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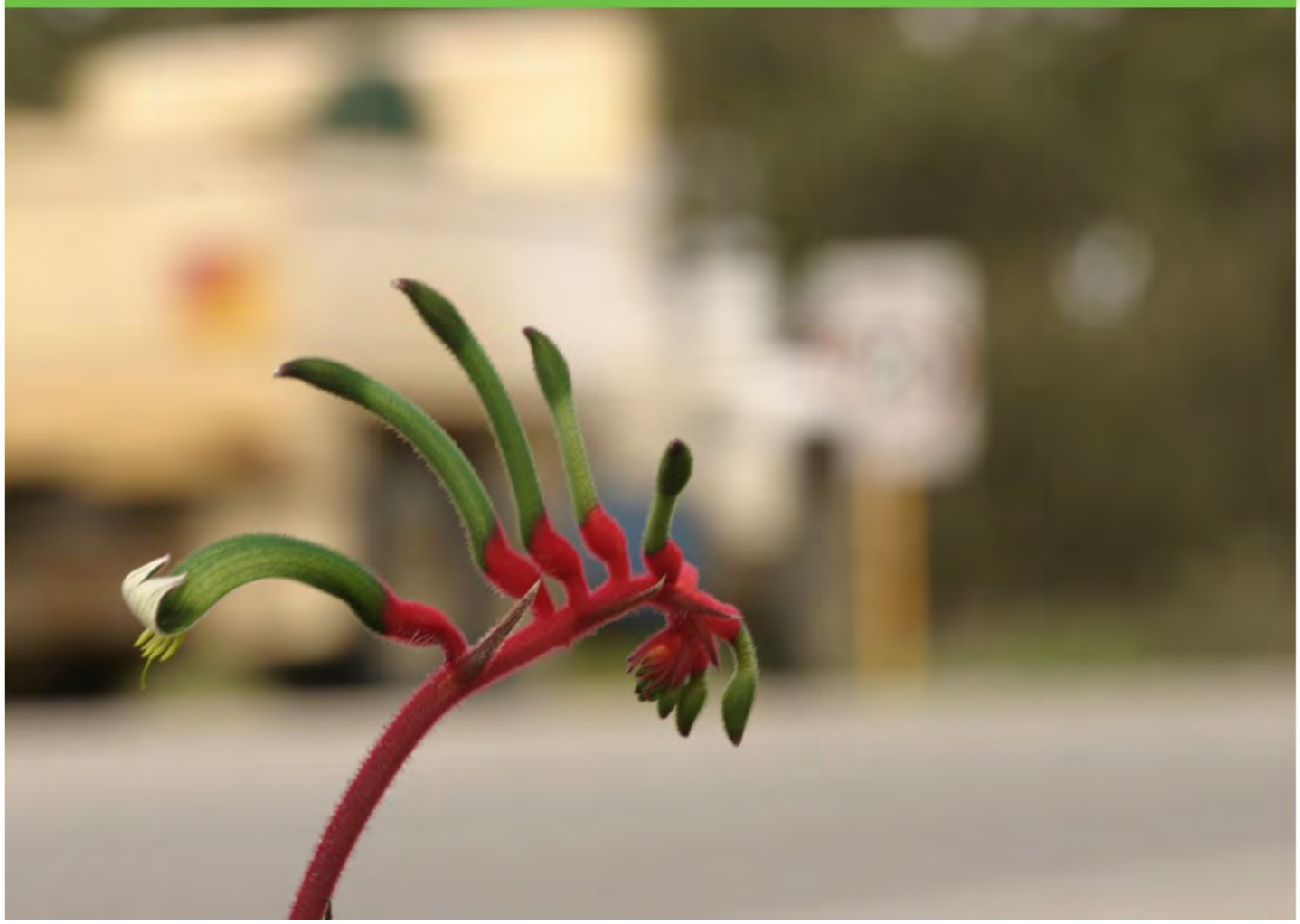
NorthLinkWA
Perth-Darwin National Highway

Condition Environmental Management Plan

Flora and Vegetation – Construction

Perth–Darwin National Highway (Swan Valley Section)

FEBRUARY 2019



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Document *Control*

Revision	Date	Description	Prepared	Reviewed	Approved
A	25/07/2016	Draft (Coffey v1)	D. Anthony	E. Waterhouse	B. Napier
B	10/08/2016	Draft for consultation with Department of Parks and Wildlife (Coffey v2)	T. Vu	D. Morley	D. Morley
C	03/11/2016	Draft (Coffey v3)	M. Holliday	E. Waterhouse	D. Morley
0	23/11/2016	Final for submission to OEPA (Coffey v4)	T. Vu	B. Napier	D. Morley
1	13/01/2017	Addressed OEPA comments (Coffey v5)	T. Vu	B. Napier	D. Morley
2	09/02/2017	Addressed OEPA comments (Coffey v6)	M. Holliday	D. Morley	D. Morley
3	10/02/2017	Addressed OEPA comments (Coffey v7)	D. Morley		D. Morley
4	28/11/2018	Amended following annual review (ELA v8)	D. Morley	J. Longstaff	J. Longstaff
5	14/02/2019	Minor amendment (ELA v9)	D. Morley	J. Longstaff	J. Longstaff

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1 SUMMARY

This Condition Environmental Management Plan (Condition EMP) (this plan) is submitted in accordance with Ministerial Statement No. 1036 conditions 7-1 and 9-1 for the Perth–Darwin National Highway (Swan Valley Section) by Main Roads Western Australia. It is a revision of the previous version approved by the former Office of the Environmental Protection Authority (OEPA) on 14 February 2017 (reference NLWA-03-EN-RP-0051 / Rev 3).

This document presents the environmental management actions to manage the potential impacts of the proposal on flora and vegetation during construction.

Table 1 presents the environmental management targets to measure achievement of the conditioned environmental objective that must be met through implementation of this plan.

Table 1 Flora and Vegetation – Construction – Condition EMP summary

Item	Details
Title of proposal	Perth–Darwin National Highway (Swan Valley Section)
Proponent name	Commissioner for Main Roads Western Australia
Ministerial Statement No.	1036
Purpose of this Condition EMP	The Flora and Vegetation – Construction – Condition EMP is submitted to fulfil the requirements of conditions 7-1 and 9-1 of the above Statement.
EPA's environmental objectives for the key environmental factors	To maintain representation, diversity, viability and ecological function at the species, population and assemblage levels.
Condition environmental objectives	To manage the construction of the proposal to meet the following environmental objectives: • To ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities during construction. • To ensure that impacts to flora and vegetation from dust are minimised as far as practicable during construction. • To ensure that impacts to flora and vegetation from the introduction or spread of weeds are minimised as far as practicable during construction.

Item	Details
Management targets	Management target 1: No introduction of *Phytophthora cinnamomi* into disease-free areas by construction activities. Management target 2: No loss of flora or vegetation from dust generated by construction activities within the development envelope and adjacent environmentally sensitive areas. Management target 3: No new declared weed species introduced into the development envelope or adjacent environmentally sensitive areas by construction activities. Management target 4: No weeds introduced or spread by construction activities to weed-free areas in the development envelope and adjacent environmentally sensitive areas. Management target 5: No disturbance of the buffers around Threatened flora species *Caladenia huegelii, Grevillea curviloba* subsp. *incurva* and *Darwinia foetida.*

2 CONTEXT, SCOPE AND RATIONALE

2.1 Description of the Proposal

Main Roads Western Australia (MRWA) proposes to construct a new 38 km section of the Perth–Darwin National Highway (PDNH) (Figure 1) between Malaga and Muchea in Western Australia (the proposal). The proposal is a dual carriageway highway and will connect the intersection of Tonkin Highway and Reid Highway in the south with Great Northern Highway and Brand Highway in the north.

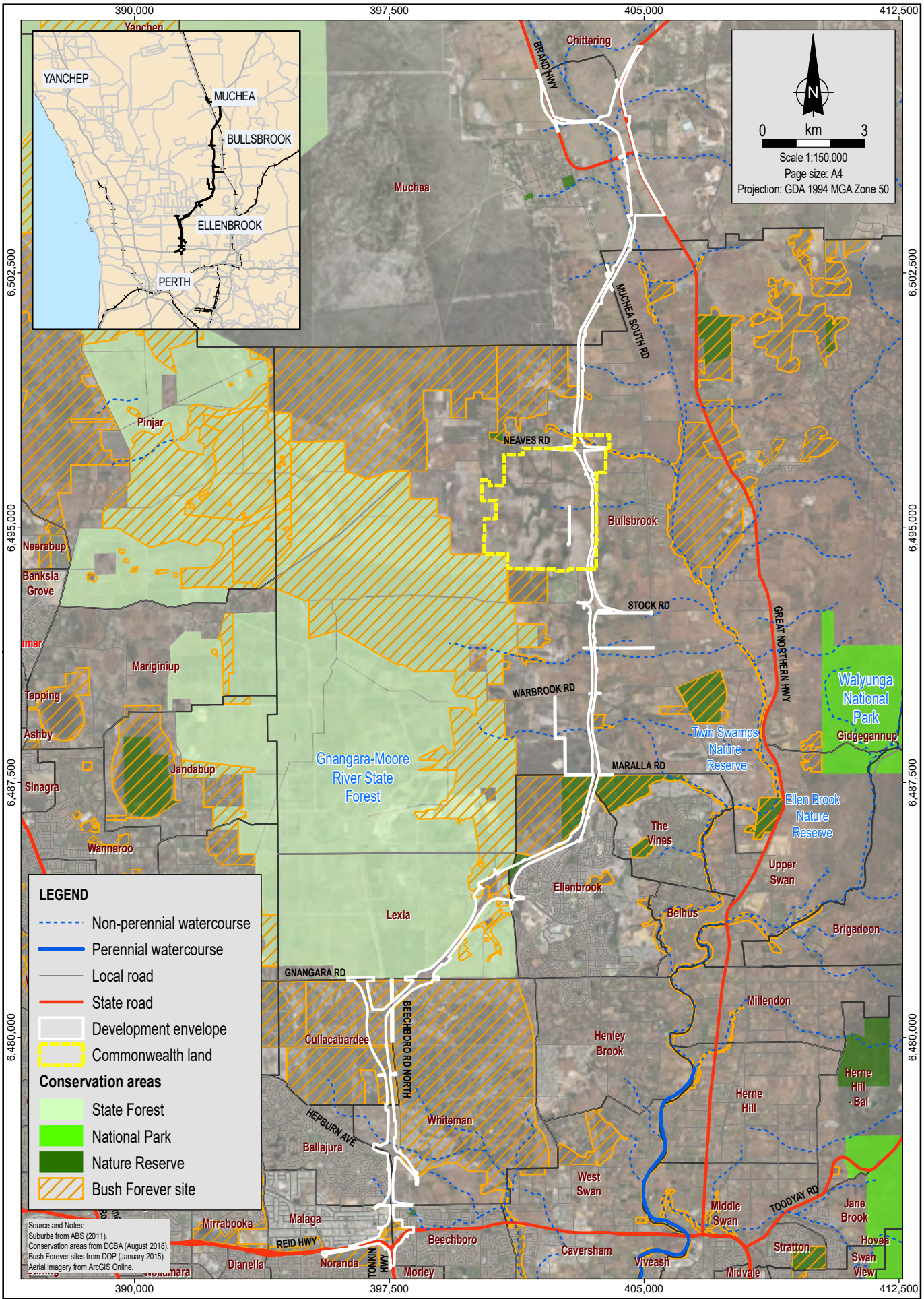
2.2 Key Environmental Factors

This plan addresses the flora and vegetation environmental factor, which is part of the Land theme. The relevance of this environmental factor to the proposal is presented in Table 2.

Table 2 Environmental aspects of the proposal for flora and vegetation (construction phase)

Environmental aspect of the proposal	Affected species, populations and communities	Impact	Activity/threatening process
Clearing of native vegetation. Ground disturbance. Vehicle and machinery movement. Movement of people.	• *Phytophthora cinnamomi* uninfested flora and vegetation (outside the development envelope). • Environmentally sensitive areas and threatened species including: – *Caladenia huegelii*. – *Grevillea curviloba* subsp. *incurva.* – *Darwinia foetida*. – Conservation Category Wetlands. – Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain). • Native flora and vegetation not infested by weeds.	Loss and degradation of flora species and vegetation, including in environmentally sensitive areas.	• Spread of *Phytophthora cinnamomi* from infested areas into disease-free areas though: – Movement of vehicles, machinery and personnel. – Ground disturbance activities. – Surface water run-off. – Public access. • Vegetation clearing of threatened species through: – Construction of laydown areas. – Stockpiles. • Introduction and spread of new declared weed species into environmentally sensitive areas through: – Movement of vehicles and machinery. – Ground disturbance activities. – Surface water run-off.

Environmental aspect of the proposal	Affected species, populations and communities	Impact	Activity/threatening process
			• Spread of weeds within the development envelope through: – Movement of vehicles and machinery. – Ground disturbance activities. – Surface water run-off.
		Loss of flora and vegetation from smothering by dust.	• Dust generation and settlement through: – Movement of vehicles and machinery. – Vegetation clearing and earth works.



NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 21.08.2018 MXD: 4483AA_58_GIS001_4 File Name: 4483AA_58_F001_GIS	Perth–Darwin National Highway Flora and Vegetation Construction Condition EMP	Proposal overview	Figure No: 1

2.3 Requirements of the Conditions

This plan is submitted in accordance with Ministerial Statement 1036 conditions 7-1 and 9-1 to 9-9 for the proposal.

As required under condition 5-1, this plan will be made publicly available for the life of the proposal.

The requirement of these conditions and where they are addressed in this plan are described in Table 3.

The former OEPA was replaced by the Department of Water and Environmental Regulation (DWER) EPA Services Division on 1 July 2017. References to OEPA in this plan have been changed to DWER except for historical usage and direct quotations of the condition text from Ministerial Statement No. 1036.

The former of Department of Parks and Wildlife (DPAW) was replaced by the Department of Biodiversity, Conservation and Attractions (DBCA) on 1 July 2017. References to DPAW in this plan have been changed to DBCA except for historical usage and direct quotations of the condition text from Ministerial Statement No. 1036.

