To be confirmed (TBC)	Contingency actions (if required)
	TBC	Final handover to City of Swan

Table of Contents

1 Introduction 1

1.1 Document purpose and scope 1

2 Background 3

2.1 Planning context 3
2.2 Environmental context 3
2.2.1 Vegetation 3
2.2.1.1 Plant communities 3
2.2.1.2 Vegetation condition 4
2.2.2 TEC vegetation 8
2.2.3 Bush Forever Site 309 10
2.2.4 Black cockatoo habitat 10
2.2.5 Threats 10
2.3 Stakeholder engagement 11

3 Goals and Objectives 13

3.1.1 Target ecosystems 14

4 Implementation 16

4.1 Timeframe 16
4.2 Activities 16
4.3 Management areas 16
4.4 Input categories 16
4.5 Licenses and approvals 17
4.6 Stakeholder roles and responsibilities 18
4.7 Minimum standards 18

5 Methods 22

5.1 Pathogen risk reduction 22
5.2 Landform preparation 22
5.2.1 Weed control 22
5.2.2 Scalping 22
5.2.3 Excavation of voids to facilitate translocation 23
5.2.4 Topsoil/mulch application 23
5.2.5 Fauna habitat enhancement 23
5.3 Plant establishment 24
5.3.1 Translocation 24
5.3.2 Sourcing tubestock 24
5.3.3 Installing tubestock 27
5.3.4 Direct seeding 27
5.4 Weed control 28
5.4.1 Herbicide application 28
5.4.2 Hand weeding 29
5.5 Access control 29
5.5.1 Fencing 29
5.5.2 Paths 29
5.5.3 Signage 29
5.6 Pest animal management 30

6 Monitoring 31

6.1 Shrubland/woodland management area inspections 31
6.1.1 Vegetation condition assessment 31
6.1.2 Native plant density measurement 33

6.1.3 Photo-point monitoring 33
6.2 Wetland management area inspections 33
6.3 Evaluation 34
6.4 Reporting 34

7 References 35

7.1 General references 35
7.2 Online references 36

List of Tables

Table 1: Plant communities previously recorded within the site and Lot 102 (Emerge Associates 2015b, 2017b) 4
Table 2: Extent of vegetation condition categories previously recorded within the site and Lot 102 (Emerge Associates 2017b) 5
Table 3: Goals and objectives 13
Table 4: Methods proposed for each input category 17
Table 5: Management areas input categories 17
Table 6: Schedule of implementation for rehabilitation and management of the site 20
Table 7: Species and densities recommended for shrubland/woodland management areas 26
Table 8: Recommended vegetation condition scale based on Keighery (1994) and TSSC (2016) 32

List of Plates

Plate 1: Plant community **Mp** in 'excellent' condition 5
Plate 2: Plant community **BaBm** showing the presence of perennial veldt grass 6
Plate 3: Plant community **BaBm** in 'very good' condition 7
Plate 4: Cleared access track and 'degraded' and 'completely degraded' vegetation adjacent to plant community **Mp** (left) 8
Plate 5: Sandy cleared access track (right) adjacent to plant community **Mp** (left) 8
Plate 6: FCT 20c vegetation in 'very good' condition on the eastern side of the site 10
Plate 7: Representative image of FCT 20c - Shrublands and woodlands of the eastern Swan Coastal Plain (Talbot Road Bushland). 14

Figures

Figure 1: Site Location
Figure 2: Plant Communities
Figure 3: Vegetation Condition
Figure 4: Environmentally Significant Features
Figure 5: Management Areas and Intensity

Appendices

Appendix A

Subdivision Concept Plan

Appendix B

Lot 102 Landscape Plan

1 Introduction

Peet Stratton Pty Ltd (Peet) proposes to develop Lot 102 Farrall Road Midvale, Western Australia (Lot 102) for urban uses as part of the wider Movida residential development. Lot 102 contains Bush Forever Site 309 (also referred to as the Farrall Road Bushland), as well as remnants of the native vegetation 'floristic community type' (FCT) 20c 'eastern shrublands and woodlands' (Gibson *et al.* 1994).

FCT 20c is a 'threatened ecological community' (TEC) that is listed as 'endangered' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 'critically endangered' by the WA Minister for the Environment. This TEC, which is formally labelled 'shrublands and woodlands of the eastern Swan Coastal Plain', is hereafter referred to as the 'TEC'.

A Local Structure Plan (LSP) for Lot 102 was approved by the Western Australian Planning Commission (WAPC) on 15 September 2016 (as part of the wider Movida estate). The LSP retained Bush Forever Site 309 and the majority of FCT 20c vegetation in good or better condition within an area of POS within Lot 102. However, the LSP identified an area of approximately 800 m^2 as an 'area subject to further investigation'. While relatively small, this area was also identified as being representative of the TEC (Tauss & Associates 2016; Emerge Associates 2017a).

A subdivision concept for Lot 102 was referred to the Environmental Protection Authority (EPA) in September 2017 under section 38 of the *Environmental Protection Act 1986* for assessment of range of factors including the management of vegetation and the TEC. In May 2018, the EPA determined that the project would be 'assessed on referral information with additional information (2-week public review)'.

Following this determination, the EPA provided correspondence to Peet requesting additional information for assessment in October 2018. This included the requirement for an independent TEC study by an independent expert on threatened ecological communities; Dr Eddie Van Etten (van Etten 2019). An outcome of the independent TEC study was a recommendation to increase the buffer area applied to the TEC in the POS area proposed within Lot 102.

A Section 43A request for proposal change was submitted to the EPA in April 2019 and accepted by the EPA in May 2019. The subdivision concept updated to include an increased TEC buffer area is provided as **Appendix A**.

1.1 Document purpose and scope

This *Rehabilitation and Vegetation Management Plan* (RVMP) document has been prepared on behalf of Peet to guide restoration and management of vegetation and areas of the TEC within the POS area proposed in the approved LSP for Lot 102. The POS is shown in **Figure 1** and hereafter referred to as the 'site'.

The requirement for a RVMP has been informed by ongoing discussions with various stakeholders, including the Office of the Environmental Protection Authority (OEPA) (now EPA Services, Department of Water and Environmental Regulation), the Department of Biodiversity Conservation

and Attractions (DBCA), the Department of Planning, Lands and Heritage (DoPLH) and the City of Swan.

In addition, the RVMP has been prepared to support the following environment and planning approvals:

- Referral of a subdivision application for Lot 102 to the Environmental Protection Authority (EPA) pursuant to Section 38 of the *Environmental Protection Act 1986*.
- Referral of the proposed action (to implement residential development over the LSP area) to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) pursuant to the EPBC Act.
- Vesting of the public open space (POS) area that includes Bush Forever Site 309, remnant areas of TEC and landscaped areas identified in the LSP over Lot 102 to City of Swan, as the future management authority.

The RVMP has been designed with attention to the six principles outlined in *The National Standards for the Practice of Ecological Restoration in Australia* (Standards Reference Group SERA 2017):

1. Ecological restoration practice is based on an appropriate local indigenous reference ecosystem.
2. Restoration inputs will be dictated by level of resilience and degradation.
3. Recovery of ecosystem attributes is facilitated by identifying clear targets, goals and objectives.
4. The goal of ecological restoration is full recovery, insofar as possible, even if outcomes take long timeframes or involve high inputs.
5. Restoration science and practice are synergistic.
6. Social aspects are critical to successful ecological restoration.

2 Background

2.1 Planning context

Lot 102 is zoned 'urban' and 'residential development' under the *Metropolitan Region Scheme* (MRS) and the City of Swan *Local Planning Scheme (LPS) No. 17* respectively. As previously indicated the LSP for the wider Movida estate was approved by the WAPC on 15 September 2016. The LSP approval noted that a 'rehabilitation and vegetation management plan' (RVMP) may be required to be prepared and implemented as a condition of subdivision.

The portion of the LSP relevant to the RVMP is a POS reserve that occupies the southern third of Lot 102 (the site). This POS area was provided in the LSP to allow for the retention of Bush Forever Site 309, a 50 m buffer to the eastern portion of Bush Forever Site 309 and the protection of the largest and best condition patch of TEC within Lot 102. An independent expert review of TEC impacts and management was requested by the EPA which identified that management of the larger patch of TEC within the proposed POS area provided the most practical conservation outcome for the occurrence of TEC within Lot 102 (van Etten 2019). The site also incorporates an area of landscaping to provide space and recreation facilities to members of the public.

2.2 Environmental context

A range of environmental investigations have been completed across the LSP area to date, including specific fauna, flora and vegetation surveys: Coffey Environments (2010), Emerge Associates (2015b) and Tauss & Associates (2016). In Emerge Associates (2017a) the results of these investigations were reviewed and the flora and vegetation assessment for Lot 102 was updated to reflect best available information. General environmental information on Lot 102 is also provided in the *Environmental Assessment and Management Strategy* (EAMS) prepared by Emerge Associates to support the initial Farrall Road LSP (Emerge Associates 2015a). Specific information relevant to the site is outlined below on the basis that general context is adequately described in these previous documents.

The type and condition of native vegetation previously identified within the site by (Emerge Associates 2015b, 2017b).is described in **Section 2.2.1**. The vegetation within Lot 102 is significant because it includes three areas of vegetation identified as the TEC (as described in **Section 2.2.1**), it includes remnants of the poorly reserved 'Forrestfield' regional vegetation complex (DBCA 2019) and wetland vegetation within Bush Forever Site 309 (as described in **Section 2.2.3**).

2.2.1 Vegetation

2.2.1.1 Plant communities

Five plant communities were identified within the site and Lot 102, as described in **Table 1** and shown in **Figure 2** (Emerge Associates 2015b, 2017b).

The **BaBm** vegetation was considered to represent FCT 20c 'eastern shrublands and woodlands'. This FCT is linked to a Commonwealth listed TEC, as discussed in **Section 2.2.2**.

The **Mp** vegetation was considered to represent FCT 11 'wet forests and woodlands'. This vegetation lies within Bush Forever Site 309, as discussed in **Section 2.2.3**.

Plant communities **BiMa** and **Cc** were considered too altered to represent an FCT.