Table 3 Summary of conditions

Condition No.	Condition	Section of this plan
7-1	Prior to the commencement of ground disturbing activities, or as otherwise agreed in writing by the CEO, the proponent shall prepare and submit Condition Environmental Management Plans to the satisfaction of the CEO to demonstrate that the environmental objectives in condition 9-1 will be met.	This plan
7-2	The Condition Environmental Management Plan shall: 1. Prioritise risk-based management actions that will be implemented to meet the environmental management objectives in condition 9-1.	Section 3.2
	2. Specify measurable management targets for determining the efficacy of the risk-based management actions.	Section 1 Section 3.3
	3. Specify monitoring to be conducted to measure the efficacy of management actions against management targets.	Section 3.4
	4. Specify, in the event that the management targets are not achieved a procedure for revision of management actions and changes to proposal activities. The procedure shall include an investigation to determine the cause of the management targets being exceeded.	Section 3.5
	5. Provide the format and timing for annual reporting required by condition 4-6 for: a) Verification of the implementation of management actions to demonstrate that condition 9-1 has been met for the reporting period. b) Reporting on the efficacy of management actions against management targets.	Section 3.6
	6. Provide for reporting when management actions are not implemented.	Section 3.6
7-3	After receiving notice in writing from the CEO that a Condition Environmental Management Plan satisfies the requirements of condition 7-2 for condition 9-1, the proponent shall prior to the commencement of ground disturbing activities:	This plan

Condition No.	Condition	Section of this plan
	1. Implement the provisions of the approved Condition Environmental Management Plan. 2. Continue to implement the approved Condition Environmental Management Plan until the CEO has confirmed by notice in writing that the proponent has met the relevant objectives specified in the approved Condition Environmental Management Plan and no longer needs to implement that particular Condition Environmental Management Plan.	
7-4	In the event that monitoring, tests, surveys or investigations indicate that management actions specified in a Condition Environmental Management Plan are not implemented or that management targets specified in a Condition Environmental Management Plans are exceeded, the proponent shall: 1. Report the exceedance or failure to implement management actions in writing within 7 days of identification.	Section 3.6
	2. Investigate to determine the cause of the management actions not being implemented and/or management targets being exceeded.	Section 3.6
	3. Investigate to provide information for the determination by the CEO of potential environmental harm or alteration of the environment that occurred due to the failure to implement management actions.	Section 3.6
	4. Provide a report to the CEO within 60 days of the reporting required by condition 7-4(1). The report shall include: a) Cause for failure to implement management actions and/or management targets exceeded. b) The findings of the investigation required by conditions 7-4(2) and 7-4(3). c) Details of revised and/or additional management actions to be implemented to prevent exceedance of the management targets and/or ensure implementation of management actions. d) Relevant changes to proposal activities. e) Measures to prevent, control or abate the environmental harm which may have occurred.	Section 3.6
7-5	The proponent may review and revise the Condition Environmental Management Plans, or as otherwise specified by the CEO.	Section 4.2
7-6	The proponent shall implement the latest revision of the Condition Environmental Management Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 7-2.	Section 4.2
9-1	The proponent shall manage the construction of the proposal to meet the following environmental objectives: 1. To ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities during construction. 2. To ensure that impacts to flora and vegetation from dust are minimised as far as practicable during construction.	This plan

Condition No.	Condition	Section of this plan
	3. To ensure that impacts to flora and vegetation from the introduction or spread of weeds are minimised as far as practicable during construction. Through implementation of the Flora and Vegetation – Construction – Condition Environmental Management Plan, approved by the CEO.	
9-2	The proponent shall prepare the Flora and Vegetation – Construction – Condition Environmental Management Plan required by condition 7-1 on advice of the Department of Parks and Wildlife.	Section 5
9-3	For the purpose of establishing management targets as required by condition 7-2(2), if adequate site specific *Phytophthora cinnamomi* and weed mapping is not available the proponent shall undertake baseline surveys prior to ground disturbing activities, or as agreed by the CEO.	Section 2.4
9-4	In the event baseline surveys are required, prior to the commencement of ground disturbing activities the proponent shall prepare in consultation with the Department of Parks and Wildlife, and submit a Baseline Survey Plan(s) to the CEO. The Baseline Survey Plan(s) shall: 1. When implemented, determine the baseline state of areas identified in condition 9-4(3) so that ongoing monitoring can determine that conditions 9-1(1) and 9-1(3) are being met.	Site-specific baseline surveys are not required for *Phytophthora cinnamomi* and weed mapping. Site-specific *Phytophthora cinnamomi* mapping is provided in Figure 2 of Appendix A and Section 2.4.1. Site-specific weed mapping is provided in Figures 8.2 and 8.6 of the proposal's Public Environmental Review (PER) and Section 2.4.2. In addition to the available *Phytophthora cinnamomi* and weed mapping, Section 3.4 includes pre-construction monitoring provisions for selected monitoring sites to provide further validation of existing mapping.
	2. Detail the proposed methodology for the baseline surveys.	
	3. Identify and spatially define the proposed survey locations and reference/control sites and provide rationale for the location of the sites.	
	4. Include a description and map of the areas that are free from *Phytophthora cinnamomi*.	
	5. Include a description and map of the areas that are free from weeds and for those areas that contain weeds, provide the level of weed cover and type.	
	6. Detail the proposed frequency and timing for the baseline surveys.	
9-5	After receiving notice in writing from the CEO that the Baseline Survey Plan(s) satisfies the requirements of condition 9-4, the proponent shall undertake the baseline surveys in accordance with the requirements of the Baseline Survey Plan(s).	
	On completion of the baseline surveys the proponent shall report to the CEO on the following: 1. Completion of the baseline surveys in accordance with the Baseline Survey Plan(s).	
	2. The results of the baseline surveys.	

Condition No.	Condition	Section of this plan
9-6	The proponent shall undertake monitoring as required by condition 7-2(3) for a period of 3 years post construction in order to demonstrate that the environmental objectives for condition 9-1 has been met.	Section 3.4
9-7	In the event that monitoring required by condition 9-6 indicates that the environmental objectives for conditions 9-1 have not been met the proponent shall undertake the requirements of condition 7-4.	Section 3.6
9-8	The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 50 m buffer of *Caladenia huegelii*, as delineated in figure 2 of Schedule 1 and defined by geographic coordinates in Schedule 2.	Section 3.2
9-9	The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 10 m buffer, as delineated in figure 3 of Schedule 1 and defined by geographic coordinates in Schedule 2, of: 1. *Grevillea curviloba* subsp. *incurva*. 2. *Darwinia foetida*.	Section 3.2

2.4 Rationale and Approach in Meeting the Environmental Objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the environmental objectives stated in Section 1. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

2.4.1 *Phytophthora cinnamomi* Dieback Linear Assessment

A *Phytophthora cinnamomi* (dieback disease) assessment was undertaken by Terratree Pty Ltd (Terratree) (Terratree, 2014). Baseline mapping of the development envelope was included in the *Phytophthora cinnamomi* assessment (Appendix A).

The *Phytophthora cinnamomi* assessment study area extended south of Reid Highway north to Muchea over approximately 37 km. A 50 m buffer was applied to the development envelope.

Terratree (2014) categorised *Phytophthora cinnamomi* in accordance with the DBCA's Manual for Detecting *Phytophthora* Dieback disease (Procedures for DPAW managed lands) (DPAW, 2013). The assessment identified that 67.6% of the study area was considered unmappable and excluded due to the lack of native vegetation in good or better condition with sufficient disease indicator species to sample. The mappable areas were divided into 'infested' (25.78%) and 'uninfested' (4.15%). Areas considered 'uninterpretable' made up 2.51% (see Appendix A).

Terratree (2014) concluded that areas 'protectable' from *Phytophthora cinnamomi* in the long term exist adjacent to the development envelope (see Appendix A).

The *Phytophthora cinnamomi* assessment identified creeks and drainage lines within the areas considered uninterpretable. These waterways are potential vectors for *Phytophthora cinnamomi.*

Terratree (2014) recommend the implementation of hygiene procedures to manage potential spread of *Phytophthora cinnamomi.*

Based on the *Phytophthora cinnamomi* assessment, infested and uninfested reference sites were determined as sample sites NLS04 and NLS05 respectively (Appendix A). The reference sites were chosen in areas that

will not be disturbed by construction activities. The *Phytophthora cinnamomi* reference sites are located outside the development envelope, not next to waterways (potential vectors for *Phytophthora cinnamomi*) but within DBCA managed nature reserves. Given the proximity of the reference sites to the development envelope, the sites provide appropriate controls for dieback infested and uninfested areas within the development envelope.

DBCA published best practice guidelines for the management of *Phytophthora cinnamomi* (CALM, 2004). The management actions described in Table 4 have considered construction management actions recommended the guidelines.

Phytophthora cinnamomi will be managed as described in Table 4.

2.4.2 Weed Surveys

Coffey Environments Australia Pty Ltd (Coffey, 2015) conducted a level 2 flora and vegetation assessment for the development envelope.

The assessment included a desktop assessment and field survey in accordance with the Environmental Protection Authority Guidance Statement No. 51 (EPA, 2004). Information recorded during the field survey included details such as inventory of all taxa including introduced weeds and percentage foliage cover and height for each taxon.

Coffey (2015) identified 99 introduced weed species. Weeds of national significance (WONS) **Asparagus asparagoides, *Eichhornia crassipes, *Opuntia stricta* and **Rubus laudatus* were present in the development envelope. The assessment identified six declared pests including four WONS species, **Moraea flaccida* and **Zantedeschia aethiopica*.

Quadrat flora sampling data detailing an inventory of all taxa including introduced weeds and percentage foliage cover and height for each taxon is provided in Appendix B. Site-specific baseline weed maps produced by Coffey (2015) are also provided in Appendix B, which show vegetation condition of the development envelope based on the quadrat flora sampling data and identified WONS and declared pest locations. The Keighery condition scale (Keighery, 1994) was used to define vegetation condition within the development envelope. The Keighery condition scale includes the classification of vegetation condition based on the presence of native vegetation and the presence and density of weeds based on quadrat flora sampling data. Vegetation condition shown as pristine or excellent in the site-specific baseline weed maps are areas that are considered weed-free areas.

Site-specific baseline weed maps provided in Appendix B also show the weed infested and uninfested reference sites SVB049 and SVB053, respectively. These sites have been chosen as the locations will not be disturbed by construction activities. The reference sites are located outside the development envelope and within DBCA-managed nature reserves. Given the proximity of these sites to the development envelope, weed taxa, percentage foliage cover and height at these locations provide an appropriate control of infested (very good vegetation condition) and uninfested (pristine vegetation condition) weed areas within the development envelope.

Weed hygiene procedures will be implemented to prevent the spread of weeds within the development envelope and introduction of new declared weed species into the development envelope.

2.4.3 Key Assumptions and Uncertainties

The key assumption is that the impact will be limited to direct impacts from the spread of *Phytophthora cinnamomi*, weeds and dust during construction. Operational impacts and the potential for indirect impacts to affect adjacent significant flora and vegetation are not included in this plan.

The majority of the Terratree (2014) study area was excluded due to the native vegetation being Degraded or Highly Degraded. Disease indicator species were impacted by the widespread canker disease and drought making interpretation more difficult (Terratree, 2014).

The level 2 flora and vegetation assessment conducted by Coffey (2015) was sufficient to identify the presence of weeds within the development envelope.

The proposed parameters (used to monitor disturbance, spread of *Phytophthora cinnamomi*, weeds and dust during construction as detailed in Section 3.4) are sufficient to determine whether the condition of the vegetated buffers and monitoring sites/locations are being maintained.

Not all plants in a population of *Caladenia huegelli* flower in one season – it may be possible that more than one individual exists in the identified population.

2.4.4 Management Approach

The management approach has been informed by best practice and recent experience on similar road projects in Western Australia. The hierarchical approach taken focuses on avoiding the establishment and/or spread of dieback disease and weeds, and avoiding dust generation. If unavoidable, management aims to minimise the duration, intensity and/or extent of impacts on flora and vegetation during construction.

2.4.5 Rationale for Choice of Management Targets

The rationale for the choice of each management targets is described below.

Management target 1: No introduction of *Phytophthora cinnamomi* into disease-free areas by construction activities.

This management target focuses on the protection of disease-free areas. The spread of *Phytophthora cinnamomi* into disease-free areas impacts susceptible vegetation resulting in potential habitat loss and ecological function.

Phytophthora cinnamomi mapping conducted by Terratree (2014) identified areas of uninfested and uninterpretable vegetation both within and adjacent to the development envelope.

Preventing spread of *Phytophthora cinnamomi* to disease-free areas will maintain the existing environmental values of vegetation within and adjacent to the development envelope.

Management target 2: No loss of flora or vegetation from dust generated by construction activities within the development envelope and adjacent environmentally sensitive areas.

Dust will be generated during construction activities, particularly during clearing, earthmoving and topsoil stripping and respreading. This management target focuses on the protection of native flora and vegetation within the development envelope and adjacent environmentally sensitive areas. Dust settlement can cause vegetation health to deteriorate and sometimes leads to death of the plant. The management target aims to limit the extent of dust emissions from construction activities and subsequent settlement and vegetation loss within the development envelope and adjacent environmentally sensitive areas.

Management target 3: No new declared weed species introduced into the development envelope or adjacent environmentally sensitive areas by construction activities.

Declared weeds were identified within and outside of the development envelope. This target focuses on minimising impacts to flora and vegetation in the development envelope and adjacent environmentally sensitive areas from the introduction of new declared weed species. Construction vehicles and machinery will operate within farmland, cleared areas and native vegetation and will move between areas with and without declared weed species. This target focuses on preventing new declared weed species being

inadvertently transferred into (and becoming established in) the development envelope or adjacent environmentally sensitive areas.

Management target 4: No weeds introduced or spread by construction activities to weed-free areas in the development envelope and adjacent environmentally sensitive areas.

This target focuses on minimising impacts to native flora and vegetation from the spread of weeds in the development envelope and to adjacent environmentally sensitive areas. Construction vehicles and machinery will operate across the development envelope which includes farmland, cleared areas and native vegetation and will move between areas with and without weeds. This target focuses on preventing the spread of weeds across (and becoming established within) different areas within the development envelope.

Management target 5: No disturbance of the buffers around Threatened flora species *Caladenia huegelii*, *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*.

This target focuses on maintaining protective buffers around known locations of Threatened flora species to satisfy conditions 9-8 and 9-9. A 50 m buffer will be established around the known location of *Caladenia huegelii* in remnant native vegetation west of Ellenbrook. A 10 m buffer will be established around the known locations of *Grevillea curviloba* subsp. *incurva* in the Brand Highway road reserve at Muchea. A 10 m buffer will be established around the known locations of *Darwinia foetida* in the Great Northern Highway road reserve at Muchea. This management target focuses on ensuring disturbance from construction activities does not occur within buffers around Threatened flora.

3 EMP PROVISIONS

3.1 Condition Environmental Objective

Implementation condition 9-1 details the environmental objectives that are to be met during construction of the proposal, namely:

- To ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities during construction.
- To ensure that impacts to flora and vegetation from dust are minimised as far as practicable during construction.
- To ensure that impacts to flora and vegetation from the introduction or spread of weeds are minimised as far as practicable during construction.

3.2 Management Actions to be Implemented

Risk-based management actions have been identified and prioritised to achieve the condition environmental objectives (Table 4). These management actions focus the greatest management effort on preventing spread of *Phytophthora cinnamomi* outside the development envelope, spread and introduction of declared and other weed species and settlement of dust on vegetation adjacent to the development envelope. These management actions were specifically developed to meet the environmental objectives detailed in Section 3.1 and will be implemented by MRWA for the proposal.

Conditions 9-8 and 9-9 require the establishment of buffers to protect *Caladenia huegelii*, *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*. These requirements have been addressed in the risk-based management actions detailed in Table 4.

Table 4 Risk-based management actions to be implemented

Risk and key impacts	Management actions	Risk-based priority
Spread of *Phytophthora cinnamomi* (into disease-free areas).	If practicable, conduct ground disturbance activities in dry months to reduce the risk of spreading disease.	High
	Restrict public access into the development envelope.	
	Install a temporary fence or appropriate buffer to prevent unauthorised access to disease-free areas.	
	Inspect and verify all vehicles and machinery to be free of weeds and soil prior to entering the development envelope.	
	Prohibit vehicles and machinery from moving outside the clearing line, except on designated tracks.	
	Physically demarcate infested and disease-free areas within the development envelope prior to earthworks commencing.	
	Prohibit movement of soils and plant material into disease-free areas.	
	Clean on entry/exit points will be established and operated as follows: • Clean on entry/exit points will be located at the boundary of disease-free areas. • All vehicles, machinery and people passing through a clean on entry/exit point must be inspected and, if necessary, cleaned of soil, mud and vegetative material. • Clean on entry/exit points are to be clearly demarcated prior to ground-disturbing activities commencing and then for the remainder of the construction phase. • Soil and wash-down water from clean on entry/exit points is to be captured and appropriately disposed of off-site. • Undertake weekly inspections of the clean on entry/exit points to monitor compliance with hygiene procedures. • Auditable hygiene inspection forms to be provided at clean on entry/exit points.	
	All personnel are to complete a site induction that will include hygiene training with regards to dieback hygiene management requirements, the environmental implications of the spread of dieback and obligations to follow this Condition EMP.	
	Vehicle operators are to complete training in the effective use of clean on entry/exit points.	
	Prepare and implement a dieback management plan.	

Risk and key impacts	Management actions	Risk-based priority
	Control surface water run-off (soil and wash down water and drainage lines) from infested areas to prevent drainage from infested areas to disease-free areas.	
	Limit the use of water in areas likely to create a vector for the movement of *Phytophthora cinnamomi* infected soils to disease-free areas.	
Introduction of new declared weed species into development envelope or adjacent environmentally sensitive areas. Spread of weeds within development envelope or adjacent environmentally sensitive areas.	Inspect all vehicles and machinery if covered in mud on entering and exiting the development envelope to ensure that weeds are not introduced to or spread outside the development envelope.	Medium
	As far as practicable, inspect imported fill, limestone, gravel and topsoil or other weed mediums for visible evidence of weeds.	
	Weedy site fill will either be treated prior to use, buried at least 0.5 m under fill or disposed of appropriately offsite.	
	Weedy imported fill, limestone, gravel and topsoil or other weed media will not be brought on site.	
	Source imported fill, limestone, gravel and topsoil or other weed media from suppliers with appropriate weed control measures.	
	Manage newly identified declared weeds within the development envelope in accordance with the *Biosecurity and Agriculture Management Act 2007* and subsidiary regulations.	
	Undertake periodic weed spraying to control weeds where and when required including after weather conditions that promote germination.	
	Prepare and implement a weed management plan.	
	All personnel are to complete a site induction that will include hygiene training with regards to weed management requirements, their obligations to follow this Condition EMP.	
	Restrict public access into the development envelope.	

Risk and key impacts	Management actions	Risk-based priority
Dust deposition on vegetation.	Dust suppression measures will be implemented on unsealed roads and access tracks, cleared areas and at locations of high dust risk, and may include: • Water carts. • Water-assisted dust sweeper(s) on access and local roads to remove any material, as necessary. • Cover vehicle loads entering and leaving sites to prevent materials escaping. • Enforce speed limits in construction areas. • Provide screening around topsoil stockpiles. • Reduce clearing areas/working areas to as low as practicable. • Progressively rehabilitating and/or stabilising cleared areas to minimise dust suspension. • Limit, and if practicable prohibit, construction activities during high wind conditions.	Medium
Protection of *Caladenia huegelii* buffer.	A 50 m buffer will be established around the *Caladenia huegelii* within remnant native vegetation west of Ellenbrook. No clearing will occur and no construction of laydown areas or stockpiles will be established within the 50 m buffer of *Caladenia huegelii*. Buffers will be clearly demarcated using temporary fences or other methods.	High
Protection of *Grevillea curviloba* subsp. *incurva* buffer.	A 10 m buffer will be established around all individuals of *Grevillea curviloba* subsp. *incurva* in the Brand Highway road reserve at Muchea. No clearing will occur and no construction of laydown areas or stockpiles will be established within the 10 m buffer of *Grevillea curviloba* subsp. *incurva*. Buffers will be clearly demarcated using temporary fences or other methods.	High

Risk and key impacts	Management actions	Risk-based priority
Protection of *Darwinia foetida* buffer.	A 10 m buffer will be established around all individuals of *Darwinia foetida* in the Great Northern Highway road reserve at Muchea. No clearing will occur and no construction of laydown areas or stockpiles will be established within the 10 m buffer of *Darwinia foetida*. Buffers will be clearly demarcated using temporary fences or other methods.	High

3.3 Management Targets

Management targets will be used to measure and report achievement against the environmental objectives (Table 5).

Table 5 Management targets to measure the efficacy of management actions

Item	Detail
Environmental objective (*Phytophthora cinnamomi*)	**To ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities during construction.**
Management target 1	No introduction of *Phytophthora cinnamomi* into disease-free areas by construction activities.
Environmental objective (dust)	**To ensure that impacts to flora and vegetation from dust are minimised as far as practicable during construction.**
Management target 2	No loss of flora or vegetation from dust generated by construction activities within the development envelope and adjacent environmentally sensitive areas.
Environmental objective (weeds)	**To ensure that impacts to flora and vegetation from the introduction or spread of weeds are minimised as far as practicable during construction.**
Management target 3	No new declared weed species introduced into the development envelope or adjacent environmentally sensitive areas by construction activities.
Management target 4	No weeds introduced or spread by construction activities to weed-free areas in the development envelope and adjacent environmentally sensitive areas.
Condition 9-8 **Condition 9-9**	**The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 50 m buffer of *Caladenia huegelii*, as delineated in figure 2 of Schedule 1 and defined by geographic coordinates in Schedule 2.** **The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 10 m buffer, as delineated in figure 3 of Schedule 1 and defined by geographic coordinates in Schedule 2, of:** **1. *Grevillea curviloba* subsp. *incurva*; and** **2. *Darwinia foetida*.**
Management target 5	No disturbance of the buffers around Threatened flora species *Caladenia huegelii*, *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*.

3.4 Monitoring

The purpose of monitoring is to inform, through the management targets, if the condition environmental objectives are being achieved and when management actions need to be reviewed and revised.

Monitoring will be undertaken for each management target as detailed in Table 6. The method, location, parameters and frequency of monitoring is specified. Early warning indicators provide advance warning that a management target may not be met. The results of monitoring will be compared against early warning indicators to enable actions to be put in place to control the contributing processes so that the management objective can be met.

Table 6 Monitoring to measure the efficacy of management actions against the management target

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 1: No introduction of *Phytophthora cinnamomi* into disease-free areas by construction activities.					
Phytophthora cinnamomi infestation.	Dieback occurrence mapping will be conducted by an accredited person using methods consistent with Terratree (2014) and in accordance with DBCA's Manual for detecting *Phytophthora* dieback disease (Procedures for DPAW managed lands) (DPAW, 2013) including: • Identifying visible symptoms of disease in species susceptible to *P. cinnamomi*. • Confirming disease presence through laboratory analysis of soil and plant tissues. • Dieback management plan.	Boundary of, and up to 10 m within, disease-free areas adjacent to the development envelope (as shown in Figures 1, 3 and 6 in Appendix C).	Location of disease front. Signs of significant erosion and surface water leaving the development envelope into disease-free areas.	• Pre-construction monitoring (after significant spring rainfall and increasing soil temperatures), in addition to baseline monitoring undertaken by Terratree (2014). • Construction – annually (after significant spring rainfall and increasing soil temperatures).	Non-conformance with the dieback management plan.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 2: No loss of flora or vegetation from dust generated by construction activities within the development envelope and adjacent environmentally sensitive areas.					
Loss of flora and vegetation due to dust smothering.	Visual observations by an experienced botanist for presence of dust on flora and vegetation and signs of plant stress at 5 m intervals, along a 30 m long transect at each monitoring site. Record observations within a plot at each 5 m interval. Photographic record of transect. Refer to Appendix D for detailed method including transect and plot design and placement.	At monitoring sites (transects) as shown in Figures in Appendix C, specifically: **Environmentally sensitive areas:** • *Caladenia huegelii* 50 m buffer – FV16B. • *Grevillea curviloba* subsp. *incurva* 10 m buffer – FVB2B. • *Darwinia foetida* 10 m buffer – FV37B. • CCWs – FV02E, FV04S, FV04E, FV06W, FV16W, FV16N, FV18W, FV19E, FV24E, FV28E. • Communities of Tumulus Springs – FV29W. **Native flora and vegetation in Excellent to Pristine condition:** • FV05W, FV05E, FV06W, FV06E, FV08W, FV08E, FV09E, FV14N, FV15N, FV15S, FV16E, FV16W,	Observations of dust covering on plant leaves and signs of stress including: • Location. • Species. • Extent of dust deposition (0-4 scale) / plant stress (0-4 scale). Refer to Appendix D.	• Quarterly.	• Aggregate of dust deposition score and plant stress score at any given plot is 7 or greater.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
		FV16N, FV17W, FV17E, FV18W.			
	Visual observations for dust on flora and vegetation along clearing edge.	Clearing edge within the development envelope.	Observations of dust covering on plant leaves including: • Location. • Extent of dust deposition (0-4 scale).	• Weekly.	• Dust covering on plants with a score of 2 or higher.
Management target 3: No new declared weed species introduced into the development envelope or adjacent environmentally sensitive areas by construction activities.					
New declared weed species.	Visual observations by an experienced botanist for spread of new declared weed species along clearing edge.	Clearing edge within the development envelope.	Location of declared weed infested areas within the development envelope including weed species, density and/or numbers.	• Pre-construction (spring) – declared weed survey mapping. • Construction – monthly visual inspections and annual declared weed survey mapping.	• Increase in declared weed species density and/or numbers from pre-construction monitoring observations in the development envelope.
	Spot check of vehicle compliance with clean on entry/exit procedures.	Vehicles and clean on entry/exit points.	Clean on entry/exit records.	• Weekly and unscheduled inspections.	• Non-conformance with weed management plan.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 4: No weeds introduced or spread by construction activities to weed-free areas in the development envelope and adjacent environmentally sensitive areas.					
Spread of weeds.	Visual observations by an experienced botanist for spread of weeds at 5 m intervals, along a 30 m long transect at each monitoring site. Record observations within a plot at each 5 m interval. Photographic record of transect. Recording of locations of weeds by GPS and photographs. Refer to Appendix D for detailed method including transect and plot design and placement.	At monitoring sites (transects) as shown in figures in Appendix B and C, specifically: **Environmentally sensitive areas:** • *Caladenia huegelii* 50 m buffer – FV16B. • *Grevillea curviloba* subsp. *incurva* 10 m buffer – FVB2B. • *Darwinia foetida* 10 m buffer – FV37B. • CCWs – FV02E, FV04S, FV04E, FV06W, FV16W, FV16N, FV18W, FV19E, FV24E, FV28E. • Communities of Tumulus Springs – FV29W. **Native flora and vegetation not infested by weeds:** • Excellent to Pristine vegetation – FV05W, FV05E, FV06W, FV06E, FV08W, FV08E, FV09E, FV14N, FV15N, FV15S,	Number, species and location of weeds.	• Pre-construction (spring) – weed survey. • Construction – annual weed survey.	• Increase in weed species, density and/or numbers from pre-construction monitoring observations within the development envelope and adjacent environmentally sensitive areas.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
		FV16E, FV16W, FV16N, FV17W, FV17E, FV18W.			
	Visual observations for spread of weed species along clearing edge.	Clearing edge within the development envelope.	Number, species and location of weeds.	• Monthly.	• Increase in weed species, density and/or numbers from pre-construction monitoring observations within the development envelope.
	Spot check of vehicle compliance with clean on entry/exit procedures.	Vehicles and clean on entry/exit points.	Clean on entry/exit records.	• Weekly and unscheduled inspections.	• Non-conformance with weed management plan.
Management target 5: No disturbance of the buffers around threatened flora species *Caladenia huegelii, Grevillea curviloba* subsp. *incurva* and *Darwinia foetida.*					
Clearing, laydowns or stock piles located within buffer of threatened flora species	Visual inspection of buffers established around threatened flora species (see Figures 3 and 6 in Appendix C).	In vegetated buffers established around known Threatened flora as shown in Appendix C, specifically: • FV16B – *Caladenia huegelii* 50 m buffer. • FVB2B – *Grevillea curviloba* subsp. *incurva* 10 m buffer. • FV37B – *Darwinia foetida* 10 m buffer.	Observations of disturbance in buffers including: • Evidence of unauthorised access. • Presence of laydown areas or stockpiles.	• While construction activities are occurring within proximity of threatened flora – weekly. • At all other times during construction – quarterly.	• Evidence of disturbance to fences around the buffers established around Threatened flora species.

3.4.1 Monitoring Site Selection

Monitoring sites have been selected to measure the efficacy of management actions against management targets. Monitoring sites are shown in Appendices B and C and justification for chosen monitoring sites for each management target is provided in the following sections.

Management Target 1 - *Phytophthora cinnamomi* Monitoring Sites

Phytophthora cinnamomi infested areas are located at numerous sites within and adjacent to the development envelope. Monitoring sites for management target 1 have been selected based on the boundary of, and up to 10 m within, disease-free areas defined in the assessment by Terratree (2014). Monitoring site locations with reference to *Phytophthora cinnamomi* are shown in Appendix C. The boundary of disease-free areas will be monitored annually during construction to determine if dieback disease fronts have moved. *Phytophthora cinnamomi* monitoring sites may need to be modified based on observed dieback disease front movements.

Many of the adjacent tracks, roads and railways are third party infrastructure and accessible by the general public. These tracks, roads and railways are potential pathways for the spread of *Phytophthora cinnamomi* outside of the development envelope. Monitoring sites have been selected to avoid areas adjacent to the development envelope where there is uncontrollable access to tracks, roads or railways.

Management Target 2 – Dust Monitoring Sites

Transect monitoring sites for management target 2 have been selected in environmentally sensitive areas and in Excellent to Pristine remnant vegetation within the development envelope and in buffers established around known locations of threatened flora. Visual observations for dust will be undertaken regularly along the clearing edge within the development envelope. Monitoring site locations with reference to dust monitoring are shown in Appendix C.

Management Target 3 – New Declared Weeds Monitoring Sites

The monitoring site for management target 3 is along the clearing edge within the development envelope. Adopting the entire clearing edge as a monitoring site will ensure identification of the presence of declared weeds within the development envelope, including the presence of declared weed species located in areas within the development envelope adjacent to environmentally sensitive areas.

Management Target 4 – Spread of Weeds Monitoring Sites

Transect monitoring sites for management target 4 have been selected within the development envelope adjacent to environmentally sensitive areas, Excellent to Pristine remnant vegetation along the development envelope and in buffers established around known locations of threatened flora. Transect monitoring sites exclude areas within the development envelope that contain high weed density as identified during baseline surveys. Excluded areas include parts of the development envelope located on land that is Completely Degraded to Very Good due to existing clearing or farming activities or high densities of aggressive weeds. Monitoring site locations with reference to weed monitoring are shown in Appendix C.

Management Target 5 – Threatened Flora Species Buffers

The monitoring sites for Threatened flora species have been established around the known locations of *Caladenia huegelii*, *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*. The sizes of the monitoring sites (i.e. buffers) is in accordance with the requirements of conditions 9-8 and 9-9.

3.4.2 Monitoring Method

Monitoring will comprise observations, inspections, surveys and recording of parameters set out in Table 6 at each monitoring site. Monitoring sites (Appendices B and C) will be established and marked by recording locations with a Global Positioning System (GPS).

Transects will extend perpendicularly from the new vegetation edge into remnant vegetation for at least 30 m. Appendix D details the method and shows the general arrangement of a transect.

Methods used to monitor dieback at the monitoring locations will be in accordance with DBCA's Manual for detecting Phytophthora dieback disease (Procedures for DPAW managed lands) (2013) as per the baseline (Terratree, 2014).

The visual inspection will involve observations along the clearing edge within the development envelope at monthly intervals during construction activities.

Monitoring of vegetated buffers established around known locations of Threatened flora will be conducted by observation. Buffer radii relevant to each Threatened flora species are:

- 50 m of the known *Caladenia huegelii* individual, where possible.
- 10 m of *Grevillea curviloba* subsp*. incurva* individuals in the Brand Highway road reserve at Muchea, where possible.
- 10 m of *Darwinia foetida* individuals in the Great Northern Highway road reserve at Muchea, where possible.

Third party assets (residential areas, roads, railway lines) encroach the above-listed buffers. Monitoring is therefore restricted to areas of remnant vegetation within the buffers.

3.4.3 Monitoring Program Review

Condition 9-6 requires monitoring to be undertaken for a period of three years post-construction. If environmental objectives for this condition are not met, monitoring will continue until environmental objectives are met.

The monitoring program will be reviewed three years post-construction and annually thereafter until the environmental objectives have been met.

The monitoring program will also be reviewed in the event that there is an exceedance of the management targets or failure to implement a management action.

3.5 Review and Revision of Management Actions

Where an early warning indicator is triggered, management actions are not implemented and/or a management target is not met, MRWA will:

- Investigate the cause of the management actions not being implemented and/or management targets being exceeded. If an early warning indicator is triggered, investigate whether it was project-attributable.
- Investigate to determine potential environmental harm or alteration of the environment that occurred due to failure to implement management actions and/or inadequacy of management actions.
- Review the management actions in Table 4 and revise if required.
- Develop additional management actions where necessary.

Potential adaptive management actions are listed in Section 4.

3.6 Reporting Provisions

3.6.1 Annual Compliance Assessment Report

The annual compliance assessment report (CAR) will include a summary of compliance against the management actions detailed in Table 4. The results of monitoring undertaken in Table 6 will be included in the appendices of the CAR including the following information:

- Demonstration of compliance with hygiene measures for *Phytophthora cinnamomi*.
- Documentation of monitoring undertaken.
- Comparison of monitoring results against the management targets and early warning indicators.
- Management actions undertaken, including revised or additional actions.

The CAR will also include information on the achievement or not of the environmental objectives (Table 7). If the environmental objective have not been achieved during the reporting period, the CAR will include a description of revised and/or additional management actions to be implemented to achieve the targets and an analysis of monitoring data to discern trends.

The CAR will be submitted in accordance with condition 4-6.