Table 1: Plant communities previously recorded within the site and Lot 102 (Emerge Associates 2015b, 2017b)

Plant community	Description	Area (ha)	
		Within Lot 102	Within site
BaBm	Sparse to open woodland of *Banksia attenuata* and *Banksia menziesii* over open shrubland to shrubland of *Adenanthos cygnorum* and *Allocasuarina humilis* over low sparse shrubland to shrubland of *Conostephium pendulum*, *Stirlingia latifolia* and Hibbertia spp. over forb and sedgeland of *Lyginia* spp., *Dasypogon bromeliifolius*, *Conostylis aculeata*, *Podotheca gnaphalioides* and forb/grassland of pasture weeds.	2.52	0.86
Bima	Open woodland to woodland of *Banksia ilicifolia, B. menziesii* and *B. attenuata* over scrubland to tall open shrubland of *Adenanthos cygnorum* and *Stirlingia latifolia* over low open shrubland *Acacia huegelii* and *Hemiandra pungens* over open native herbland and grassland of pasture weeds such as **Ehrharta calycina*[2].	0.85	0.08
Cc	Woodland of *Corymbia calophylla* over shrubland *Jacksonia* spp., *Adenanthos cygnorum* and **Leptospermum laevigatum* (or shrub layer absent) over closed forb/grassland of pasture weeds.	0.22	-
Mp	Woodland to low open forest of *Melaleuca preissiana*, with emergent *Corymbia calophylla* over sparse shrubland of *Astartea scoparia, Marianthus* sp., *Xanthorrhoea preissii* and *Acacia pulchella* over sedgeland to closed sedgeland of *Dielsia stenostachya* and *Cyperaceae* sp. and open forbland of *Corynotheca micrantha* subsp. *micrantha*, *Drosera* spp. and *Burchardia congesta*.	1.63	1.62
PC	Sparse native and planted exotic trees over closed forb/grassland of pasture weeds	3.14	0.71
Total		**8.36**	**3.27**

2.2.1.2 Vegetation condition

The above plant communities range from 'completely degraded' to 'excellent' condition using the Keighery (1994) scale. The extent of vegetation by condition category is detailed in **Table 2** and shown in **Figure 3.**

[2] The '*' asterisk denotes species is not native to Western Australia.

Table 2: Extent of vegetation condition categories previously recorded within the site and Lot 102 (Emerge Associates 2017b)

Condition category (Keighery 1994)	Size (ha)	
	Within Lot 102	Within site
Pristine	0	0
Excellent	1.40	1.39
Very good	0.07	0.07
Good	0.53	0.33
Degraded	3.22	0.76
Completely degraded	3.14	0.71
Total	**8.36**	**3.27**

The highest quality vegetation is located within the south western portion of Lot 102 within plant community **Mp**. This vegetation comprises an intact vegetation structure with native canopy and understorey species, as shown in **Plate 1.** Cover and diversity of non-native species was low. Some degraded areas occur around the margins of the **Mp** vegetation, where native understorey is replaced by a closed grassland of **Ehrharta calycina* (perennial veldt grass), **Ehrharta longifolia* (annual veldt grass) and **Eragrostis curvula* (African love grass) with localised occurrence of the bulb **Watsonia meriana* var. *bulbillifera* (bugle lily).

*Plate 1: Plant community **Mp** in 'excellent' condition*

According to the vegetation condition scale for the banksia woodland TEC (DoEE 2016), the majority of the **BaBm** vegetation was mapped as being in 'degraded' condition, with very low native species diversity and the aggressive weed species **Ehrharta calycina* (perennial veldt grass), as shown in **Plate 2**. Three areas of **BaBm** in the eastern portion of the site were mapped as being in 'good' condition, with obvious signs of disturbance but higher native species diversity and more intact structure than vegetation in 'degraded' condition. A portion of **BaBm** in the south-eastern corner was mapped as being in 'very good' condition due to a relatively intact vegetation structure and higher native species diversity than areas of **BaBm** in lesser condition, as shown in **Plate 3**.

*Plate 2: Plant community **BaBm** showing the presence of perennial veldt grass*

*Plate 3: Plant community **BaBm** in 'very good' condition*

The **BiMa** and **Cc** vegetation were mapped as being in 'degraded' condition due to low native species diversity and altered structure.

A large part of the site has been disturbed and was mapped as being in 'completely degraded' condition (**Plate 4**). Some of these areas comprise completely cleared tracks which have been historically used for access across the site (**Plate 5**). Few native flora species remain in these areas, although the native annual herb *Podotheca gnaphalioides* may be present. The aggressive weed perennial veldt grass was dominant in most 'degraded' and 'completely degraded' areas.

*Plate 4: Cleared access track and 'degraded' and 'completely degraded' vegetation adjacent to plant community **Mp** (left)*

*Plate 5: Sandy cleared access track (right) adjacent to plant community **Mp** (left)*

2.2.2 TEC vegetation

The 'shrublands and woodlands of the eastern Swan Coastal Plain' TEC is directly linked to FCT 20c, as determined in the Gibson *et al.* (1994) regional floristic assessment of the southern Swan Coastal

Plain. FCT 20c occurs on the transitional Forrestfield unit and soils of the Ridge Hill Shelf, on the Swan Coastal Plain adjacent to the Darling Scarp, but also extends marginally onto the alluvial clays deposited on the eastern fringe of the Swan Coastal Plain. The community reflects this transitional landform and soil area between the Darling Scarp and the Swan Coastal Plain, with many species present being more common on the Darling Scarp and others more commonly associated with marri or wandoo woodlands on heavy soils (English and Blyth 2000). As a consequence FCT 20c is a biodiverse community with a mean species richness of 64 (Gibson *et al.* 1994).

FCT 20c occurs as a shrubland or woodland, of *Banksia attenuata* and *Banksia menziesii*, sometimes with *Allocasuarina fraseriana*, over diverse shrub and herb layers (DoEE 2016). The shrub layer usually includes *Adenanthos cygnorum, Hibbertia huegelii, Allocasuarina humilis, Bossiaea eriocarpa, Hibbertia hypericoides* and *Stirlingia latifolia*. Common herbs include *Conostylis aurea, Trachymene pilosa, Lomandra hermaphrodita, Burchardia umbellata* and *Patersonia occidentalis*. Common sedge species include *Mesomelaena pseudostygia* and *Lyginia barbata* (English and Blyth 2000).

The FCT 20c community is likely to have been rare prior to extensive clearing of the Forrestfield geomorphological unit (Gibson *et al.* 1994). Based on the interim recovery plan for the community only two significant known occurrences of FCT 20c remain (English and Blyth 2000; DEC 2006). One of these is the Talbot Road Bushland Reserve, located approximately 700 m east of the site, and the other is the Bushmead Rifle Range in Helena Valley, approximately 4.5 km south of the site. These bushland areas therefore provide the most appropriate reference sites for FCT 20c. Historically, the TEC within the site was contiguous with vegetation within the Talbot Road Bushland Reserve.

The presence of FCT 20c vegetation in the site was confirmed via surveys by Tauss and Associates and Emerge Associates in May and June 2016 (Tauss & Associates 2016; Emerge Associates 2017a) and mapped by the Department of Parks and Wildlife (now Department of Biodiversity, Conservation and Attractions (DBCA)) in 2016. An independent study of the TEC was undertaken within the site by Dr Eddie Van Etten in 2019 (van Etten 2019).

Based on the results of the independent study, three patches of plant community **BaBm** representing the TEC are considered to be present in the site: one larger patch in the south eastern portion of Lot 102 (to the east of Bush Forever Site 309 as shown in **Figure 4**) and two smaller patches in the north eastern portion of Lot 102. DBCA mapping of the TEC within Lot 102 identifies a further patch of the TEC associated with a historical fence line. This patch was considered too small and linear to be considered a representative of the TEC (van Etten 2019). Vegetation adjacent to these patches (excepting Bush Forever Site 309) comprise lower quality patches of FCT 20c vegetation (or vegetation that would have previously represented FCT 20c) which do not represent the TEC.

The vegetation in the site determined to represent the TEC was described as 'sparse to open woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over open shrubland to shrubland of *Adenanthos cygnorum* and *Allocasuarina humilis* over low sparse shrubland to shrubland of *Conostephium pendulum, Stirlingia latifolia* and *Hibbertia* spp. over forb and sedgeland of *Lyginia* spp., *Dasypogon bromeliifolius*, *Conostylis aculeata*, *Podotheca gnaphalioides* and forb/grassland of pasture weeds' (Emerge Associates 2015b). A representative image of the TEC is shown in **Plate 6.**

Plate 6: FCT 20c vegetation in 'very good' condition on the eastern side of the site

2.2.3 Bush Forever Site 309

Bush Forever Site 309 (Farrall Road Bushland, Stratton) is located in the south western portion of Lot 102 (**Figure 4**). The attributes contributing to the regional significance of Bush Forever Site 309 include the representation of ecological communities and general criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation (Government of WA 2000).

Bush Forever Site 309 contains plant community **Mp** which is a seasonal wetland community that represents FCT 11 (refer **Section 2.2.1**).

The part of the site that includes Bush Forever Site 309 is mapped as part of a 'multiple use' wetland (**Figure 4**) but due to the generally excellent condition of vegetation present it is considered to be more representative of a 'conservation category' wetland (Emerge Associates 2015b).

2.2.4 Black cockatoo habitat

Species such as *Banksia attenuata*, *Banksia menziesii, Corymbia calophylla, Eucalyptus marginata* and *Eucalyptus todtiana* located within the site are known to provide foraging habitat for three species of black cockatoo listed as threatened under the EPBC Act and BC Act.

2.2.5 Threats

The primary threats requiring management within the site are:

- disturbance (physical)
- weed invasion
- frequent fire

- pest animals
- pathogens.

Physical disturbance includes disturbance from unauthorised vehicle access and rubbish dumping as well as unmanaged pedestrian access.

Grass weeds, particularly perennial veldt grass, are the primary weed issue, although a range of woody, herbaceous and bulbous weeds also occur.

While the vegetation within the site is adapted to fire, frequent fires may alter vegetation composition. The high cover of grassy weeds present in Lot 102 makes it vulnerable to fire (ignited from natural causes and/or due to arson).

Pest animals such as foxes and rabbits are likely to occur in the site and pose a threat to the native ecology within the site and proposed restoration due to herbivory.

The soil borne water mould *Phytophthora cinnamomi* (dieback) occurs on the Swan Coastal Plain. Dieback kills susceptible plants by attacking their root system which inhibits uptake of water and nutrients and is spread through movement of soil and mud, especially by vehicles and footwear. (DPaW 2015). A large range of native flora species are susceptible to dieback including many that are present within the site There is no practical large-scale cure for dieback and therefore containment is the primary option available for management. It is unknown whether dieback occurs in the site. It may occur and it may also have previously occurred. Given the site's urban context preventing the potential for the introduction of dieback would be extremely difficult to guarantee.