Table 7 Environmental management plan reporting table

Key environmental factor: Flora and Vegetation (Ministerial Statement 1036, conditions 9-1 to 9-9		
Condition environmental objective and management target set in the Condition EMP	**Reporting on the management objectives and management targets annually, commencing 12 months from date of issue**	**Status[1]**
Condition environmental objective 1: To ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities during construction.	*Phytophthora cinnamomi* was not introduced into disease-free areas by construction activities. Management target 1 has been met.	Yes/No
Condition environmental objective 2: To ensure that impacts to flora and vegetation from dust are minimised as far as practicable during construction.	Impacts to flora and vegetation from dust were minimised as far as practicable during construction. Management target 2 has been met.	Yes/No
Condition environmental objective 3: To ensure that impacts to flora and vegetation from the introduction or spread of weeds are minimised as far as practicable during construction.	Impacts to flora and vegetation from the introduction or spread of weeds were minimised as far as practicable during construction. Management targets 3 and 4 have been met.	Yes/No
Condition 9-8: The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 50 m buffer of *Caladenia huegelii*, as delineated in Figure 2 of Schedule 1 and defined by geographic coordinates in Schedule 2.	No clearing was undertaken and no laydown areas or stockpiles were constructed within the 50 m buffer of *Caladenia huegelii*. Management target 5 has been met.	Yes/No

Key environmental factor: Flora and Vegetation (Ministerial Statement 1036, conditions 9-1 to 9-9		
Condition environmental objective and management target set in the Condition EMP	**Reporting on the management objectives and management targets annually, commencing 12 months from date of issue**	**Status[1]**
Condition 9-9: The proponent shall not undertake clearing or construct any laydown areas or stock piles within the 10 m buffer, as delineated in figure 3 of Schedule 1 and defined by geographic coordinates in Schedule 2, of: 1. *Grevillea curviloba* subsp. *incurva*; and 2. *Darwinia foetida*.	No clearing was undertaken and no laydown areas or stockpiles were constructed within the 10 m buffers of *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*. Management target 5 has been met.	Yes/No

Notes:
1. The status of achievement of the condition environmental objectives is indicated as follows:
Yes - condition environmental objective achieved.
No - condition environmental objective not achieved.

3.6.2 Reporting on Management Actions not Implemented or Exceedance of the Management Targets

In the event that the management target is exceeded (or not met), the CEO of DWER will be advised in writing within seven days of identification of the exceedance.

A report will be provided to the CEO of DWER within 60 days of a management target not being met including details on:

- The cause for failure to implement management actions and/or management targets to be exceeded.
- Findings of the investigation to determine potential environmental harm or alteration of the environment that occurred due to failure to implement management actions.
- Details of revised and/or additional management actions to be implemented to prevent exceedance of the management targets and/or ensure the implementation of management actions.
- Relevant changes to the proposal activities.
- Measures implemented to prevent, control or abate environmental harm which may have occurred.

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4 ADAPTIVE MANAGEMENT AND REVIEW OF THE EMP

4.1 Adaptive Management

MRWA will implement adaptive management to respond to any issues identified in implementation of management measures, monitoring and evaluation against the management target, to more effectively meet the environmental objectives.

Potential adaptive management actions include:

1. *Phytophthora cinnamomi* introduction:
   - Quarantine affected areas.
   - Restrict access to quarantined areas.
   - Determine/investigate cause/source (see Section 3.5).
   - Review dieback management actions for practicality or relevance.
   - Improve training and education for construction personnel.
   - Improve and implement increased management actions as necessary.
   - Consider application of phosphite if introduced into disease-free areas.
   - Implement revegetation, if practicable.
   - Monitor the success of remedial actions.
2. Introduction of new and/or spread of existing weed species:
   - Quarantine affected areas.
   - Restrict access to quarantined areas.
   - Determine/investigate cause/source (see Section 3.5).
   - Further inspection or survey of surrounding area to determine extent of infestation.
   - Review weed hygiene management actions for practicality or relevance.
   - Improve training and education for construction personnel.
   - Improve and implement increased management actions as necessary.
   - Control (spraying or removal).
   - Monitor the success of remedial actions.
3. Vegetation stress potentially caused by dust deposition:
   - Determine/investigate cause/source (see Section 3.5).
   - Conduct an analysis to determine if dust deposition is the cause of vegetation stress.
   - Remove dust on vegetation using water (if practicable).
   - Implement revegetation, if required.

4. Dust emissions during periods of high winds:
   - Increase water cart usage frequency, as required.
   - Monitor the success of remedial actions.
   - Halt construction activities, if necessary.
5. Disturbance of threatened flora buffers:
   - Restrict access to fenced threatened flora buffers by providing additional signage.
   - Determine/investigate cause/source (see Section 3.5).
   - Improve training and education for construction personnel.
   - Implement revegetation, if required.
6. Identified new population or individual of *Caladenia huegelii* within development envelope:
   - Salvage and translocate new *Caladenia huegelii* population or individual within the proposed footprint to augment the known population within the specified 50 m buffer.
   - Monitor the success of translocation.

4.2 Review of Plan

This plan will be reviewed as required during the construction phase to determine if management actions require revision. Potential reasons or triggers for altering management actions include:

- Changes to construction methods and timing.
- Trigger of early warning indicators (as specified in Table 6).
- Results of trend analysis of monitoring results.
- New or revised information becoming available about *Phytophthora cinnamomi* and/or disease indicator species and declared weed species.

In accordance with condition 7-5, Main Roads may review and revise this plan or as otherwise specified by the CEO of DWER.

The latest version of this plan shall be implemented once the CEO of DWER has confirmed in writing that it satisfies the requirements of condition 7-2.

The implementation of this plan will be audited.

The plan will continue to be implemented until directed otherwise by the CEO of DWER in accordance with condition 7-3(2).

5 STAKEHOLDER CONSULTATION

MWRA consulted with stakeholders while developing this plan, consistent with the EPA's expectations to align the plan with the principles of environmental impact assessment. This section provides a summary of consultation that occurred. The comments raised during consultation with stakeholders were considered in preparing this plan.

DBCA (formerly DPAW) was consulted in accordance with condition 9-2.

A summary of the consultation and MRWA's response in included in Table 8.

Table 8 Stakeholder consulted, comments and responses

Date	Organisation	Summary of consultation	MRWA response to comment/concern
13 September 2016	Department of Parks and Wildlife – Swan Region and Environmental Management Branch	DPAW provided comments on this plan.	MRWA has taken into account DPAW's comments and revised the plan where appropriate.
25 October 2016	Department of Parks and Wildlife – Swan Region and Environmental Management Branch	Workshop to discuss other Condition Environmental Management Plans, some of which have overlapping themes with this Condition Environmental Management Plan.	MRWA has taken into account DPAW's comments and revised the plan where appropriate.

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6 GLOSSARY

6.1 Abbreviations

Abbreviation	Definition
CAR	Compliance Assessment Report
Condition EMP	Condition Environmental Management Plan
DBCA	Department of Biodiversity, Conservation and Attractions
DPAW	Department of Parks and Wildlife
DWER	Department of Water and Environmental Regulation
GPS	Global Positioning System
MRWA	Main Roads Western Australia
OEPA	Office of the Environmental Protection Authority
PDNH	Perth–Darwin National Highway
PEC	Priority Ecological Community
TEC	Threatened Ecological Community

6.2 Definitions

Accredited person means a suitably qualified person certified or registered by DBCA to interpret symptoms of *Phytophthora cinnamomi*.

Development envelope means the road reserve that the proposal will be constructed within.

Disease-free means uninfested or uninterpretable areas determined by an accredited person.

Environmentally sensitive areas means conservation estate, Bush Forever sites, Cullacabardee, Whiteman Park, Lexia wetlands, Dick Perry Reserve and locations of Threatened and Priority listed flora and ecological communities and their buffers. Note that this definition was provided in the proposal's Public Environmental Review and Response to Submissions. It is not intended to reflect the definition given for the same term in s. 51A of the *Environmental Protection Act 1986*.

Excluded means an area that is highly disturbed and the vegetation is unlikely to recover.

Infested (CALM, 2001) means areas that an accredited person has determined to have plant disease symptoms consistent with the presence of the pathogen *P. cinnamomi*.

Proposal footprint means the area that will be cleared for the construction of the proposal.

Uninfested (CALM, 2001) means areas that an accredited person has determined to be free of plant disease symptoms that indicate the presence of the pathogen *P. cinnamomi*.

Uninterpretable (DEC, 2012) means areas where indicator species are absent or too few to determine the presence or absence of *Phytophthora cinnamomi***.**

Unmappable (DEC, 2012) means areas that are sufficiently disturbed so that *Phytophthora cinnamomi* occurrence mapping is not possible at the time of inspection.

Weed-free means areas identified by a suitably qualified person as not infested by declared or other weeds.

7 REFERENCES

CALM. 2001. *Phytophthora cinnamomi* and the diseases caused by it – A Protocol for Identifying 'protectable Areas' and Their Priority for Management (Working Draft). WA Department of Conservation and Land Management. Perth, Western Australia.

CALM. 2004. Best practice guidelines for the management of *Phytophthora cinnamomi* - Guidelines to manage the threat to biodiversity posed by *P. cinnamomi* and the disease caused by it in native vegetation managed by the Department of Conservation and Land Management. WA Department of Conservation and Land Management. Perth, Western Australia.

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APPENDIX A

Phytophthora cinnamomi (dieback disease) Baseline Assessment

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Terratree

Phytophthora Dieback Linear Assessment

Perth Darwin National Highway Project Corridor

Prepared for Coffey

Ref: T14008

ecological assessment
& management

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Document Control

Version	Date	Author	Reviewer
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DISCLAIMER

This document is prepared in accordance with and subject to an agreement between Terratree Pty Ltd ("Terratree") and the Client for whom it has been prepared (Coffey Environments Australia Pty Ltd) and is restricted to those issues that have been raised by the Client in its engagement of Terratree and prepared using the standard of skill and care ordinarily exercised by Environmental Scientists in the preparation of such documents.

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Terratree Pty Ltd

Executive Summary

Coffey Environments Australia Pty Ltd (Coffey) commissioned Terratree Pty Ltd (Terratree) to undertake a linear *Phytophthora* Dieback assessment of the Perth Darwin National Highway (PDNH) project corridor (hereafter referred to as the 'project corridor') for Main Roads Western Australia as part of the NorthLink project.

The study area is approximately 37 km in length and extends from 0.5 km south of Reid Highway along Tonkin Highway, to approximately 4 km north of Muchea along the Great Northern Highway. The assessment was conducted in accordance with the Department of Parks and Wildlife's (DPAW) *Manual for detecting* Phytophthora *Dieback disease (Procedures for DPAW managed lands)* (2013).

A nominal 200 m wide study area was determined to be appropriate because it allowed 100 m for the disturbance corridor plus an additional 50 m either side. The width of the study area was increased to assess sections that are wider than 200 m and the landscape context within which the corridor is located.

Approximately 17 km of native vegetation required assessment along the corridor which equated to 465 ha in total. Native vegetation adjacent to the disturbance corridor was mapped so that protectable areas could be identified and appropriately managed to prevent infestation.

In total 27 soil and tissue samples were taken from recently dead and dying disease indicator species, which included one canker tissue sample. Four positive results for *Phytophthora cinnamomi*, one positive result for a *Lasiodiplodia* sp. (Canker), and 21 negative samples were reported. Overall, 1,541.61 ha were assessed with 69.8% determined to be Excluded (unmappable) from the Dieback assessment, 23.5% Infested, 3.7% Uninfested and 3.0% Uninterpretable.

Dieback is spread through the movement of water and soil within the landscape. Major vectors of Dieback include, among others, wet soil adhering to vehicle tyres/tracks and earthmoving equipment. Therefore, quarantine management procedures are an effective tool to reduce the spread of Dieback as a result of earthmoving activities.

While some areas of protectable Uninfested vegetation were mapped within the corridor, the Uninfested areas adjacent to the corridor are more significant in terms of being protectable from Dieback in the longer term. While the majority of the vegetation within the project corridor will be cleared, the critical issue preventing the spread of pathogen into adjacent areas where it can vector it along watercourses, tracks and roads.

Uninterpretable areas (3%) are predominantly comprised of creeks and drainage lines intersecting the study area. Uninterpretable riparian vegetation and watercourses may, or may not be hosting the pathogen but these areas are potential vectors for the pathogen if hygiene is not adequately managed.

Terratree recommends that a Dieback Management Plan be prepared for the PDNH Project by a suitably qualified and experienced person in accordance with best practice management techniques.

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1 Introduction

Coffey Environments Australia Pty Ltd (Coffey) commissioned Terratree Pty Ltd (Terratree) to undertake a linear *Phytophthora* Dieback assessment of the Perth Darwin National Highway (PDNH) project corridor (hereafter referred to as the 'project corridor') for Main Roads Western Australia as part of the Perth to Darwin Highway project known as NorthLink. The assessment was conducted in accordance with the Department of Parks and Wildlife's (DPAW) *Manual for detecting* Phytophthora *Dieback disease (Procedures for DPAW managed lands)* (2013).

1.1 Background

Phytophthora Dieback ('Dieback') is a soil borne pathogen with a range of hosts in the southwest of Western Australia (WA). These predominantly come from the Proteaceae, Ericaceae, Myrtaceae, Xanthorrhoeaceae and Fabaceae plant families. While some plant species are resistant, others are susceptible to the disease caused by the pathogen resulting in chlorosis, dieback and usually death (Wills, R.T. and Keighery, G.J. 1994).

According to the most recent Western Australian (WA) State of the Environment Report (Environmental Protection Authority, 2007) Dieback, which is listed as a Priority 1 threat, is the third greatest threat to biodiversity after salinity and climate change. It is considered a more serious threat than weeds, clearing of native vegetation, acid sulphate soils and soil erosion. It is significant in WA because:

- Over 40% (2,300) of the native plant species and half of the endangered plant species in the south-west of WA are susceptible to the pathogen
- The changes in plant community composition and structure that Dieback causes has impacts throughout the whole ecosystem, including impacts on the indigenous fauna
- Dieback can lead to significant soil erosion as a result of the loss of susceptible vegetation

The pathogen that causes Dieback is widespread in areas with greater than 800 mm of annual rainfall, less extensive in areas that receive between 600–800 mm and mainly restricted to water-gaining sites in areas that receive 400–600 mm. The pathogen does not occur in areas that receive less than 400 mm of annual rainfall. In WA, Dieback is a significant environmental issue for projects between Geraldton in the Midwest and Esperance on the South Coast and is widespread in the Southwest region.

Three variables are required to have disease expression caused by Dieback:

1. Host- plant species present that are susceptible to *Phytophthora* spp. (i.e. *Banksia, Hakea, Leucopogon, Daviesia* spp.).

2. Pathogen - The *Phytophthora* pathogen must be present either residing in susceptible or resistant species.

3. Environment - Soil temperatures 15-30^{o} C and pH 5-6 (acidic) for *P. cinnamomi*. Some species including *P. multivora* can survive in alkaline soils (pH 7+).

The average annual rainfall for the Perth metro area (1993 -2014) is 738 mm but the disease is widespread due to and the relatively high concentration of disease vectors including uncontrolled vehicular access, surface and stormwater drainage, and rubbish dumping in areas of remnant native vegetation.

1.2 Project Location and Description

The 'study area' is comprised of the project corridor plus a nominal 50 m buffer either side which was expanded if an understanding of the broader landscape context was required for assessment. The study

area is approximately 37 km in length and extends from 0.5 km south of Reid Highway along Tonkin Highway, to approximately 4 km north of Muchea along the Great Northern Highway (**Figure 1**).

The PDNH project will require clearing remnant native and planted exotic and native verge vegetation. To manage the risks to biodiversity associated with the possible presence of the plant pathogen *Phytophthora cinnamomi* and other less virulent *Phytophthora* species, Dieback occurrence has been mapped and protectable areas were identified within, adjacent to, and downstream of the study area.