2.3 Stakeholder engagement

The following stakeholders were consulted on the preparation of this document:

- Department of Biodiversity Conservation and Attractions (DBCA)
- Department of Planning, Lands and Heritage (DoPLH)
- EPA Services, Department of Water and Environmental Regulation
- The City of Swan.

This involved an onsite meeting with DBCA, DoPLH and EPA Services at Lot 102 to discuss the RVMP on 22 November 2016.

A separate meeting was held on 16 February 2017 with the City of Swan to discuss the RVMP and the LSP amendment.

Engagement with these stakeholders did not reveal any areas of concern and all parties were generally supportive of the content and intent of the RVMP.

EPA Services subsequently sought expert opinion from Dr Eddie van Etten who conducted a study of the management implications of areas of TEC within Lot 102. Dr Eddie van Etten's report was similarly generally supportive of the content and intent of the RVMP. Updates made to this version of the RVMP have been made to address recommendations provided in van Etten (2019).

Prior to public advertising, comment was also provided from DAWE, DBCA and internally within EPA Services on the content of the RVMP, including revegetation targets and completion criteria, species selection, dieback management and revegetation methods. Relevant updates have been provided in this version of the RVMP.

3 Goals and Objectives

In accordance with the LSP, the largest and best condition patch of TEC vegetation and all wetland vegetation within Bush Forever Site 309 will be retained within the site, as shown in **Figure 4**.

In addition to this the goals of the RVMP are as follows:

1. Restore approximately 5,278 m^2 of FCT 20c vegetation in 'degraded' or 'completely degraded' condition, such that a vegetation condition rating of 'good' or better is achieved.

2. Manage approximately 4,565 m^2 of FCT 20c vegetation in 'very good' or better condition to maintain its existing condition and restore any 'degraded' portions to 'good' or better condition.

3. Manage approximately 17,036 m^2 FCT 11 vegetation associated with Bush Forever Site 309 to maintain its existing condition and restore any 'degraded' portions to 'good' or better condition.

Specific objectives based on these goals are outlined in **Table 3**. The objectives include structural and compositional requirements related to the target ecosystem of FCT 20c and criteria for assessing vegetation condition (adapted from TSSC (2016) with reference to Keighery (1994) and Casson et al. (2009), and comments by DBCA on the previous version of this RVMP (Emerge Associates 2017a).

The objectives provide measurable indicators of vegetation condition "state", such that future performance against each goal can be evaluated. Further information on and discussion of vegetation condition and its application in evaluation of restoration performance is provided in **Section 6**.

Table 3: Goals and objectives

Goal	Objectives
1. Restore approximately 5,278 m2 of FCT 20c vegetation in 'degraded' or 'completely degraded' condition, to achieve a vegetation condition rating of 'good' or better.	1.1 The canopy layer species *Banksia attenuata*, *Banksia menziesii*; and more occasionally *Allocasuarina fraseriana*, *Eucalyptus marginata* and *E. todtiana* are present. 1.2 The combined density of canopy layer species is between one plant per 100 m^2 and one plant per 25 m^2. 1.3 The shrub/herb/sedge layer contains a variety of appropriate native species that have been recorded in FCT 20c vegetation during previous flora and vegetation surveys within Lot 102 (Emerge Associates 2015b; Tauss & Associates 2016) or from sample plots for FCT 20c within Gibson *et al.* (1994). 1.4 The combined shrub/herb/sedge layer species density is greater than 4 plants per m^2. 1.5 Total native species richness is at least 20% of mean species richness recorded from sample plots sites for FCT 20c within Gibson *et al.* (1994). 1.6 Weed cover is less than 20% in any 20 x 20 m portion of a management area.

Table 3: Goals and objectives (continued)

Goal	Objectives
2. Undertake management of approximately 4,565 m^2 of FCT 20c vegetation in 'very good' or better condition to maintain its existing condition and restore any 'degraded' portions to 'good' or better condition	2.1 The shrub /herb /sedge layer contains a variety of appropriate native species that have been recorded from previous flora and vegetation surveys within Lot 102 (Emerge Associates 2015b; Tauss & Associates 2016) or from relevant reference sites for FCT 20c within Gibson et al. (1994). 2.2 Total native species richness is greater than 50% of mean species richness recorded from sample plots sites for FCT 20c within Gibson et al. (1994). 2.3 Weed cover is less than 5% in any 20 x 20 m portion of a management area.
3. Undertake management of approximately 17,036 m^2 FCT 11 vegetation associated with Bush Forever Site 309 to maintain its existing condition and restore any 'completely degraded' and 'degraded' portions to 'good' or better	3.1 The shrub /herb /sedge layer contains a variety of appropriate native species that have been recorded in FCT 11 vegetation during previous flora and vegetation surveys within Lot 102 (Emerge Associates 2015b; Tauss & Associates 2016) or from relevant sample plots for FCT 11 within Gibson et al. (1994). 3.2 Weed cover is less than 20% in any 20 x 20 m portion of a management area.

3.1.1 Target ecosystems

The target ecosystem for TEC restoration is FCT 20c vegetation such as that found in Talbot Road Bushland, approximately 700 m to the east of the site, as shown in **Plate 7.**

Plate 7: Representative image of FCT 20c - Shrublands and woodlands of the eastern Swan Coastal Plain (Talbot Road Bushland).

To ensure that the management is effective in restoring the specific vegetation that is present within the site, reference information will first be derived from previous flora and vegetation surveys within the site (Emerge Associates 2015b; Tauss & Associates 2016). In addition, understanding of the flora composition of the target ecosystem is provided by regional floristic surveys like Gibson *et al.* (1994). A total of 9 quadrats for FCT 20c were sampled in Gibson *et al.* (1994), most of which were located within the Talbot Road Bushland.

The target ecosystem for wetland management are is FCT 11. Floristics for FCT 11 can also be obtained from Emerge Associates (2015b) and Gibson *et al.* (1994).

4 Implementation

The requirement for implementation of this RVMP is expected to be a condition of subdivision approval. Therefore, the RVMP will be implemented following final LSP amendments and subdivision of the approved development area within Lot 102.

4.1 Timeframe

The RVMP will be implemented for a minimum of five years and then up until handover of the site to the City of Swan. Subject to subsequent agreement with the City of Swan, handover will only occur once the goals and objectives outlined in **Table 3** are met.

Implementation of a post-handover management plan is expected to be undertaken over long term timeframe (i.e. in perpetuity).

4.2 Activities

The primary activities proposed for management within the site include:

- pathogen risk reduction (refer **Section 5.1**)
- landform preparation (refer **Section 5.1**)
- plant establishment (refer **Section 5.3**)
- weed control (refer **Section 5.4**)
- access control (refer **Section 5.5**).

4.3 Management areas

Management areas are defined within the site to assist in coordinating management, as shown in **Figure 5**. A landscape plan detailing management areas and landscaping features is shown in **Appendix B**.

The management areas are categorised based on the type of vegetation that occurs within them or is proposed to occur within them. The management areas associated with FCT 20c are referred to as 'shrubland/woodland' management areas and the management area associated with FCT 11 is referred to as a 'wetland' management area. The remaining portion of the site not identified for native vegetation management will be developed as a landscaped area within the POS. In this area landscaping will be conducted to create amenity and opportunities for recreation.

Each management area is further classified based on input categories and associated methods that are proposed to be conducted within them (refer **Section 4.3** below).

4.4 Input categories

Assigning input categories assists in the selection of management methods and helps to ensure the intensity of management applied within each management area is appropriate for existing values

and threats. Three input categories have been applied to management areas within the site including:

- low
- targeted (infill)
- intensive.

The methods proposed for each input category are shown in **Table 2**.

Table 4: Methods proposed for each input category

Input category	Methods				
	Landform preparation	Plant establishment	Weed control	Access control	Dieback risk reduction.
Low	-	-	✓	✓	✓
Targeted	-	✓ (infill)	✓	✓	✓
Intensive	✓	✓	✓	✓	✓

Management areas 'shrubland/woodland – 1' and 'wetland – 1' have been assigned to a low input category due to the presence of existing intact native vegetation (TEC vegetation and wetland vegetation within Bush Forever Site 309, as described in **Section 2.2.1** and **Section 2.2.3** respectively). 'Shrubland/woodland – 2' management area has been assigned a targeted input category due to the presence of existing native vegetation interspersed with bare and/or weedy patches which can be planted. The four remaining 'shrubland/woodland' management areas have been assigned an intensive input category due to the low cover and diversity of native species and high weed cover.

Each management area/input category combination is associated with goals and objectives (refer **Table 3**). Goal 1 applies to 'shrubland/woodland' areas 2,3,4,5 and 6, goal 2 applies to 'shrubland/woodland-1' and goal 3 applies to 'wetland – 1'. A summary of input categories assigned to each management area is shown in **Table 5** and in **Figure 5**.

Table 5: Management areas input categories

Management area	Input category	Approximate area (m^2)	Applicable goal (Table 1)
Shrubland/woodland - 1	Low	4,565	2
Shrubland/woodland - 2	Targeted (infill)	1,833	1
Shrubland/woodland - 3	Intensive	1,688	
Shrubland/woodland - 4	Intensive	527	
Shrubland/woodland - 5	Intensive	435	
Shrubland/woodland - 6	Intensive	794	
Wetland - 1	Low	17,036	3
Landscaping	Not subject to this RVMP	5,841	N/A

4.5 Licenses and approvals

The requirement for permits to take native vegetation will be discussed with DBCA prior to the commencement of works. Permits under the *Biodiversity Conservation Act 2016* (BC Act) and the BC Regulations may be required to undertake proposed activities such as seed collection and translocation (refer **Section 5**).

Approval under the BC Act will also be required to modify any occurrence of the FCT 20c TEC within the site. Approval to modify TEC can be obtained via submission of a form available on the DBCA website (DBCA 2019).

4.6 Stakeholder roles and responsibilities

Stakeholders that will have important roles in the RVMP include:

- Peet Stratton Pty Ltd
- City of Swan
- DBCA
- interested community members.

Peet will be responsible for the implementation of this RVMP until handover of the site to the City of Swan.

Following handover the site will be transferred to the Crown and continued to be managed for conservation purposes by the City of Swan.

Peet commits to implementing the RVMP for at least five years and until the goals and objectives have been met, after which the site will be handed over to the City of Swan. Handover prior to meeting the goals and objectives will be at the discretion of the City of Swan and will be subject to the site being on a trajectory to achieve the objectives.

4.7 Minimum standards

Minimum standards for the implementation of the RVMP (adapted from Standards Reference Group SERA (2017)) are outlined below:

- Restoration and management shall be undertaken in a manner that is responsive to natural processes and fosters and protects natural recovery.
- Primary implementation of activities shall be adequately followed up by secondary treatments, as required.
- All materials used during restoration will be sourced *in situ* or if this is not possible from the nearby locations on the Swan Coastal Plain. Any soil material brought into the site shall be as far as is practical certified as dieback free.
- All activities will exercise full compliance with occupational work, health and safety legislation and all other legislation including that relating to soil, air, water, oceans, heritage, species and ecosystem conservation.
- Management should at all times aim to avoid harm to people, environment or property.
- The site managers will communicate regularly with key stakeholders to keep them informed of progress of restoration and management.

4.8 Contingency

Contingency actions are only required if objectives are determined not to have been met (**Table 3**). Contingency actions would only be undertaken in years 2, 3 and 4 (**Table 6**).

If objectives are not met due to unforeseen factors, or over small areas due to issues with implementation, the relevant methods may be repeated. Note that many activities proposed in **Section 5** such as weed control, translocation, tubestock planting and direct seeding can result in variable outcomes, due to uncontrollable or unpredictable factors like extreme weather events, seasonal variation in rainfall or temperature and differences in landform, soil or biology. In addition, if predation (by rabbits for example) and/or physical disturbance (such as vandalism) occur these factors may impact outcomes within management areas.

Where it is demonstrated that the prescribed methods have been ineffective, alternative methods may adopted that better achieve the desired outcomes. In the event that this is required, further liaison with the City of Swan (or the clearing authority associated with the subdivision condition) is recommended to confirm the acceptability of any modification to proposed methodology.

4.9 Program of works

The tasks that may be completed within the site and Lot 102 are summarised below:

- Collect seed from native species within Lot 102.
- Prepare management areas for translocation, direct seeding and planting including;
    - translocation of vegetation in late autumn
    - weed control
    - plant tubestock and complete direct seeding in late autumn / winter period.
- Inspect management areas to evaluate performance against evaluation criteria (refer **Section 6.2**).
- Undertake weed control actions as required.
- Undertake contingency actions (e.g. plant ordering) if required.

A schedule of implementation is provided as **Table 6**.

Table 6: Schedule of implementation for rehabilitation and management of the site

Timeframe		Specific Task
Prior	December Year 0/January Year 1	Collect native seed from within Lot 102 Farrall Road
Year 1	Following first rains in late autumn / winter (approx.)	Undertake management area preparations (weed control, scalping, excavation etc.)
		Undertake direct vegetation transfer
		Undertake direct seeding
		Salvage large shrubs (e.g. zamia palms, grass trees)
	July to August	Undertake weed control as required
	November (approx.)	Order plants from specialist nursery
Year 2	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant tubestock in management areas using deep planting method
		Undertake direct seeding (as required)
		Contingency measures (if required)
	June	Evaluate weed cover and requirement for weed control or contingency measures required
Year 2 (cont'd)	July to August	Undertake weed control
	November (approx.)	Source plants
Year 3	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant supplementary tubestock in management areas using deep planting method (if required)
		Undertake direct seeding (as required)
		Contingency actions (if required)
	June	Evaluate weed cover and requirement for weed control or contingency measures required.
	July to August	Undertake weed control as required

Table 6: Schedule of implementation for rehabilitation and management of the site (continued)

Timeframe		Specific Task
Year 4	March	Evaluate management status and confirm on track to meet criteria
	Following first rains in late autumn / winter (approx. April)	Undertake weed control in management areas (as required)
		Plant supplementary tubestock in management areas using deep planting method (if required)
		Undertake direct seeding (as required)
		Contingency actions (if required)
	June	Evaluate weed cover and requirement for weed control or contingency measures required.
	July to August	Undertake weed control as required
Year 5-handover	March	Evaluate management status and confirm on track to meet criteria
	To be confirmed (TBC)	Contingency actions (if required)
	TBC	Final handover to City of Swan

5 Methods

Where appropriate, methods have been adopted as recommended in recently published expert scientific guidance *Banksia Woodlands A restoration Guide for the Swan Coastal Plain* (Stevens *et al.* 2016).

5.1 Pathogen risk reduction

To ensure dieback and other pathogens are not introduced into the site or to other locations from the site as a result of implementation of the RVMP, the following management measures adapted from advice provided by the Dieback Working Group will be undertaken:

- A dieback assessment will be undertaken within areas proposed to be removed and transferred during 'vegetation direct transfer' prior to relocation (refer **Section 5.3.1**).
- Vehicles, tools, equipment and machinery will be free of all mud, soil and plant material on arrival at the site.
- If vehicles, tools, equipment and machinery are temporarily removed from the site during works they must be free of all mud, soil and plant material on leaving the site and on return.
- If vehicles, tools, equipment and machinery have entered a known dieback infested area they will be thoroughly cleaned with a high-pressure hose and disinfected with bleach or fungicide product such as Phytoclean©, at an appropriate wash-down location.
- If fill or mulch material is imported to the site it will be, as far as is practical, certified as free of dieback.

5.2 Landform preparation

Stevens *et al.* (2016) recommend that site preparation is conducted in dry months (summer and autumn). The landform preparation methods below will be completed sequentially or as appropriate.

5.2.1 Weed control

Weed control may be required to prepare intensive and targeted management areas prior to planting or seeding (Stevens *et al.* 2016). Where weed cover is high and few native plants occur, a broad-spectrum herbicide formulation, such as Roundup© (glyphosate 360g/L), may be applied to achieve blanket control. However, as outlined in **Section 5.4**, in many parts of the site spot spraying, selective herbicide or manual methods may be necessary to minimise the risk of off target impact to existing native vegetation. Refer to **Section 5.4** for further information regarding weed control.

5.2.2 Scalping

Scalping, or removal of the top 100 mm to 150 mm of soil profile, is an effective way of reducing weed burden in heavily weed infested areas (Stevens *et al.* 2016). By removing the upper layer of the soil profile, the below ground parts of perennial weeds and weed seed is also removed. Scalping is particularly effective technique for controlling perennial grasses and may be a good option for preparing the areas of intensive management. The topsoil within intensive areas may then be

replaced with translocated vegetation and soil material (refer **Section 5.3.1**) or topsoil sourced from relative weed free locations within Lot 102 (refer **Section 5.2.4**).

5.2.3 Excavation of voids to facilitate translocation

Where 'vegetation direct transfer' is planned (refer **Section 5.3.1**) the soil profile should be excavated to the depth required width to create a void which matches the dimensions of translocated vegetation and soil material. Dimensions will depend on excavator bucket. Rodgers *et al.* (2011), who reported on a local (south west Western Australian) example of successful vegetation direct transfer, used a modified 1 x 1 m excavator bucket. Both civil construction and specialist restoration contractors will be able to advise appropriate machinery options and associated excavation depths.

Where translocation of large plants such as grass trees and zamia palms is planned (refer **Section 5.3.1**) the soil profile should be excavated to create a void which large enough to house the roots of the plant. A specialist restoration contractor will be able to advise appropriate machinery options and associated excavation depths for translocating these plants.

5.2.4 Topsoil/mulch application

In addition to translocation, topsoil may be harvested, as required[3], from parts of Lot 102 with higher native species cover and re-spread in intensive management areas. Top soil is acknowledged as best source for native seed and is the only way to source some native species found in banksia woodland that are difficult to propagate (Stevens *et al.* 2016).

Due to the degraded condition of vegetation within much of Lot 102 it is unavoidable that some weed seed will be transported in topsoil. Nonetheless, care will be taken to avoid taking topsoil from areas of high weed cover and weeds will be managed using weed control methods outlined in **Section 5.4**. In addition to, or in place of, topsoil application, a light layer of mulch (<50 mm) may be spread across intensive management areas.

Mulch may also be spread across the 'degraded' and 'completely degraded' portions of the 'wetland – 1' management area. Where mulch is used it will in the first instance be sourced from within Lot 102.

5.2.5 Fauna habitat enhancement

Fauna habitat elements such as logs, branches and woody debris may be salvaged during earthworks within the remainder of Lot 102. These items may be placed within intensive or targeted management areas to provide fauna habitat and encourage fauna inhabitation within the management areas.

Care must be taken when placing fauna habitat elements to ensure that native vegetation is not damaged. Therefore, it is recommended that fauna habitat elements are placed in open areas, following translocation or topsoil application (intensive areas only), but prior to planting of tubestock.

[3] In addition to or in place of vegetation direct transfer (Rodgers et al. 2011)

5.3 Plant establishment

Plant establishment methods below should be conducted sequentially, after landform preparation has been completed including weed control (**Section 5.4**). A combination of translocation, tubestock planting and seeding will be used to increase the native species diversity and cover in management areas.

5.3.1 Translocation

The patches of FCT 20c vegetation in 'good' and 'degraded' condition within the disturbance footprint, as shown in in **Figure 3**, provide an opportunity to salvage material for use in the intensive management areas. Two methods of translocation will be considered: 'direct vegetation transfer' and translocation of selected large shrubs such as *Isopogon drummondii*, *Macrozamia fraseri* (zamia palm) and *Xanthorrhoea preissii* (grass tree).

Direct vegetation transfer, also called 'habitat-' or 'community-translocation', involves the removal and relocation of intact mats or sods of vegetation and attached soil for rehabilitation purposes (Rodgers *et al.* 2011). For the site small sections of vegetation including small shrubs, herbs and sedge components, complete with soil surrounding their root areas, are relocated using a loader or other machinery. The sections of vegetation and soil are then placed in pre-prepared void as carefully as possible (refer **Section 5.2.3**). Some of the larger native plants will not survive being disturbed and moved. However, it is likely that a proportion will survive and, moreover, the seed and below ground storage organs of many species will be transferred, along with associated invertebrate, microbial and mycorrhizal (fungi) components. Because of the wide variety of organisms that may be relocated, direct vegetation transfer can result in superior restoration outcomes than could be achieved by planting and seeding alone (Rodgers *et al.* 2011).