1.3 Regulatory Context

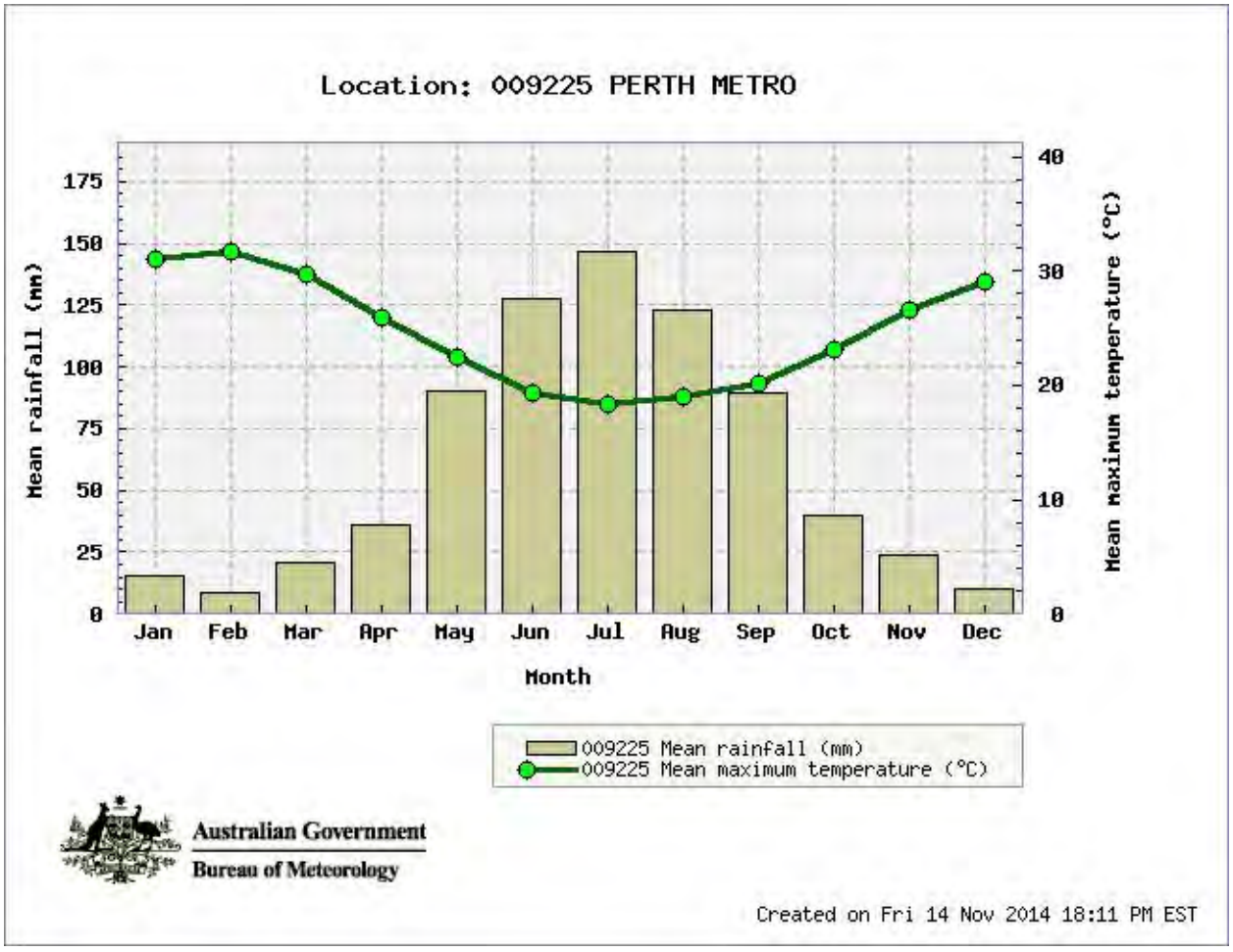
Dieback management is required under the following regulatory mechanisms in WA:

- *Phytophthora* Dieback is listed as a Key Threatening Process with the Federal Government under the *Environment Protection and Biodiversity Conservation Act* (1999).
- *Environmental Protection Act* (1986) Part V S.50A "Serious Environmental Harm" provisions.

2 Existing Environment

2.1 Climate

The Perth Metropolitan Area experiences a Mediterranean type climate with hot summers and wet winters. The average annual rainfall for the Perth metro area (1993 -2014) is 738 mm and the mean maximum temperature (1994-2014) is 24.7°C.



Graph 1: Perth Metro mean rainfall (1993-2014) and mean maximum temperatures (1994-2014) (BoM, 2014)

2.2 Flora and Vegetation

The Swan Coastal Plain is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, *Casuarina obesa* on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats, coastal limestone. Heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages and Marri on colluvial and alluvial soils (Mitchell *et. al*, 2002).

3 Methods

The Dieback assessment was undertaken by DPAW registered Dieback Interpreter Joseph Grehan and Field Assistant Kelby Jennings from September to October 2014. The linear Dieback assessment was conducted in accordance with the *Manual for detecting Phytophthora Dieback disease (Procedures for DPAW managed lands)* (DPAW, 2013).The assessment occurred during optimal sampling conditions, after significant spring rainfall and increasing soil temperatures.

3.1 Recent Changes to Dieback Occurrence Categories

The Dieback Interpreters Guidelines (DPAW, 2013) were recently updated and now categorise land that has been cleared of native vegetation as 'Excluded' from assessment. Non-vegetated areas that are Excluded from assessment include pasture, pits, easements, development, large roads (sealed and unsealed), permanently flooded areas and parkland tree stands. Excluded areas are distinguished from 'Temporarily Uninterpretable' areas by the fact that they cannot regenerate naturally and eventually become Mappable. **Table 1** presents the assessability of vegetated and non-vegetated areas, which include the Excluded category (DPAW, 2013).

The Temporarily Uninterpretable category is allocated to areas of native vegetation which have been disturbed, but will recover over time and become Interpretable and therefore Mappable. Examples of Temporarily Uninterpretable areas include vegetation that has been impacted by fire, grazing, timber harvesting, flooding or mining and rehabilitation. Recovery in Temporarily Uninterpretable areas may take longer than 3 years (DPAW, 2013).

Table 1: Assessability of vegetated and non-vegetated areas (as cited in DPaW 2013)

	Phytophthora **occurrence category**	**Typically present**	**May be present**
Naturally vegetated areas (Phytophthora occurrence categorisation is or will be possible) Small un-vegetated areas can exist and may be included in the assessment area considering total environmental context	**INFESTED**	Dead and dying reliable indicator species	Healthy reliable indicator species. Indicator Species Deaths (ISDs) that have been killed by other agents
	UNINFESTED	Healthy reliable indicator species	ISDs that have been killed by other agents
	UNINTERPRETABLE	Very few reliable indicator species	Occasional reliable indicators, but too few for *Phytophthora* dieback interpretation
	NOT YET RESOLVED	Usually reliable indicator species in an environment not favourable to disease development	Negative sample results for all *Phytophthora* species
	TEMPORARILY UNINTERPRETABLE	Indicator species masked by disturbance. Keighery disturbance rating of 4 or greater Disturbance typically from; fire, harvesting, temporary flooding. Should recover (become interpretable) in 3 years or less	Occasional reliable indicator species, but disturbance prevents accurate placement of *Phytophthora* occurrence boundaries. Recovery time may be longer than 3 years
	DISEASE RISK ROAD	Unformed track with shoulders of interpretable vegetation	Shoulders and batters with regenerated vegetation. Incipient infestation

	Phytophthora occurrence category	Typically present	May be present
Non-vegetated areas (*Phytophthora* occurrence assessment is not possible) Can be determined by desktop assessment (aerial photo) Small vegetated areas can exist and may be Excluded from the assessment area considering total environmental context	**EXCLUDED**	Pasture, pits, easements, infrastructure, large roads (sealed and unsealed) permanent flooding, plantations, parkland tree stands	Sporadic reliable indicator species

The Keighery vegetation disturbance scale (**Table 2**) was used to determine the interpretability of remnant vegetation area. Areas that achieve a vegetation condition rating of 1-3 (Pristine - Very Good) are considered to be Mappable. In addition, there must also be enough disease indicator species present to enable a diagnosis of the disease status. An area with a vegetation condition rating of 4 (Good) is possibly Mappable however it is up to the interpreter's discretion and may be categorised as Temporarily Uninterpretable or Excluded depending on the likelihood that the area will recover and become Mappable. Areas given a condition rating of 5 or 6 (Degraded or Completely Degraded) are unmappable and therefore Excluded from assessment.

Table 2: Keighery vegetation disturbance scale and assessability (DPAW, 2013)

Interpretability	Scale		Condition
Mappable	1	Pristine	Pristine or nearly so, no obvious signs of disturbance
	2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species
	3	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
Possibly Mappable, discretion required	4	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.
Unmappable or Excluded from assessment	5	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.
	6	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.

The vegetation of Uninterpretable areas can range from Pristine to Very Good however whether the pathogen is present in resistant hosts or as Zoospores in permanent water bodies is indeterminable. Uninterpretable areas that meet the protocols for identifying Protectable Areas (CALM, 2004) are managed as being both Infested and Uninfested so that the pathogen is neither imported into, nor exported from these areas.

3.2 Protocols for Identifying Protectable Areas

According to the *Phytophthora cinnamomi* Management Guidelines (CALM, 20003) the following primary criteria are used to define 'Protectable Areas' as those that:

- Have been determined to be free of the pathogen *Phytophthora* sp. by a registered Dieback Interpreter (all susceptible indicator plant species are healthy and no plant disease symptoms normally attributed to *Phytophthora* Dieback are evident).
- Are positioned in the landscape and are of sufficient size (e.g. > 4 ha with axis >100 m) such that a qualified Interpreter judges that the pathogen will not autonomously engulf them in the short term (a period of a few decades).
- Includes areas of high conservation and/or socio-economic value (for example, a small Uninfested area with a known population of a susceptible species of Threatened flora).
- Consists of areas where human vectors are controllable (e.g. not an open road, private property) (DPAW, 2013, pp 101 - 102).

3.3 Field Assessment

A nominal 200 m wide study area was proposed. The minimum 200 m wide study area was determined to be appropriate because it allowed 100 m for the disturbance corridor plus an additional 50 m either side. The width of the study area was increased to assess sections that are wider than 200 m and the landscape context within which the corridor is located.

Approximately 17 km of native vegetation required assessment along the corridor which equated to 465 ha. Native vegetation adjacent to the disturbance corridor was mapped so that protectable areas could be identified and appropriately managed to prevent infestation.

The first step of the field assessment was to complete a reconnaissance of the study area to determine the following:

- Access.
- Identify interpretable vegetation and disease expression if present.
- Identify possible disease vectors, e.g. tracks, utility corridors, ground disturbance, feral animals.
- Determine the location of high risk areas, e.g. areas of high disturbance and water-gaining sites.
- Identify other impacts to vegetation, e.g. drought, cankers, herbivory, *Armillaria luteobubalina,* fire.

The Dieback assessment involved traversing areas of native vegetation within the study area along 50 m wide strip-lines, recording evidence of presence or absence of Dieback and taking soil and tissue samples of recently dead or dying disease indicator species. This was followed by disease boundary mapping, including buffers of appropriate width, as prescribed in the Dieback Interpreter's Guidelines (**Section 3.6**). The samples were lodged with DPAW's Vegetation Health Services Laboratory (VHS) where diagnostic baiting was conducted. All sample point locations were recorded with a hand-held Global Positioning Satellite (GPS) device.

3.4 Sampling

Soil and tissue samples were taken from recently dead or dying disease indicator species to confirm the presence or indicate the possible absence of Dieback and inform interpretation of the area. Negative sample results do not necessarily mean that the pathogen is absent because low levels of inoculum can lead to false negative results.

Sampling strategies for the assessment of Dieback include the following:

Initial standards sampling: Initial samples were taken to determine disease behaviour. The results inform the sampling strategy and enable the testing of early hypotheses (e.g. are other factors causing the deaths of susceptible species such as *Armillaria luteobubalina* or drought).

Sampling to support infested diagnosis: Recently dead and dying indicator species were sampled to support an infested diagnosis.

Sampling to support an uninfested diagnosis: Recently dead and dying indicator species were sampled to support an uninfested diagnosis. A cautious approach must be adopted when claiming that a negative result means that an area is Uninfested because false negative results can be recorded when inoculum levels are depleted due to prolonged unfavourable environmental conditions for the pathogen.

All sampling strictly adhered to the following procedures:

- All tools used in sampling were thoroughly sterilised with a 70:30 mixture of methylated spirits and water before samples were taken. Tools were dry prior to sampling so that the results were not compromised.
- The area around the base of the plant being sampled was cleared of leaf litter and debris so that this material was not included in the sample.
- The plant sampled was excavated to a suitable depth to ensure that adequate plant tissue material can be obtained from the roots and cambium layer around the collar of the plant being sampled.
- Material from all around the plant was taken in addition to any obvious lesions to avoid missing any infected material. All the plant tissue material and a few handfuls of soil from around the roots and other places in the soil profile were placed in a polythene bag.
- Enough distilled water to moisten the soil was poured into the bag to ensure the survival of any inoculum that may be present in the sample.
- All relevant information pertaining to the plant sampled and sample location was recorded on the Sample Information Sheet.
- Two aluminium tags which provide the date, project name, sample number, species sampled and the name of the interpreter were written. One tag was placed in the sample bag and the other was tied near the sample site which was also flagged with a day-glo orange flagging banner.
- The sample hole was backfilled to prevent fauna becoming trapped.
- All tools were brushed off (to remove excess soil) and sterilised to prevent contamination of the next sample site and sample.

3.5 Mapping

Dieback occurrence maps illustrate the extent of Dieback within the study area. Areas of vegetation were classified according to their Dieback occurrence category, as defined in DPAW's draft Dieback Interpreters guidelines (**Table 1**). Field evidence and observations were used to prepare the Dieback occurrence map of the study area (**Figure 2-13**). Information used in Dieback occurrence mapping includes:

Sample results: Positive sample results for *Phytophthora* spp. confirm that a particular point is infested. Extrapolation of this is done by the Dieback Interpreter mapping disease occurrence through field observations including susceptible species deaths, biomass reduction, disease pattern and chronology. The Interpreter must also determine the disease status in low interpretability areas and areas where disease was being masked through colonisation of resistant species such as sedges (McComb *et.al* 1994) (**Plate 1**).

Interpretability of the vegetation: this is determined from the abundance and cover of susceptible species and the presence or absence of disease indicator species. The level of interpretability is also determined by the vegetation condition with areas rating five or greater (Degraded to Completely Degraded) on the Keighery scale (**Table 2**) Excluded from assessment. Vegetation may also be in Pristine or Excellent

condition and be Uninterpretable due to the composition of the plant species present and the absence of disease indicator species.

Topography and drainage: these two factors are critical in determining the likelihood of an area being infested and whether an area is protectable from disease.

Disease vectors and disturbance: these two factors are considered when determining whether an area is likely to recover and is Temporarily Uninterpretable or should be Excluded from assessment because it is not likely to recover naturally and therefore become mappable. Excluded areas may be assessed as high risk of being Infested due to uncontrolled public access, dumping and disturbance.

3.6 Buffers

The following buffers were applied during mapping of Infested areas in accordance with the Dieback Interpreter Guidelines (DPAW, 2013):

- Minimum upslope buffers 15 m depending on complexity of disease expression.
- Minimum downslope buffer of 25 m depending on degree of slope, drainage patterns, soil type and geology.

3.7 Limitations

The following limitations were encountered during the assessment:

- The Degraded or Completely Degraded condition of the majority of native vegetation within the study area meant that the majority (69.8%) of the study area had to be Excluded from assessment.
- The widespread impacts of canker made Dieback interpretation more difficult because primary disease indicator species including *Banksia* spp. were particularly affected by these pathogenic fungi.
- The widespread impact of drought made Dieback Interpretation more difficult.
- Access to some of the properties along the project corridor was initially prohibited which delayed the field assessment by several weeks resulting in some samples being taken later, during less optimal conditions.

4 Results

In total, 27 soil and tissue samples were taken from recently dead and dying disease indicator species, which included one canker tissue sample. All the samples, apart from one sample taken from a *Xanthorrhoea preissii*, were taken from *Banksia* spp. because this genus is considered the most susceptible to *Phytophthora cinnamomi*. In total, four positive results for *P. cinnamomi*, one positive result for a *Lasiodiplodia* sp. (canker), and 21 negative samples were reported (**Table 3, Appendix 2**).

Table 3: Sample Results

Sample No.	Species	Easting GDA 94 Zone 50	Northing GDA 94 Zone 50	Laboratory Results
1	*Banksia attenuata*	400799	6484596	*P. cinnamomi*
2	*Banksia ilicifolia*	399603	6482900	Negative
3	*Banksia grandis*	404845	6509570	Negative
4	*Banksia menziesii*	403463	6488149	*P. cinnamomi*
5	*Banksia attenuata*	403463	6487606	Negative
6	*Banksia attenuata*	403745	6487608	*Lasiodiplodia* sp. (canker)
7	*Banksia attenuata*	403415	6487327	Negative
8	*Banksia attenuata*	403428	6487171	Negative
9	*Banksia ilicifolia*	403303	6486895	Negative
10	*Banksia ilicifolia*	403329	6486759	Negative
11	*Banksia attenuata*	403268	6486599	Negative
12	*Banksia menziesii*	403442	6487076	Negative
13	*Banksia attenuata*	403234	6486262	Negative
14	*Banksia attenuata*	402730	648561	Negative
15	*Banksia attenuata*	402356	6485482	Negative
16	*Banksia attenuata*	402039	6485343	Negative
17	*Banksia ilicifolia*	401931	6485377	Negative
18	*Banksia attenuata*	402329	6485559	Negative
19	*Banksia menziesii*	397209	6479515	*P. cinnamomi*
20	*Banksia ilicifolia*	397523	6478527	Negative
21	*Banksia attenuata*	397376	6478222	Negative
22	*Banksia menziesii*	397166	6480700	*P. cinnamomi*
23	*Banksia menziesii*	396969	6480467	Negative
24	*Banksia menziesii*	405118	6507024	Negative
25	*Banksia menziesii*	402968	6485904	Negative
26	*Banksia attenuata*	403001	6485955	Negative
27	*Xanthorrhoea preissii*	397572	6477399	Negative

In total 1,541.61 ha were assessed with 69.8% of the area determined to be Excluded (unmappable) from the Dieback assessment, 23.5% Infested, 3.7% Uninfested and 3.0% Uninterpretable (**Table 4**).

Table 4: Proportion of each Dieback occurrence category within the study area

Dieback Occurrence Category	Area (ha)	Area (%)
Excluded (unmappable)	1,076.51	69.8
Infested (*P. cinnamomi*)	362.47	23.5
Uninfested	56.76	3.7
Uninterpretable	45.90	3.0
Total	1,541.64	100

5 Discussion

Because of the length of the study area, the following discussion considers Dieback occurrence from the northern to the southern extent of the study area (**Figures 2-13** respectively).

5.1 Figures 2-7

The northern portion of the study area from Muchea to Warbrook Road shown in **Figures 2-7** was mostly Excluded from assessment because it is not possible to map Dieback occurrence in pasture and disturbed areas where the vegetation condition is rated as Degraded to Completely Degraded according to the Keighery vegetation condition scale.

An Infested area has been mapped extending from a historical positive result for *Phytophthora cinnamomi* to the northern extent of the study area on both sides of the Great Northern Highway (**Figure 2**). Although a negative sample (NLS03) result was returned from this area, there was enough evidence, including disease indicator species deaths, disease patterns and chronology; to determine that this section of the study area is infested.

Watercourses which are dominated by species resistant to Dieback, including *Melaleuca raphiophylla* and *Eucalyptus rudis,* intersect the study area at several locations (**Figures 2-7**, **Plate 2**). One Uninterpretable watercourse is downstream of an Uninfested area (NLS24) and is therefore unlikely to be vectoring the pathogen downstream (**Figure 2**). Hygiene management within Uninterpretable areas is critically important because poor hygiene management can result in the pathogen being vectored downstream to Uninfested vegetation.

5.2 Figure 8

This section of the study area includes Infested vegetation, both north (NLS04) and south of Maralla Road, including an area within DPAW managed Nature Reserve 2066/893. Significantly, there is also an area of Protectable Uninfested vegetation which extends both west and east beyond the corridor. Vegetation in these Uninfested areas displayed symptoms of drought and canker with a positive a result for *Lasiodiplodia* sp. recovered from a recently dead *Banksia menziesii* (**Plate 3**, **Appendix 1**).

The Infested areas were commonly restricted to wetland areas where sufficient *Xanthorrhoea preissii* and fringing *Banksia* spp. deaths displaying disease pattern and chronology provided enough evidence for an infested diagnosis (**Plate 4**). The infestation within the nature reserve south of Maralla Road had been previously delineated with a positive sample site for *P. cinnamomi*. Mapping of this infestation was checked and updated. Hygiene management within this section will be critical to ensuring that the pathogen is not vectored into uninfested areas adjacent to the corridor.

5.3 Figures 9 and 10

This section of the study is located in the Ellenbrook area (**Figure 9**), within Rocla's mining tenement and also traverses the Gnangara-Moore River State Forest (**Figure 10**). Although potential disease vectors were plentiful in the bushland adjacent to Ellenbrook, including unrestricted vehicular access and rubbish dumping; the majority of this section of the study area is Uninfested. Infested areas were mainly restricted to wetland areas and immediately adjacent upland vegetation. Some areas were highly disturbed and were therefore Excluded from assessment but are considered high risk due to unrestricted vehicular access and rubbish dumping (**Plate 5**). In total, 11 samples were taken in this section with no positive results for *P. cinnamomi* or other *Phytophthora* species. These sample results, along with the vegetation condition, absence of disease pattern or chronology; support an Uninfested diagnosis for these areas. Significantly, the upland vegetation east of the study area appears to be Uninfested, with Dieback generally restricted to water-gaining sites.

The majority of the study area within Rocla's mining lease was Excluded from assessment either because it was pine plantation or cleared land that cannot be assessed for the presence of Dieback. Some areas where

the pine trees had been cleared had native species regenerating. However, the vegetation condition was Degraded and there were not enough disease indicator species present to enable assessment of these areas.

Disease expression within areas of native vegetation in Rocla's mining lease areas was obvious with multiple disease indicator species deaths, strong disease pattern and chronology (**Plate 6**). For these reasons, only two samples were taken in this area with one positive result (NLS01) for *P. cinnamomi.*

5.4 Figures 11 and 12

This section of the study area south of Gnangarra Road, which includes Cullacabardee Nature Reserve (**Figure 11**) and the western side of Whiteman Park, is mostly Infested (NLS 19 and NLS 22) with obvious disease symptoms, pattern and chronology (**Plate 7**). Several historical positive sample results for *P. cinnamomi* have been recorded both east and west of the study area, with disease vectors intersecting the project corridor in the form of drainage lines and unsealed roads (**Figure 12**). The area in between Hepburn Avenue and Cullacabardee Nature Reserve is Completely Degraded with *Xanthorrhoea preissii* the only remnant native species present. Normally an area that is Completely Degraded would be Excluded from assessment; however the evidence of disease pattern and chronology in the *X. preissii* population, in conjunction with widespread disease in the surrounding landscape has resulted in an Infested diagnosis (**Plate 8**).

There are three Uninfested areas within Cullacabardee Nature Reserve (**Plate 9**). The two smaller areas are Unprotectable due to their size (0.49 and 0.18 ha). The larger Uninfested area is 9.66 ha and located upslope of Dieback vegetation. Therefore it would meet DPAW's protocol for identifying protectable areas because more than four hectares of this Uninfested area are upslope from Dieback.

5.5 Figure 13

The most southern section of the study area between Hepburn Avenue and the Tonkin and Reid Highway interchange is a combination of Infested and Excluded areas. The Infested areas displayed obvious disease symptoms, including disease pattern and chronology. The Excluded areas include cleared areas and areas where the vegetation condition is Degraded or Completely Degraded, making these areas unmappable for Dieback (**Plate 10**).

5.6 Other Potential Impacts to Vegetation

There may be other factors causing the observed deaths of disease indicator species, including drought, other *Phytophthora* species, other pathogenic fungi and *Armillaria luteobubalina* (Armillaria or Australian Honey Fungus).

5.6.1 Drought

Impacts to vegetation as a result of prolonged drought were differentiated from impacts caused by *P. cinnamomi* by the following characteristics:

- No disease pattern or chronology in the surrounding vegetation.
- The plant had senesced gradually rather than succumbing quickly as is usually the case with deaths attributed to *P. cinnamomi.*
- No visible lesions or mycelium on the roots of the dead or dying plant.
- Re-shooting or epicormic growth visible on dying plants (**Plate 11**).

The presence of single or multiple dead branches with the remainder of the plant appearing to be healthy may be attributed to drought or pathogenic fungi. Impacts to vegetation symptomatic of drought were evident throughout the study area (**Plate 12**).

5.6.2 *Armillaria* (Australian Honey Fungus)

Armillaria luteobubalina (Armillaria) or Australian Honey Fungus is a species of mushroom which causes Armillaria root-rot in affected plants. The fungus is widespread in Jarrah (*Eucalyptus marginata*) and Karri (*E. diversicolor*) forests of the southwest of WA, but has also been recorded in coastal vegetation between Cape Arid 120 km east of Esperance to Cervantes 160 km north-west of Perth (Shearer *et al.* 1994a, 1997). Armillaria is dispersed by spores produced by the mushroom and also reproduces vegetatively through the roots of affected plants. It affects many of the same plant genera as *Phytophthora* in particular members of the Myrtaceae and Protecaceae plant families such as *Eucalyptus* and *Banksia* species (Shearer 1994a). Armillaria forms quite visible white or yellow leathery mycelial sheath which is visible beneath the bark in the roots or lower stem. Other observable factors that can be applied in the diagnosis of *Armillaria* infection include:

- Clusters of fruiting bodies around or near the base of the plant.
- A pungent mushroom smell.
- An inverted V-shaped scar at the base of the plant.
- Yellow-white stringy rot under the bark in the roots and base of affected plants (DEC, 2012).

While some of the mycelium observed in this study may be as a result of Armillaria, the assessment was undertaken at the wrong time of the year to observe fruiting bodies and therefore confirm the presence of the fungus. It is possible that *Armillaria luteobubalina* is present within the study area and contributing to the destruction of the vegetation.

5.6.3 Other Pathogenic Fungi

In addition to the impact of drought the possibility also exists that cankers caused by aerial fungi are having an impact on *Banksia* species in particular. Crane and Burgess (2013) studied the effect of cankers caused by pathogenic fungus on Proteaceous species. The study examined the impact that aerial cankers are having on coastal vegetation between Esperance and Cervantes and demonstrated pathogenicity in seven *Banksia* species over a wide geographic range. The pathogenic fungus was identified as a new genus and species within the Cryphonectriaceae (Diaporthales) and is described as *Luteocirrhus shearii* gen. sp. *nov*. The fungus causes the death of single branches; however it can lead to multiple branch deaths or cause complete crown dieback as occurred with some of the *Banksia baxteri* and *B. verticillata* sampled (Crane and Burgess 2013).

Only one canker sample was taken from a *Banksia attenuata* to confirm that it was having an impact on the proteaceous species being assessed for symptoms of Dieback. The sample returned a positive result for *Lasiodiplodia* sp. This species of canker has a host range which includes species from the Protecaceae, Myrtaceae and Ericaceae plant families. *Lasiodiplodia* sp. along with other genera in the Botryosphaeriales, are commonly isolated from stem and twig cankers of *Eucalyptus, Hakea* and *Banksia* spp. of south-western Australia (Shearer 1994b). Crane (2014; **Appendix 1**) states that '*Lasiodiplodia* sp. are sometimes parasitic and often exist as benign endophytes (present in host tissues asymptomatically) causing disease only when the host is compromised in some way. Plants affected by drought, insect attack, defoliation by fungi, sunscald, herbicides or mechanical injury are predisposed to infection and disease development'.

6 Conclusion and Recommendations

The Dieback assessment determined that the majority of the study area (69.8%) is unmappable due to being cleared and/or farmland and is therefore Excluded from assessment. Mappable areas are a mosaic of mainly Infested (23.5%) and Uninfested (3.7%) native vegetation. While some areas of Protectable Uninfested vegetation were mapped within the corridor, the Uninfested areas adjacent to the corridor between Maralla Road and Gnangara Road are more significant because they are Protectable from Dieback in the longer term. While the majority of the vegetation within the project corridor will be cleared, the critical issue is that the pathogen is not introduced into areas that can vector it along watercourses, tracks and roads.

Uninterpretable areas (3%) are predominantly comprised of creeks and drainage lines intersecting the study area. Uninterpretable riparian vegetation and watercourses may, or may not, be hosting the pathogen but these areas are a potential vector for the pathogen if hygiene is not adequately managed.

Dieback is spread through the movement of water and soil within the landscape. Major vectors of Dieback include, among others, wet soil adhering to vehicle tyres/tracks and earthmoving equipment. Therefore, quarantine management procedures are an effective tool to reduce the spread of Dieback as a result of earthmoving activities.

Terratree makes the following recommendations for managing *Phytophthora* Dieback during the PDNH project:

- A Dieback Management Plan should be prepared for the project by a suitably qualified and experienced person in accordance with best practice management techniques described in the following publications:
  - Management of *Phytophthora* Disease; Policy Statement 3. Department of Parks and Wildlife (2014).
  - "*Phytophthora cinnamomi* and Disease Caused by it" Volume 1 Management Guidelines, Department of Environment and Conservation (2004).
- The management plan should include:
  - A comprehensive risk assessment of potential disease vectors and proposed activities within project corridor.
  - Recommendations for hygiene management locations that consider the level of risk to biodiversity in the surrounding landscape.
  - A program to monitor and report on compliance with the hygiene protocols prescribed in the management plan.
  - A communication program to make personnel aware of the risk to biodiversity associated with spreading Dieback and the importance of adhering to hygiene protocols.

7 References

Bureau of Meteorology http://www.bom.gov.au/ accessed November 13th 2014

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8 Glossary of Terms

Assessment – (*Phytophthora* occurrence) any combination of activities including, detection, diagnosis (interpretation), mapping and demarcation of *Phytophthora* Dieback disease in natural ecosystems.

Assessment Area – an area where *Phytophthora* occurrence assessment is possible, or will be possible in the short to medium term. This area may be larger or smaller than the proponent's project area.

Buffer – the intervening area reducing the danger of interaction. In dieback mapping this refers to the area between the visible disease symptoms and the demarcation.

Chlorosis – the loss of the normal green colouration of leaves of plants, caused by mineral deficiency, disease or lack of light.

Disease – The combination of a pathogen, host and correct environmental conditions, which results in disease symptoms or death of a host.

Environment - The sum of all external factors which act on an individual organism during its lifetime.

Excluded Area – An area of high disturbance in which native vegetation is unlikely to recover.

Host - means the plant which is invaded by a pathogen and from which the pathogen derives its energy.

Indicator species – Plant species that area more susceptible to Phytophthora disease and reliably show symptoms earlier than other species.

Infection – The invasion of a host organism's bodily tissue by disease causing organisms. In relation to Dieback this refers to an individual plant and not the population.

Infested – The state of being invaded or overrun by pests or parasites. In relation to Dieback it refers to a population of plants and not individual plants.

Inoculum – Cells, tissue, or viruses that are used to inoculate a new culture

Lesion- any abnormality in the tissue of an organism (damage), usually caused by disease or trauma.

Mycelium – The mass of hyphae that for the vegetative part of a fungus

Pathogen – Any organism or factor causing disease within a host

Pathogenic – Causing or capable of causing disease

***Phytophthora* Dieback –** A term referring to the disease symptoms caused by *Phytophthora* species in susceptible vegetation.

Protectable area- an area of vegetation that can be protected by the application of hygiene controls to prevent infestation.