Direct vegetation transfer should be conducted in late autumn to early winter when temperatures are cooling and seasonally higher rainfall is expected to commence, but prior to the seasonal germination of native annual and geophytic species. If translocation does not coincide with sufficient natural rainfall supplementary water may be applied to assist in bedding down the transferred material.

Isopogon drummondii, zamia palms and grass trees within the disturbance footprint of Lot 102 will be salvaged with assistance of specialist contractor. Zamia palms will primarily be used within the formal POS area adjacent to BF 309 but may also be used in other POS across the broader LSP area. The *Isopogon drummondii* and grass trees will be relocated to suitable parts of the intensive management areas.

It is recommended that the zamia palms and grass trees are removed by a specialist contractor who is expected to take the plants off site for hardening off in a nursery setting prior to returning them for installation as part of landscaping works. Supplementary water is likely to be required for multiple years to assist the zamia palms and grass trees to establish.

5.3.2 Sourcing tubestock

Where possible seed and cuttings collected within Lot 102 will be used to propagate tubestock, as using local provenance material is considered to provide superior restoration outcomes (Stevens *et*

al. 2016). Seeds from many species recommended for planting in the site have been already been collected from within the site (**Table 7**) and additional seeds and cuttings will be collected within the site prior to vegetation clearing. Where a shortfall exists for important species, seed or cutting material may be sourced from nearby parts of the Swan Coastal Plain or Darling Scarp. A revegetation contractor will be able to advise of a suitable provenance distance.

An accredited specialist revegetation nursery will be engaged to propagate the plants. The tubestock should be grown as tall as possible to facilitate deep planting as outlined in **Section 5.2.3**. The nursery or revegetation contractor can advise which species can be grown tall enough such that deep planting is appropriate. Before collection, the tubestock should be hardened off, in good condition and dieback-free.

A list of 39 species suitable for use in the shrubland/woodland management areas, and recommended tubestock numbers, is provided in **Table 7**. This species list is constructed from observations of FCT 20c vegetation on site, combined with species known to be present within FCT 20c. Seed has already been collected from within the site for 19 of these species, as indicated in **Table 7**. The other species are available from specialist nurseries but their use will be subject to availability of a local seed source. An experienced restoration contractor can advise of appropriate substitutes if availability of seeds and/or tubestock is limited for some species.

Plant numbers have been calculated based a target density of two (2) plants per m^2 after five years, assuming a 70% annual survival rate. Note that this target relates to tubestock derived plants only and actual plant density is expected to be higher due to the presence of remnant vegetation and the application of complementary translocation, topsoil and direct seeding methods. Initial planting density was increased to accommodate for expected plant mortality and reduce the requirement for future infill planting. As a general rule a 70% survival rate can be expected for most native plants in the first few years after planting, without supplementary water or maintenance, if they are installed correctly and early in the growing season. Plant survival should be expected to vary from year to year in response to differences in seasonal conditions and interference by other factors such as predation or disturbance.

Table 7: Species and densities recommended for shrubland/woodland management areas

Lifeform	Species	Indicative no. plants
Tree	*Allocasuarina fraseriana^*	40
	*Banksia attenuata^*	200
	*Banksia menziesii^*	200
	Eucalyptus marginata	20
	*Eucalyptus todtiana^*	20
Shrub/Herb	*Acacia applanata*	120
	Acacia huegelii	100
	*Acacia sessilis^*	100
	*Allocasuarina humilis^*	160
	*Boronia ramosa^*	120
	*Burchardia congesta^*	120
	*Conostylis aculeata^*	70
	Conostylis aurea	70
	*Dasypogon bromeliifolius^*	20
	Banksia dallanneyi	140
	*Gompholobium tomentosum^*	200
	Hemiandra pungens	200
	Hibbertia hypericoides	200
	*Hovea trisperma^*	80
	*Hypocalymma angustifolium^*	100
	Isopogon drummondii	100
	Jacksonia floribunda	80
	Jacksonia restioides	80
	*Leptospermum erubescens^*	40
	Melaleuca seriata	260
	Melaleuca trichophylla	340

Table 8: Species and densities recommended for shrubland/woodland management areas (continued)

Lifeform	Species	Indicative no. plants
Shrub/Herb	*Patersonia occidentalis*	120
	*Petrophile linearis^*	120
	*Phlebocarya ciliata^*	120
	Scholtzia involucrata	120
	*Stirlingia latifolia^*	120
	Verticordia densiflora var. densiflora	120
	Xanthorrhoea preissii	80
Grass / grass like	*Amphipogon amphipogonoides^*	40
	*Amphipogon turbinatus^*	40
	Lepidosperma squamatum	60
	Lomandra hermaphrodita	50
	Lyginia barbata	50
	Neurachne alopecuroidea	80
Total		**4,300**

^Seed already collected from within the site.

5.3.3 Installing tubestock

Tubestock should be installed using a deep planting method. For example, tubestock grown to 300 mm tall can be planted with only 50-75 mm of stem showing above the sand surface (WAPC 2003). This positions the roots much closer to water supplies and decreases water loss in hot conditions. Deep planting can also help to prevent herbivory from animals such as rabbits, resulting in the death of seedlings, which can easily re-sprout if the top of the plant is removed.

Tree bags are not recommended as per advice from Stevens *et al.* (2016).

5.3.4 Direct seeding

Direct seeding of selected native species will also be conducted. Seed has been collected within Lot 102 over two summers (2017 and 2018). Seeding lists and rates will be finalised following submission of tubestock order from remaining seed store. Key species for which seeding would be beneficial may include components of shrub layer that are known to germinate well from seed such as *Acacia* spp., *Allocasuarina* spp., *Eremaea pauciflora* and *Melaleuca* spp. and annual herbs such as *Podotheca gnaphalioides*.

Direct seeding will be conducted in early winter following or in conjunction with tubestock installation.

5.4 Weed control

Weed control will be required to reduce and limit weed cover within all management areas. In particular, weed control will be required as part of landform preparation in intensive management areas to reduce competition with establishing native plants. Following translocation, topsoil spreading, direct seeding and tubestock planting, weed control will then be required in late winter or spring to remove weeds that have established with translocated material and/or after planting. Ideally weeds are controlled before they reproduce.

The weed control treatments will then need to be repeated in subsequent years to reduce competition with establishing native plants and achieve weed cover targets. It is likely that weed control will need to be carried out one to two times per year until handover. Weed management should be guided by monitoring inspections as outlined in **Section 6.1**.

The most appropriate method to control weeds should be decided after annual site inspection has been completed. But may include both chemical (herbicide) and manual (hand weeding) approaches as outlined below.

To ensure weeds are not spread within the site or to other sites, the following management measures should be undertaken during management works:

- Topsoil from areas with high weed cover should be buried at depth and not re-used in management areas.
- Topsoil from areas with low weed cover should be immediately transferred into prepared parts of intensive management areas or if this is not practical stockpiled in relatively weed free location for later use.
- As far as is practical any imported fill or mulch material should be certified free of environmental weeds.

5.4.1 Herbicide application

For grass weeds a grass selective formulation such as Fusilade® Forte (13 ml/L or 6.5 L/ha) may be applied, without risking off target impact to most of the native species present. The best time to apply grass selective herbicide to control perennial veldt grass is between July and August (DPaW 2016a).

Note that native grass species such as *Microlaena stipoides* are present within Bush Forever Site 309 and *Neurachne alopecuroidea* and *Austrostipa* spp. are present within remnant FCT 20c vegetation. Care should be taken to avoid impacting upon these plants. Other native flora may also be sensitive to particular selective herbicide formulations. Therefore, herbicide application should be targeted to areas of higher weed cover and should be undertaken with caution to avoid off target impacts.

For bulbous weeds, a selective formulation such as 2,2-DPA 10 g/L + Pulse® may be applied. The best time to apply bulb selective herbicide to control *Watsonia meriana* is September as plants are flowering (DPaW 2016b).

Where weed cover is higher a broad-spectrum herbicide formulation such as Roundup© (glyphosate 360g/L) may be applied as a blanket spray over larger area or as a spot spray that carefully targets specific weed plants amongst native vegetation.

Herbicides should only be applied by a licenced pest management technician and in accordance with manufacturer's instructions as provided on product label. A licenced pest management technician will be able to advise what a suitable approach would be based on information obtained during a site inspection. Herbicide use in the wetland area should be in accordance with the recommendations contained in '*Water Note No. 22 Herbicide Use in Wetlands'* (WARC 2001) to prevent poisoning of frogs and tadpoles. Further guidance on control methods can be obtained from *Florabase* (Western Australian Herbarium 2019) and the Australian Pesticides and Veterinary Medicines Authority (APVMA) Permit No. 13333.

5.4.2 Hand weeding

Hand weeding can be successful approach for certain weed species and where weeds are present with relatively low abundance. Different techniques may be appropriate for different weed species and technical reference should be consulted where required to ensure manual control is as effective as possible. Further information on effective control methods can be obtained from *Florabase* (Western Australian Herbarium 2019).

5.5 Access control

Generally, public access to the management areas will be restricted to increase the success rate of the program, which will be achieved through the implementation of various measures discussed below. A landscape plan detailing proposed location of fencing and paths is provided in **Appendix B**.

5.5.1 Fencing

Fencing will be erected around the shrubland/woodland and wetland management areas (both sides of any paths) to restrict access. Gate(s) for maintenance access will be provided based on agreement with the City of Swan. The fencing specification will be determined in consultation with the future land manager for the site.

Fencing on the western boundary of the management area (generally aligning with the Bush Forever Site 309 boundary) has already been constructed following approval from the City of Swan. Fencing in this location is in accordance with the City of Swan 'Chain Link Fence and Gate Detail' (Drawing STD 58-3s Amendment A).

5.5.2 Paths

Access to the site will be managed via formal paths. The design of paths is yet to be finalised, but it is expected they will be constructed from compacted inert material or appropriate form of hardstand subject to approval from the City of Swan. Paths will be located within existing firebreaks. Sealed paths form hard edge interfaces to management areas and help reduce weed or turf encroachment.

5.5.3 Signage

Signage may be erected to identify management areas, which could involve educational material regarding the environmental value of the vegetation. This would involve consultation with the City of Swan.

5.6 Pest animal management

Pest animals will be managed as need arises using methods such as trapping, baiting and fumigation subject to advice from a licenced pest management technician. As outlined in **Section 5.3.3**, tubestock will be planted using a deep planting method to minimise any impacts from herbivory. Plastic tree guards are not recommended to be installed around tubestock (Stevens *et al.* 2016).

Monitoring (refer **Section 6**) will be undertaken to assess the presence of pests and impact of herbivory, and contingency actions (refer **Section 4.7**) will be initiated if impacts from pest animals are determined to be a cause for not meeting objectives.

6 Monitoring

Monitoring is required to enable the evaluation of the outcomes of management. Each management area is proposed to be inspected a minimum of two times per year. One inspection will occur in early autumn (circa March) to identify issues and determine plant establishment rates. The second inspection will occur in early winter (June) to inform the upcoming weed control program. Inspections will be completed either by a qualified and experienced person such as restoration contractor or environmental consultant.

Monitoring will be ongoing up until handover to the City of Swan.

6.1 Shrubland/woodland management area inspections

Shrubland/woodland management areas will be traversed by foot and as far as necessary the entirety of each management area inspected as follows:

- Vegetation composition and condition will be assessed by recording an inventory of native species present along with estimates and mapping of native plant density and weed cover.
- Areas of low native species establishment will be identified for contingency action and notes will be taken on the likely cause of low establishment.
- Photographs will be taken of significant features, including plant recruitment, losses or evidence of herbivory.
- Weed assessments will include identification of priority weeds for management.

A map showing areas that require further actions such as planting or weed management will be produced as part of the inspection.

6.1.1 Vegetation condition assessment

Assessing vegetation condition is conventionally a qualitative exercise. This presents problems for using vegetation condition to evaluate restoration success due to the potential for different outcomes between assessors. The Keighery (1994) vegetation condition scale is a categorical scheme that is commonly applied on the Swan Coastal Plain (refer to categories in **Table 6** below). Under the Keighery (1994) scale 'very good' condition vegetation can have a structure that appears altered, with obvious signs of disturbance and may include some more aggressive weeds. 'Good' condition vegetation can be significantly altered and include very aggressive weeds and partially cleared areas, while retaining at least a basic structure or the ability to regenerate it. 'Degraded' condition vegetation has a basic structure severely impacted by disturbance that would require intensive management to promote regeneration. Therefore, based on Keighery (1994) 'very good' condition generally implies vegetation has a relatively intact structure and composition, while 'good' condition implies that vegetation has a middling intactness; intermediate between being relatively intact and being 'degraded'.

Casson *et al*. (2009) aligned the Keighery (1994) vegetation condition scale with additional quantitative parameters. Using the Casson *et al*. (2009) scale, parameters relate to the structure, composition, level of disturbance and/or weeds and native plant recruitment are also assessed. For

example, 'very good' condition vegetation would be expected to have all structural layers present with minor modification, most flora species recorded within reference sites, a moderate to low level of ground disturbance and weed presence; and several flora species that demonstrate recruitment through the presence of seedlings or saplings. 'Good' condition vegetation would be expected to retain all expected structural layers but with discontinuous areas, diminished species presence, moderate levels of disturbance and only isolated recruitment by a limited selection of species (Casson *et al.* 2009).

The conservation advice for the banksia woodlands of the Swan Coastal Plain TEC defines a categorical condition rating system which is based on the Keighery (1994) scale with quantifiable parameters for native species diversity and weed cover (DoEE 2016).

The evaluation criteria for vegetation condition defined in this RVMP were adapted from the TSSC (2016) scheme, with reference to definitions in Keighery (1994) and Casson *et al*. (2009). In this RVMP criteria for native species diversity were further quantified by requiring that relative native diversity is calculated as a percentage of the mean species richness recorded from reference sites (Gibson *et al.* 1994), as outlined in **Table 8.** These criteria should be applied by mapping the native species and weed cover over the extent of management areas, including areas of low native or high weed cover.

Table 9: Recommended vegetation condition scale based on Keighery (1994) and TSSC (2016)

Category label	Definition (Keighery 1994)	Native species diversity / Weed cover (TSSC 2016)		Adapted native species diversity[1]
Pristine	Pristine or nearly so, no obvious signs of disturbance.	Typical native vegetation composition	Zero or close to	>70%
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	Native plant species diversity fully retained or almost so	Less than 10%	>70%
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing	High native plant species diversity	5-20%	50-70%
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	Moderate native plant species diversity	5-50%	20-50%

Table 8: Recommended vegetation condition scale based on Keighery (1994) and TSSC (2016) (continued)

Category label	Definition (Keighery 1994)	Native species diversity / Weed cover (TSSC 2016)		Adapted native species diversity[1]
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Low native plant species diversity	20-70%	<20%
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	Very low native plant species diversity	Greater than 70%	<20%

[1]Relative to expected natural range of diversity for that vegetation unit such as a 'floristic community type' (FCT) defined by (Gibson *et al.* 1994).

6.1.2 Native plant density measurement

A measure of native plant density will be obtained from a minimum of two randomly located samples within each shrubland/woodland management area. Sample units may include suitably scaled quadrat (e.g. 20 x 20 m for tree layer or 5 x 5 m for shrub layer), line intercept or other appropriate method (such as direct counts for tree layer). Smaller sample units may be recorded with a digital photograph (facing the ground). The location and data from each sample will be provided in the final report (refer **Section 6.4**).

6.1.3 Photo-point monitoring

Photo-points will be established to assist in cataloguing the progress of management areas. Photo-points should be recorded at an oblique angle such that the management area and the horizon are visible in the image. Successive photo-points should maintain the same view angle to allow direct comparison over time. At least three photo-points will be provided for each management area. The location and image data from photo points will be provided in the final report (refer **Section 5.4**).

6.2 Wetland management area inspections

The wetland management area should be inspected by foot and traversed to the extent required to inform weed control program. Areas where weed cover is low do not need to be regularly inspected. Areas of weed species cover should be identified for management and photographs taken of significant features. Care should be taken to ensure weed seed is not distributed on shoes or clothing by personnel undertaking management area inspections. No planting has been recommended for the wetland management area due to the generally excellent condition of vegetation. It is expected that weed control and subsequent natural regeneration will be sufficient to improve the condition of the small 'degraded' and 'completely degraded' portions within the wetland management area. If

monitoring determines that these portions are not improving, infill planting may be required and will be discussed with the City of Swan. If planting is required, the species to be installed will comprise understorey species present within the portion of plant community **Mp** in 'excellent' condition in the site, such as *Dielsia stenostachya*.

Vegetation condition within the wetland management area should be assessed and mapped as outlined in **Section 6.1.1**

6.3 Evaluation

Evaluation criteria for performance are provided by the objectives are outlined in **Table 3**.

After each monitoring event an experienced and qualified person, such as a restoration contractor or environmental consultant, will analyse the data by comparing it to the applicable objectives (refer to **Table 3**). Over time, this will provide an indication of whether each management area is on a trajectory to meet the goals and objectives. Management actions for the following six months will be informed by the results of this assessment. Evaluation will be ongoing up until handover to the City of Swan.

If unforeseen factors impact upon management areas (such as unauthorized access, herbivory from fauna such as rabbits, bushfire or vandalism) the management should be assessed based on its trajectory at the time and contingency actions considered following discussion with the City of Swan.

6.4 Reporting

A report summarising management outcomes will be provided to DBCA and the City of Swan following five years of implementation and prior to handover (if handover occurs after five years).

7 References

7.1 General references

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West Australian Planning Commission (WAPC) 2003, *Coastal Planning and Management Manual*, West Australian Planning Commission.

Water and Rivers Commission (WARC) 2001, *Water Note No. 22 - Herbicide Use in Wetlands*, East Perth.

7.2 Online references

Department of Parks and Wildlife (DPaW) 2016a, *FloraBase – The Western Australian Flora*, Perth, viewed November 2016, <https://florabase.dpaw.wa.gov.au/browse/profile/347

Department of Parks and Wildlife (DPaW) 2016b, *FloraBase – The Western Australian Flora*, Perth, viewed November 2016, <https://florabase.dpaw.wa.gov.au/browse/profile/1567>.

DBCA 2019, Threatened ecological communities, viewed 8 April 2019, <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities>.