Susceptible – Likely to be influenced or able to be harmed by particular pathogen

Symptom – A phenomenon that arises from, and accompanies a particular disease or disorder and serves as an indication of it

Uninfested – An area that does not contain infected plants or show visible signs of disease

Uninterpretable – a natural area where there are inadequate visible symptoms present to make a diagnosis

Unmappable – A naturally vegetated area that has had disturbance and from which is likely to recover in the short term

Unprotectable – A disease free area that is likely to become Infested within a given time

Vector – any agent that acts as a carrier or transporter

Figures

390,000 400,000 410,000

6,510,000 6,500,000 6,490,000 6,480,000 6,470,000

Gnangara-Moore River State Forest

Un-named Nature Reserve

Bullsbrook Nature Reserve

Neaves Road Nature Reserve

Neerabup National Park

Un-named Conservation Park

Un-named Miscellaneous Reserve

Lake Joondalup Nature Reserve

Jandabup Nature Reserve

Woodvale Nature Reserve

2066/893

2650/480

Twin Swamps Nature Reserve

Walyunga National Park

Ellen Brook Nature Reserve

Gnangara-Moore River State Forest

Talbot Road Nature Reserve

John Forrest National Park

Parkerville Nature Reserve

Un-named 5(1)(g) Reserve 1014/836

Greenmount National Park

Beelu National Park

Un-named 5(1)(h) Reserve

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LEGEND

- Swan Valley Bypass
- Tonkin Highway Grade Seperation
- DPaW managed lands
- Watercourse

NORTHLINK - PROJECT LOCALITY

Linear Phytophthora Dieback Survey

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Scale (A3) 1:135,000	Prepared: B Jones	talis
Date: 19/11/2014	Checked: J Botterill	
Project No: TW14013	Reviewed: N King	Terratree
Figure: 01	Revision: Rev A	

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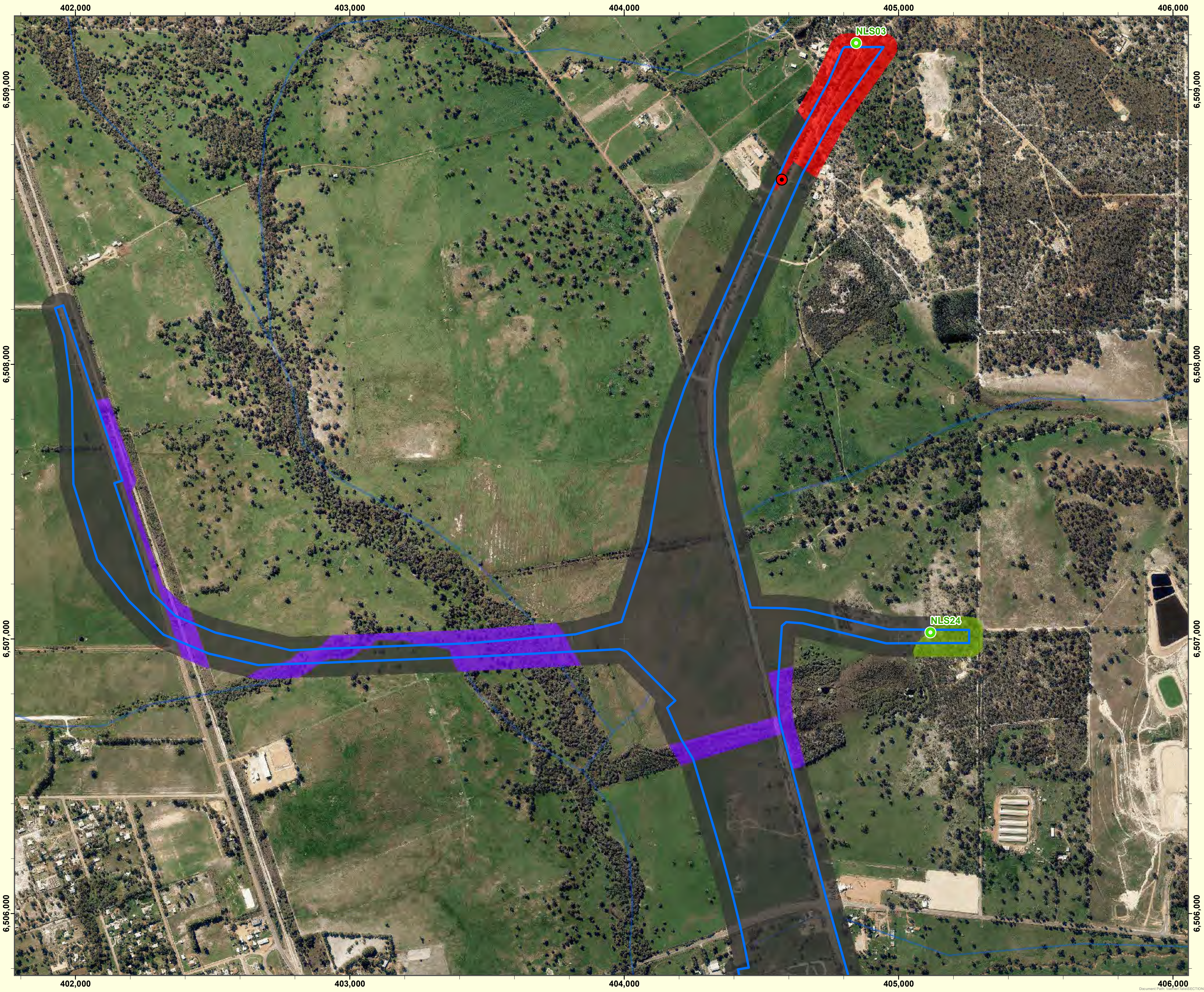

LEGEND

- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninfested
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative
- *P. cinnamomi* (Historical)

NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 2

Terratree

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LEGEND

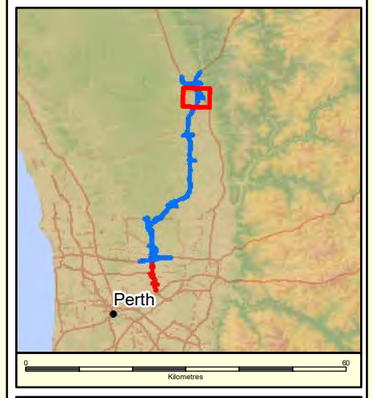
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 3

Terratree

talis consultants

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LEGEND

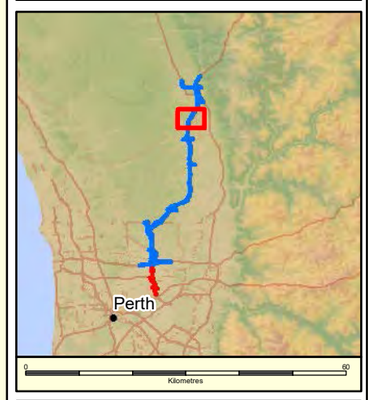
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 4

Terratree

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LEGEND

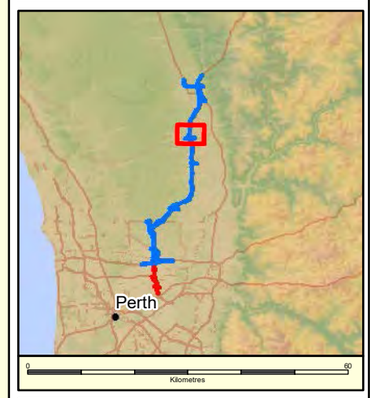
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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Date:	19/11/2014
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Project No:	TW14001
Prepared:	B Jones
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Figure 5

Terratree

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LEGEND

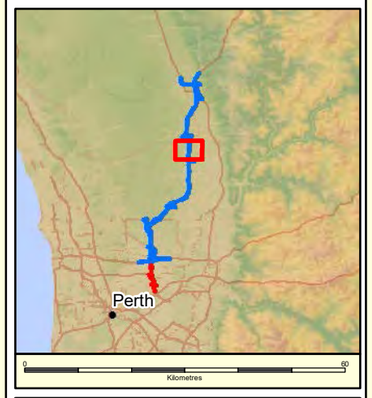
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Date:	19/11/2014
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Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 6

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Gnangara-Moore River State Forest

LEGEND

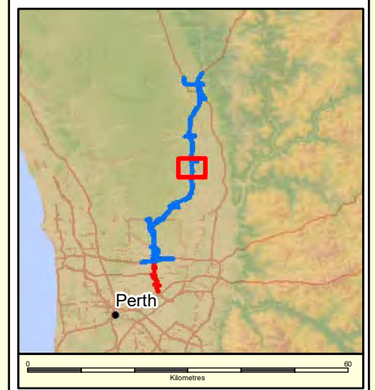
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 7

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NLS08
NLS12
NLS09
NLS10
NLS11
NLS13

Un-named Nature Reserve

LEGEND

- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninfested
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative
- *Lasiodiplodia* sp. (canker)
- *P. cinnamomi* (Historical)

NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 8

Terratree

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Gnangara-Moore River State Forest

Un-named Nature Reserve

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LEGEND

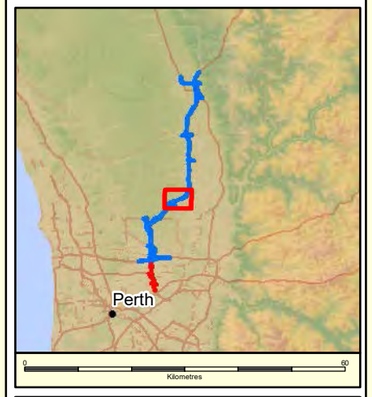
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninfested
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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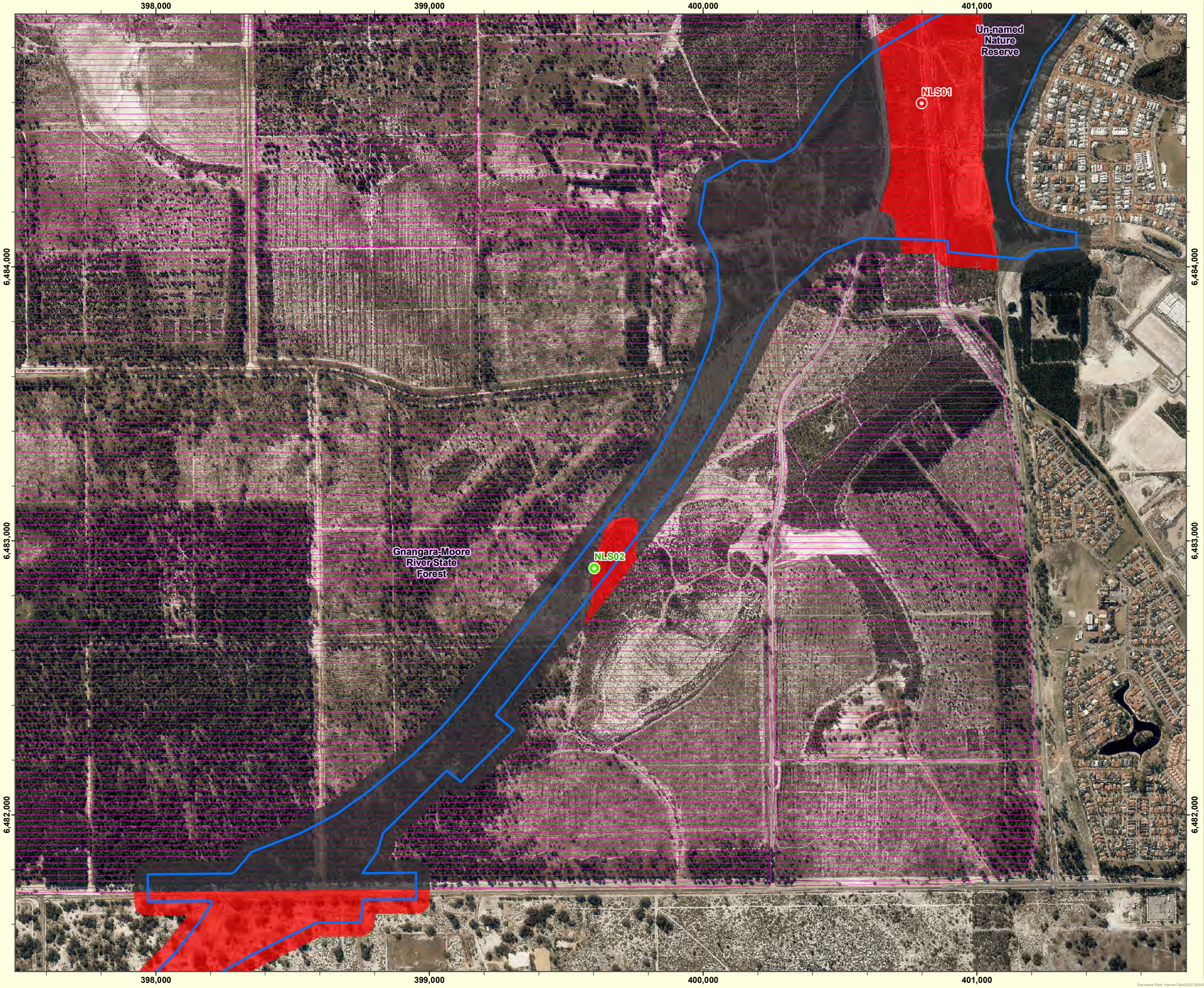
Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 9

Terratree

talis consultants



LEGEND

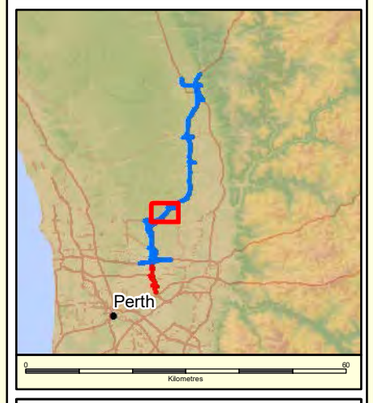
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

Coordinate System: GDA 1994 MGA Zone 50
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Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 10

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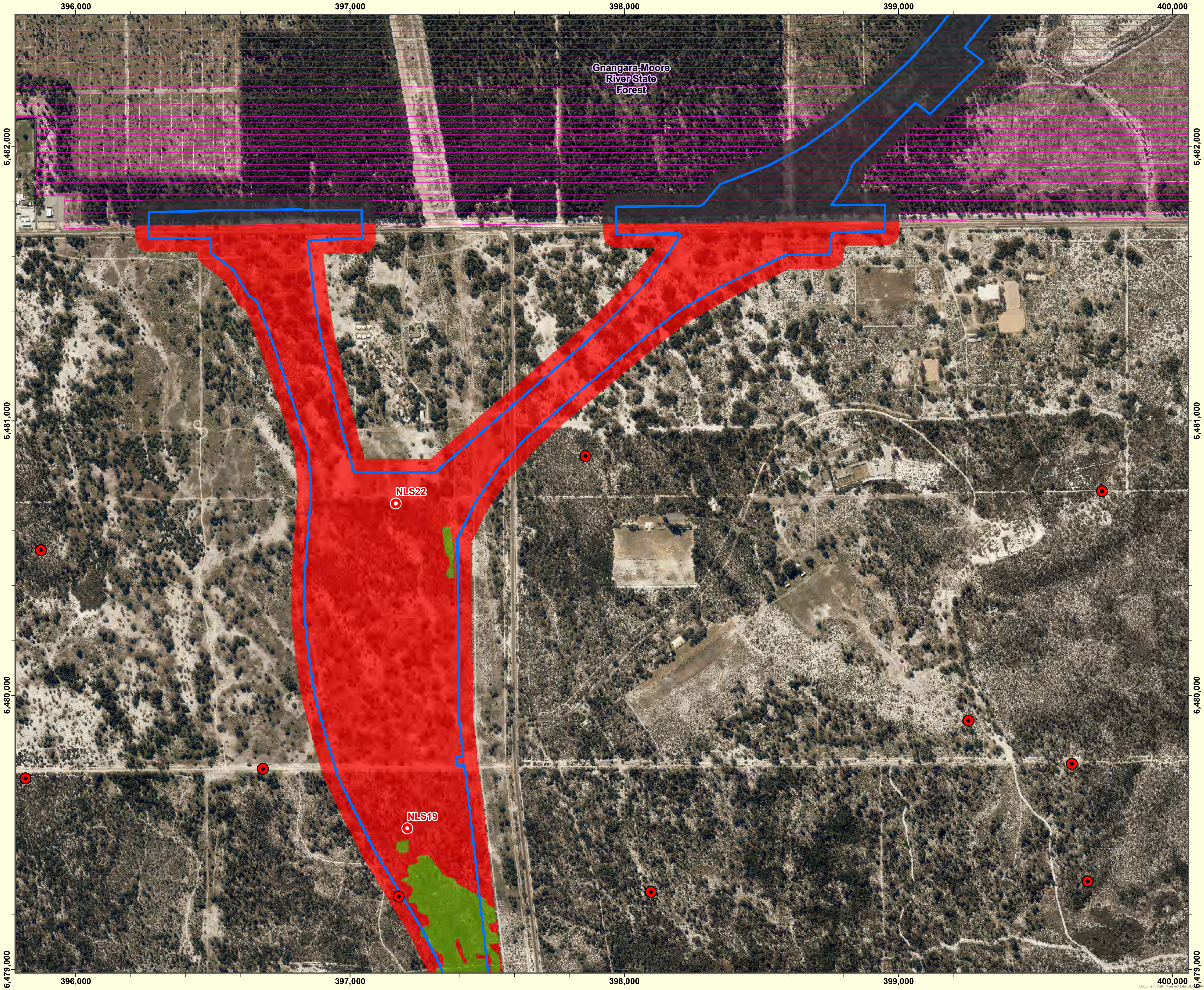


LEGEND

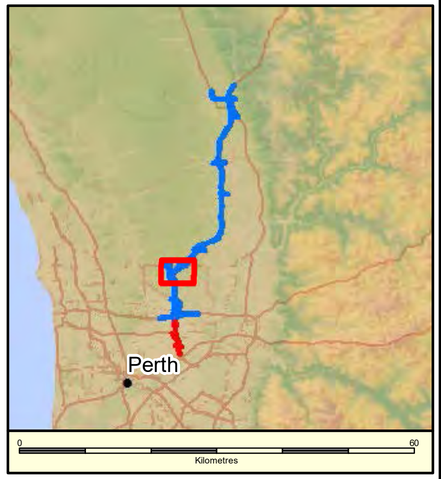
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninfested

Dieback Sample Results

- *P. cinnamomi*
- Negative
- *P. cinnamomi* (Historical)



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

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Meters

Scale @ A3:	1:12,500
Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 11

Terratree

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LEGEND

- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninfested
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative
- *P. cinnamomi* (Historical)

NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

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Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 12

Terratree

talis consulting

396,000 397,000 398,000 399,000 400,000

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Un-named Nature Reserve

LEGEND

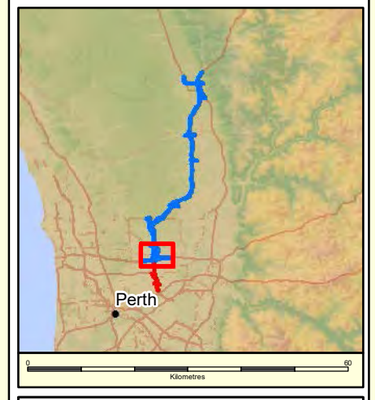
- Swan Valley Bypass
- Tonkin Highway Upgrade
- DPaW managed lands
- Watercourse

Dieback Occurence Category

- Excluded
- Infested
- Uninterpretable

Dieback Sample Results

- *P. cinnamomi*
- Negative



NORTHLINK - SWAN VALLEY BYPASS PROJECT

Linear Phytophthora Dieback Survey

N W E S

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Date:	19/11/2014
Revision:	Rev B
Project No:	TW14001
Prepared:	B Jones
Checked:	J Botterill
Reviewed:	N King

Figure 13

Terratree

talis consultants

Plates

Plate 1: Infested area being masked by resistant sedges

Plate 2: Uninterpretable vegetation dominated by resistant species *Melaleuca raphiophylla*

Plate 3: Canker lesion above the root collar on a *Banksia attenuata*

Plate 4: Infested water-gaining site at Ellenbrook with dead *Xanthorrhoea preissii* displaying disease pattern and chronology.