Figures

Figure 1: Site Location

Figure 2: Plant Communities

Figure 3: Vegetation Condition

Figure 4: Environmentally Significant Features

Figure 5: Management Areas and Intensity

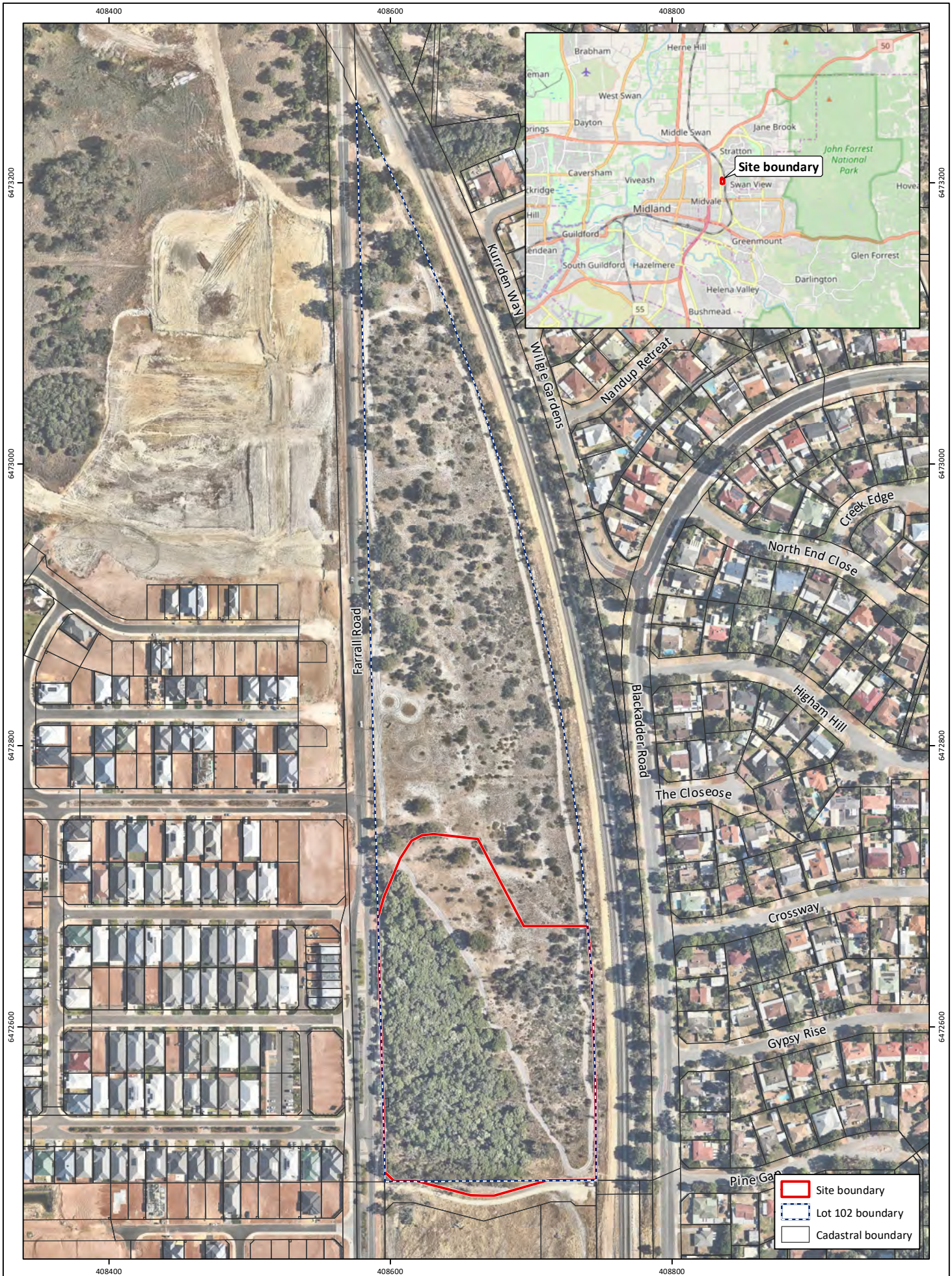

Figure 1: Site Location

Project:	Rehabilitation and Vegetation Management Plan Lot 102 Farrall Road Midvale
Client:	Peet Stratton Pty Ltd

Plan Number:
EP16-009(09)--F115a

Drawn:	AFF
Date:	17/02/2020
Checked:	RAO
Approved:	CKK
Date:	17/02/2020

N

0 50 100
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

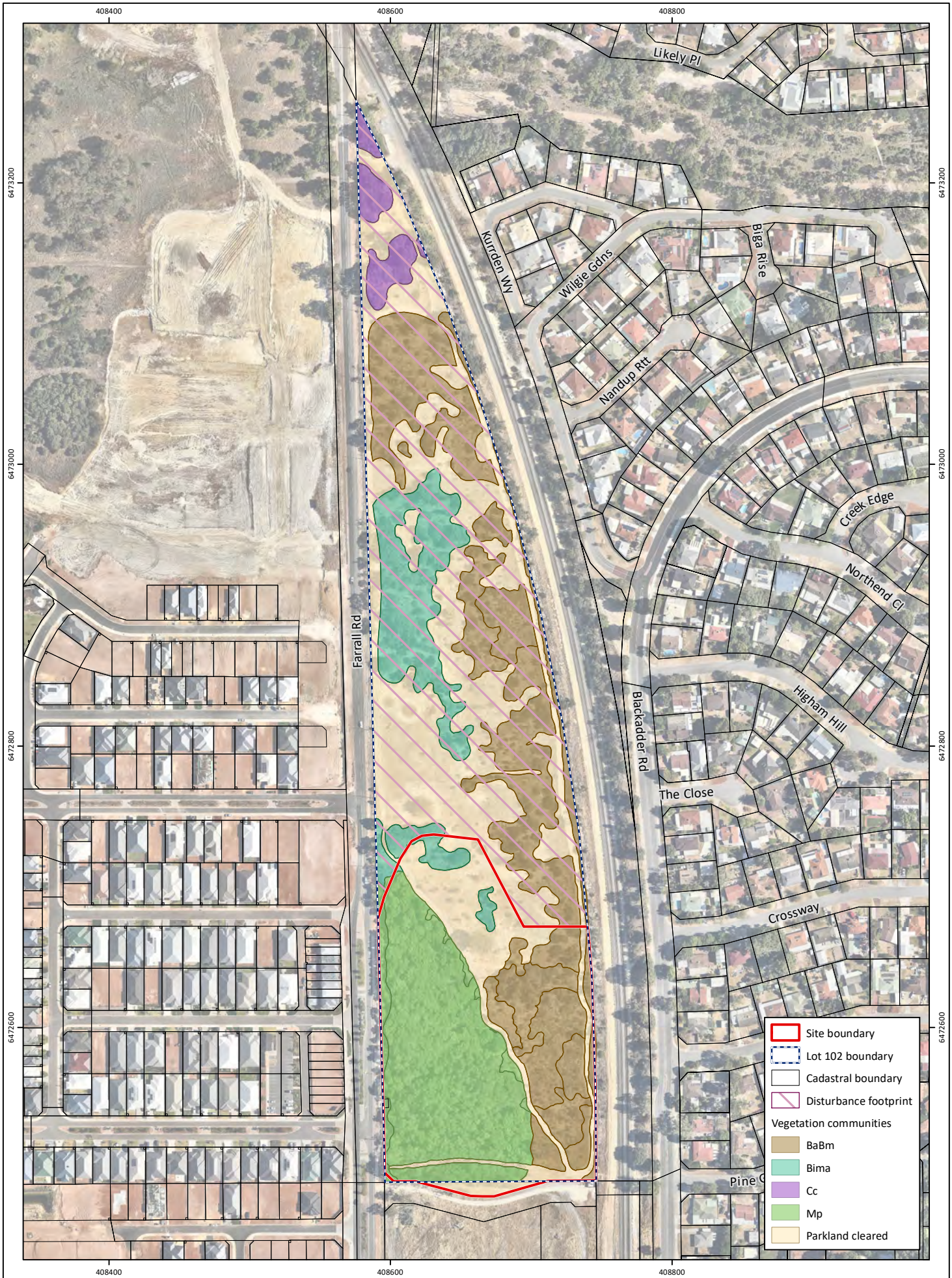

Figure 2: Plant Communities

Project:	Rehabilitation and Vegetation Management Plan Lot 102 Farrall Road Midvale
Client:	Peet Stratton Pty Ltd

Plan Number:
EP16-009(09)--F151

Drawn:	AFF
Date:	25/02/2020
Checked:	RAW
Approved:	TAA
Date:	25/02/2020

N

0 50 100
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

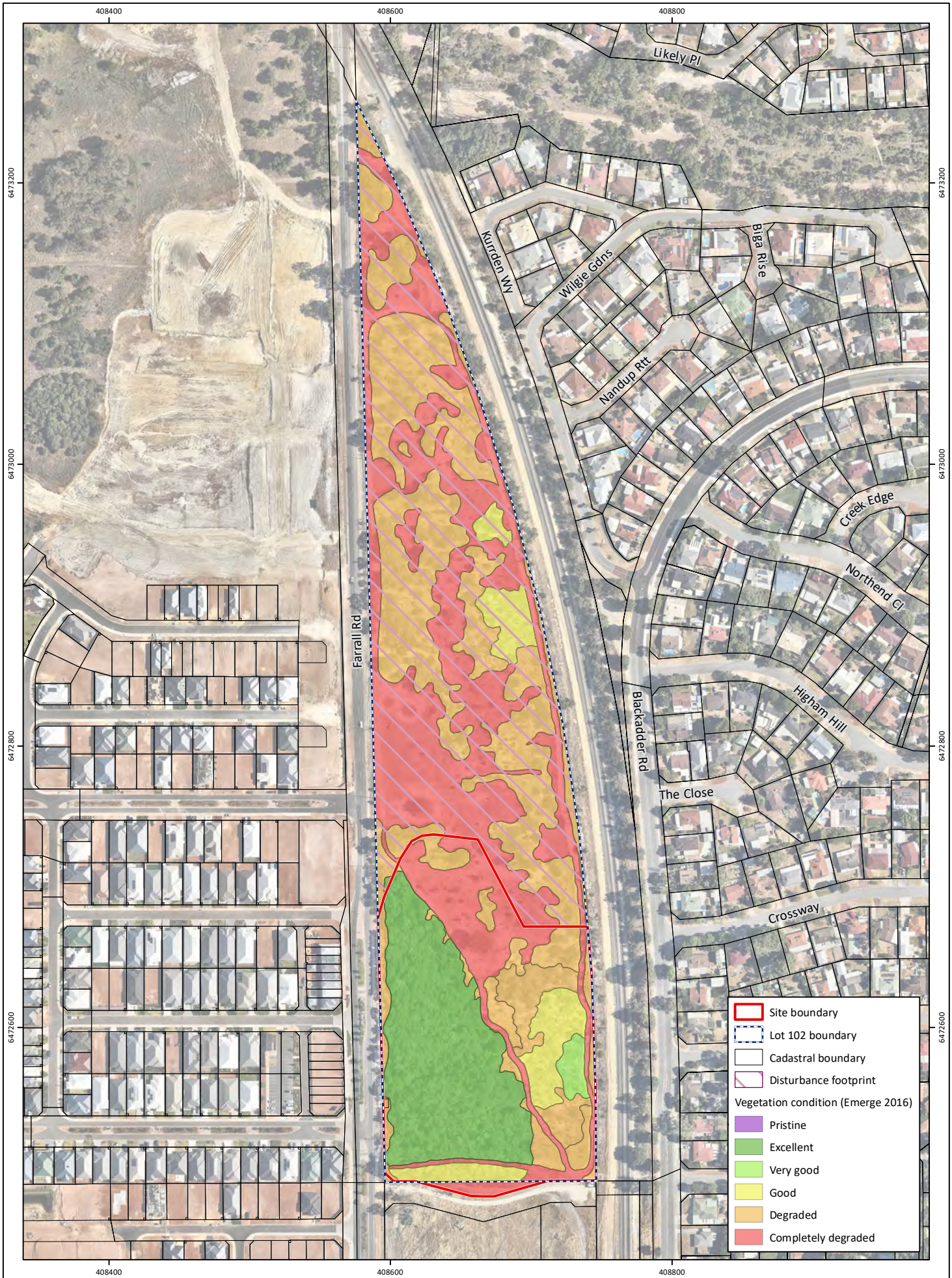

Figure 3: Vegetation Condition

Project: Rehabilitation and Vegetation Management Plan
Lot 102 Farrall Road Midvale

Client: Peet Stratton Pty Ltd

Plan Number:
EP16-009(09)--F152

Drawn:	AFF
Date:	25/02/2020
Checked:	RAW
Approved:	TAA
Date:	25/02/2020

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Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

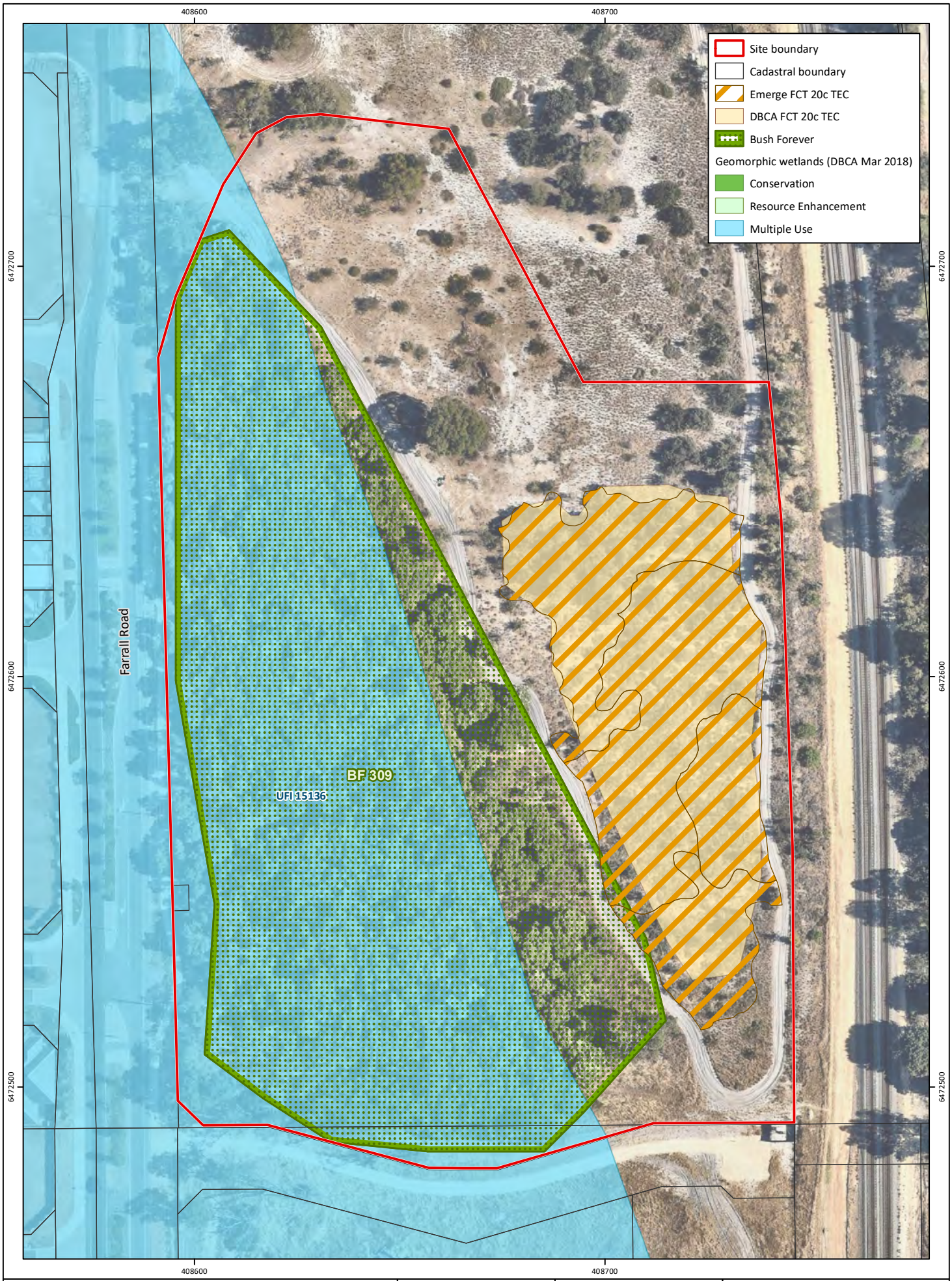

Figure 4: Environmentally Significant Features

Project: Rehabilitation and Vegetation Management Plan
Lot 102 Farrall Road Midvale

Client: Peet Stratton Pty Ltd

Plan Number:
EP16-009(09)--F113a

Drawn:	AFF
Date:	25/02/2020
Checked:	RAW
Approved:	TAA
Date:	25/02/2020

N

0 10 20 30
Metres

Scale: 1:1,200@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

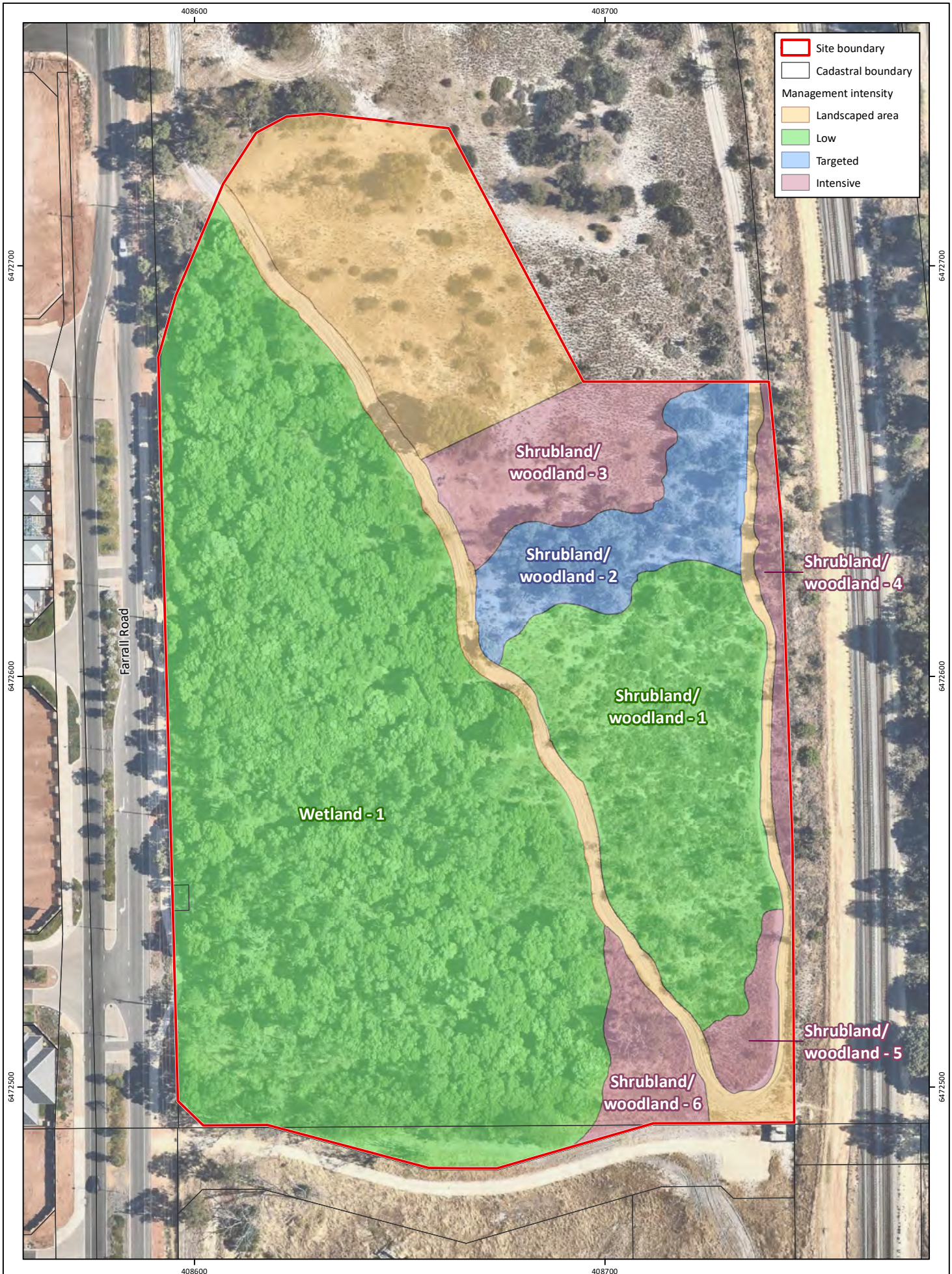

Figure 5: **Management Areas and Intensity**

Project: Rehabilitation and Vegetation Management Plan
Lot 102 Farrall Road Midvale

Client: Peet Stratton Pty Ltd

Plan Number: EP16-009(09)--F114a

Drawn:	AFF
Date:	25/02/2020
Checked:	RAW
Approved:	TAA
Date:	25/02/2020

N

0 10 20 30
Metres

Scale: 1:1,200@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Subdivision Concept Plan

All road carriageway detail where depicted on this subdivision plan including road pavements, road treatments, medians or parking, are for illustrative purposes only and are subject to final engineering design and separate approval processes. The detail reflects the preferred urban design intent for the road network standards.

All dimensions and areas depicted on this plan are subject to pre-cal and final survey and will vary from the figures shown. This plan remains the property of CLE.

Future Development Area

102

POS

BF Site 309

FARRALL ROAD

BLACKADDER ROAD

70

10179

12542

12356

12605

9006

8000

9004

9101

9100

9808

0 20 40 60 80 100 150 200m

CLE Town Planning + Design
www.cleplan.com.au

SUBDIVISION CONCEPT

Lot 1032 Farrall Road, Midvale

DRAFT

plan no: 3001-250A-01
date: 5 April 2019
scale: 1:2,500 @ A3, 1:1,250 @A1

N

Appendix B

Lot 102 Landscape Plan

LD Total 2019

LOT 102 LANDSCAPE PLAN

LEGEND

1 BUSH FOREVER
2 TEC MANAGEMENT
3 REVEGETATION
4 RETAINED VEGETATION
5 CRUSHED LIMESTONE PATHS, NO EDGING (FIRE BREAK)
6 PATH BY CIVILS, FUTURE ALIGNMENT TBC

BUSH FOREVER BOUNDARY

CONSERVATION FENCE

LANDSCAPED AREA - SUBJECT TO FURTHER DETAILED DESIGN

INTERPRETIVE SIGNAGE

TRANSFORMER LOCATION

NOTE: REFER FIGURE 3 MANAGEMENT AREAS AND ZONES

FARRALL ROAD

TRAINLINE

N

SCALE - 1:800 @ A3

0m 10m 20m 50m

LD TOTAL
LEADERS IN LANDSCAPING