Plate 5: Rubbish dumping at Ellenbrook due to unrestricted vehicular access

Plate 6: Infested area within Rocla's mining lease area with obvious disease symptoms, pattern and chronology.

Plate 7: Infested area in Cullacabardee Nature Reserve with obvious disease symptoms, pattern and chronology.

Plate 8: Infested *Xanthorrhoea preissii* population in Whiteman Park.

Plate 9: Uninfested area in Cullacabardee Nature Reserve with multiple healthy disease indicator species and no disease symptoms.

Plate 10: Example of Excluded (unmappable) near the intersection of Reid and Tonkin Highways.

Plate 11: Epicormic growth on *Banksia attanuata* indicates recovery from drought

Plate 12: Drought symptoms in otherwise healthy vegetation

Appendices

Appendix 1: Vegetation Health Services Laboratory report on positive identification of *Lasiodiplodia* sp. (Canker)

Appendix 2: Sample Results from the Vegetation Health Services laboratory

PLANT DISEASE SAMPLE INFORMATION SHEET

CLIENT NAME Terratree. Joe Grehan joeg@terratree.com.au

SAMPLE *Banksia attenuata* canker NLS 06 (canker).

DIAGNOSIS A *Lasiodiplodia* sp. (Fig 1 & 2) was isolated almost in pure culture and most likely indicates some inability of the plant to contain the fungi which can also be present on healthy plants.

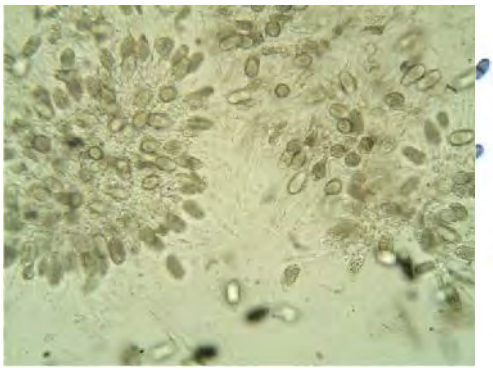

Fig. 1 Young conidia and coniophores

Fig. 2 Mature conidia with melanisation and weak striations

THE PATHOGEN *Lasiodiplodia sp* along with other genera in the Botryosphaeriales, are commonly isolated from stem and twig cankers of *Eucalyptus*, *Hakea* and *Banksia sp*. of south-western Australia (Shearer 1994) Sometimes parasitic they often exist as benign endophytes (present in host tissues asymptomatically) causing disease only when the host is compromised in some way. Trees affected by drought, insect attack, defoliation by fungi, sunscald, herbicides or mechanical injury are predisposed to infection and disease development.

SYMPTOMS Twig and branch death.

HOST RANGE Myrtaceae, Proteaceae and Epacridaceae.

DISTRIBUTION Ubiquitous across the south-west but can have local high inoculum levels in infection pockets.

CONTROL Really need to trial this first to look at host/pathogen/fungicide response. Unsure? Is it warranted?

LABORATORY SAMPLES CC1720 not retained

SITE Northern Linkage?

MAP REFERENCE E 403745 N 6487608 Zone 50?

19/9/2014
Colin Crane
Manager Vegetation Health Service
Department of Parks and Wildlife
Science Division
PH. (08) 9334 0482
Fax.(08) 9334 0327
Email: colin.crane@dpaw.wa.gov.au

Shearer BL (1994) The major plant pathogens occurring in native ecosystems of south-western Australia, Journal of the Royal Society of Western Australia **77**, 113-122.

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6152 **Phone:** (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS
Name Joe Grehan - Terratree Pty Ltd
Fax No. _____ Phone No. 93354228 / mob 0400003688
Region/District SWAN

Job Type (Please indicate)
D.E.C. (C) Alcoa (A)
Recoup (R) Other _____
Private (P)

VHS USE ONLY
Date ~~received~~ processed 23/8/14
Date ~~faxed~~ emailed 5/9/14

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Forest block, Sample number etc.)	Plant species sampled	Site Impact (1)	GDA (2)	Map Reference (3)	Land Tenure (4)	Result s/s root (5)	Result bait
VHS31247	5/8/14	NLS01	Banksia attenuata	High	✓	E 400799 N 6484596	SF		CIN
VHS31248	5/8/14	NLS02	Banksia ilicifolia	High	✓	E 399603 N 6482900	R		NEG
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			

NOTES:
1. Site impact - Low, Moderate, High or Very High (as in the Dieback Interpreter's Manual).
2. Please tick this column if your map references are supplied in the new GDA standard.
3. An AMG map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (other - describe in comments below).
5. Result codes used - CIN= *Phytophthora cinnamomi*, CIT= *P.citricola*, CRY= *P.cryptogea*, PI=*P.inundata*, PM= *P.megasperma*, PN= *P.nicotianae*, NEG = negative, SUB = subcultured.

COMMENTS:

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6152 **Phone:** (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS
Name Joe Grehan - Terratree
Fax No. _____ Phone No. 93354228 (Mob) 0403003688
Region/District SW/AW Email - joeg@terratree.com.au

Job Type (Please indicate)
D.E.C. (C) Alcoa (A)
Recoup (R) Other _____
Private (P)

VHS USE ONLY
Date ~~received~~ processed 23/8/14
Date ~~faxed~~ mailed 5/9/14

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Forest block, Sample number etc.)	Plant species sampled	Site Impact (1)	GDA (2)	Map Reference (3)	Land Tenure (4)	Result s/s root (5)	Result bait
VHS31249	9/8/14	NLS03	Banksia grandis	H	✓	E 404845 N 6507571	Road Reserve		NEG
VHS31250	9/8/14	NLS04	Banksia menziesii	M	✓	E 403463 N 6488149	Private		CIN
VHS31251	20/8/14	NLS05	Banksia attenuata	M	✓	E 403463 N 6487606	RR		NEG
cc720	20/8/14	NLS06 (canker)	B. attenuata	M	✓	E 403745 N 6487608	RR		STILL TO COME
VHS31252	20/8/14	NLS07	B. attenuata	M	✓	E 403415 N 6487327	RR		NEG
VHS31253	20/8/14	NLS08	B. attenuata	M	✓	E 403428 N 6487113	RR		NEG
VHS31254	20/8/14	NLS09	B. ilicifolia	M	✓	E 403303 N 6486895	RR		NEG
VHS31255	20/8/14	NLS10	B. ilicifolia	M	✓	E 403329 N 6486759	RR		NEG

NOTES:
1. Site impact - Low, Moderate, High or Very High (as in the Dieback Interpreter's Manual).
2. Please tick this column if your map references are supplied in the new GDA standard.
3. An AMG map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (other - describe in comments below).
5. Result codes used - CIN= *Phytophthora cinnamomi*, CIT= *P.citricola*, CRY= *P.cryptogea*, PI=*P.inundata*, PM= *P.megasperma*, PN= *P.nicotianae*, NEG = negative, SUB = subcultured.

COMMENTS:

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6151 **Phone:** (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS of sender
Name Joe Greham
~~Fax No.~~ Mob. 0400003685 Phone No. 93384228
DEC Office or Company Name Terratree Pty Ltd

GDA
(1)
GDA 94 ✓

Job Type (Please indicate)
D.E.C. (C) Alcoa (A)
Recoup (R) FPC
Private (P) Other

VHS USE ONLY
Date ~~received~~ processed 6/9/14
Date ~~faxed~~ emailed 18/9/14

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Give location, eg. Forest Block or Shire, etc. and sample number)	Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (5)
VHS31291	1/9/14	NLS11	Banksia attenuata	M	50	E 403268 N 6486599	P		4D NEG
VHS31292	1/9/14	NLS12	B. menziesii	M	50	E 403442 N 6482076	P		4D NEG
VHS31293	1/9/14	NLS13	B. attenuata	M	50	E 403234 N 6486262	P		4D NEG
VHS31294	1/9/14	NLS14	B. attenuata	M	50	E 402230 N 6485671	P		NEG
VHS31295	1/9/14	NLS15	B. attenuata	M	50	E 402356 N 6485482	P		NEG
VHS31296	1/9/14	NLS16	B. attenuata	M	50	E 402039 N 6485343	P		4D NEG
VHS31297	1/9/14	NLS17	B. ilicifolia	L	50	E 401931 N 6485377	P		NEG
VHS31298	1/9/14	NLS18	B. attenuata	M	50	E 402329 N 6485559	P		4D NEG

NOTES:
1. Please tick this box if your map references are supplied in the **GDA 94** standard. If not, please specify the datum used.
2. Site impact - Low, Moderate, or High (as in the Dieback Interpreter's Manual).
3. An MGA map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (Other - describe in comments below).
5. Result codes used – CIN = *Phytophthora cinnamomi*, MUL = *P. multivora*, CRY = *P. cryptogea*, PI = *P. inundata*, ARE = *P. arenaria*, ELO = *P. elongata*, THE = *P. thermophila*, PM = *P. megasperma*, PN = *P. nicotianae*, CON = *P. constricta*, NEG = negative, SUB = subcultured for further tests

Please Note: a). NEG results cannot be used to represent a total absence of *Phytophthora* in the sampled area. b). Information from your samples will be incorporated into the VHS database.

COMMENTS:

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6152 **Phone:** (08) 9334 0317 **Fax:** (08) 9334 0114

Job Type (Please indicate)
D.E.C. (C) Alcoa (A)
Recoup (R) Other_____
Private (P)

VHS USE ONLY
Date received: Processed 12/9/15
Date faxed: 24/9/15

CONTACT DETAILS
Name: Joe Grehan – Terratree Pty Ltd
Fax No.: _____ Phone No.: 93354228 / 0400003688
Region/District: Swan joeg@terratree.com.au

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Forest block, Sample number etc.)	Plant species sampled	Site Impact (1)	GDA (2)	Map Reference (3)	Land Tenure (4)	Result s/s root (5)	Result bait
VHS31330	7/9/14	NLS A 19	Banksia menziesii	H	✓	E 392209 N 6419515	R		CIN
VHS31331	7/9/14	NLS A 20	Banksia ilicifolia	H	✓	E 392523 N 6418527	R		NEG
VHS31332	7/9/14	NLS A 21	Banksia attenuata	H	✓	E 392376 N 6418222	R		NEG
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			

NOTES:
1. Site impact - Low, Moderate, High or Very High (as in the Dieback Interpreter's Manual).
2. Please tick this column if your map references are supplied in the new GDA standard.
3. An AMG map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (other - describe in comments below).
5. Result codes used - CIN= *Phytophthora cinnamomi*, CIT= *P.citricola*, CRY= *P.cryptogea*, PI=*P.inundata*, PM= *P.megasperma*, PN= *P.nicotianae*, NEG = negative, SUB = subcultured.

COMMENTS:

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6151 **Phone:** (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS of sender
Name J. Grehan - Terratree Pty Ltd
~~Fax No.~~ joeg@terratree Phone No. 93354228
DEC Office or Company Name Consultant

GDA (1)	Job Type (Please indicate)	VHS USE ONLY
GDA 94 ✓	D.E.C. (C) Alcoa (A) Recoup (R) FPC Private (P) Other____	Date ~~received~~ processed 19/9/14 Date ~~faxed~~ emailed 1/10/14

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Give location, eg. Forest Block or Shire, etc. and sample number)	Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (5)
VHS31378	7/9/14	NLS 22	Banksia Menziesii	H	50	E 391166 N 6480700	SF		CIN
VHS31379	9/9/14	NLS 23	B. Menziesii	H	50	E 396969 N 6480461	SF		NEG
						E ------ N -------			
						E ------ N -------			
						E ------ N -------			
						E ------ N -------			
						E ------ N -------			
						E ------ N -------			
						E ------ N -------			

NOTES:
1. Please tick this box if your map references are supplied in the GDA 94 standard. If not, please specify the datum used.
2. Site impact - Low, Moderate, or High (as in the Dieback Interpreter's Manual).
3. An MGA map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (Other - describe in comments below).
5. Result codes used – CIN = *Phytophthora cinnamomi*, MUL = *P. multivora*, CRY = *P. cryptogea*, PI = *P. inundata*, ARE = *P. arenaria*, ELO = *P. elongata*, THE = *P. thermophila*, PM = *P. megasperma*, PN = *P. nicotianae*, CON = *P. constricta*, NEG = negative, SUB = subcultured for further tests

Please Note: a). NEG results cannot be used to represent a total absence of *Phytophthora* in the sampled area. b). Information from your samples will be incorporated into the VHS database.

COMMENTS:

VEGETATION HEAL H SERVICE - PHYTOPHTHORA SAMPLE IFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C, 17 Dick Perry Ave KENSINGTON 6151 **Phone**: (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS of sender
Name Joe Grehan - Terratree Pty Ltd
~~Fax No.~~ 93354228 · Phone No. 0400603688
DEC Office or Company Name Terratree Pty Ltd

GDA (1)
GDA 94 ✓

Job Type (Please indicate)	
D.E.C. (C)	Alcoa (A)
Recoup (R)	FPC
Private (P)	Other____

VHS USE ONLY	
Date ~~received~~	7/11/14
Date faxed	21.10.14

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Give location, eg. Forest Block or Shire, etc. and sample number)	Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (5)
VHS31745	4/11/14	NLS 24	Banksia menziesii	M	50	E 405118 N 6507024	P		NEG
VHS31746	4/11/14	NLS 25	B. menziesii	M	50	E 402968 N 6485904	P		NEG
VHS31747	4/11/14	NLS 26	B. attenuata	H	50	E 403001 N 6485955	P.		NEG
VHS31748	4/11/14	NLS 27	X. preissii	H	50	E 397522 N 6477399	P		NEG
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			
						E _____ N _____			

NOTES:
1. Please tick this box if your map references are supplied in the **GDA 94** standard. If not, please specify the datum used.
2. Site impact - Low, Moderate, or High (as in the Dieback Interpreter's Manual).
3. An MGA map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (Other - describe in comments below).
5. Result codes used – CIN = *Phytophthora cinnamomi*, MUL = *P. multivora*, CRY = *P. cryptogea*, PI = *P. inundata*, ARE = *P. arenaria*, ELO = *P. elongata*, THE = *P. thermophila*, PM = *P. megasperma*, PN = *P. nicotianae*, CON = *P. constricta*, NEG = negative, SUB = subcultured for further tests

Please Note: a). NEG results cannot be used to represent a total absence of *Phytophthora* in the sampled area. b). Information from your samples will be incorporated into the VHS database.

COMMENTS:

APPENDIX B

Site-specific Baseline Weed Maps and Quadrat Flora Sampling Data

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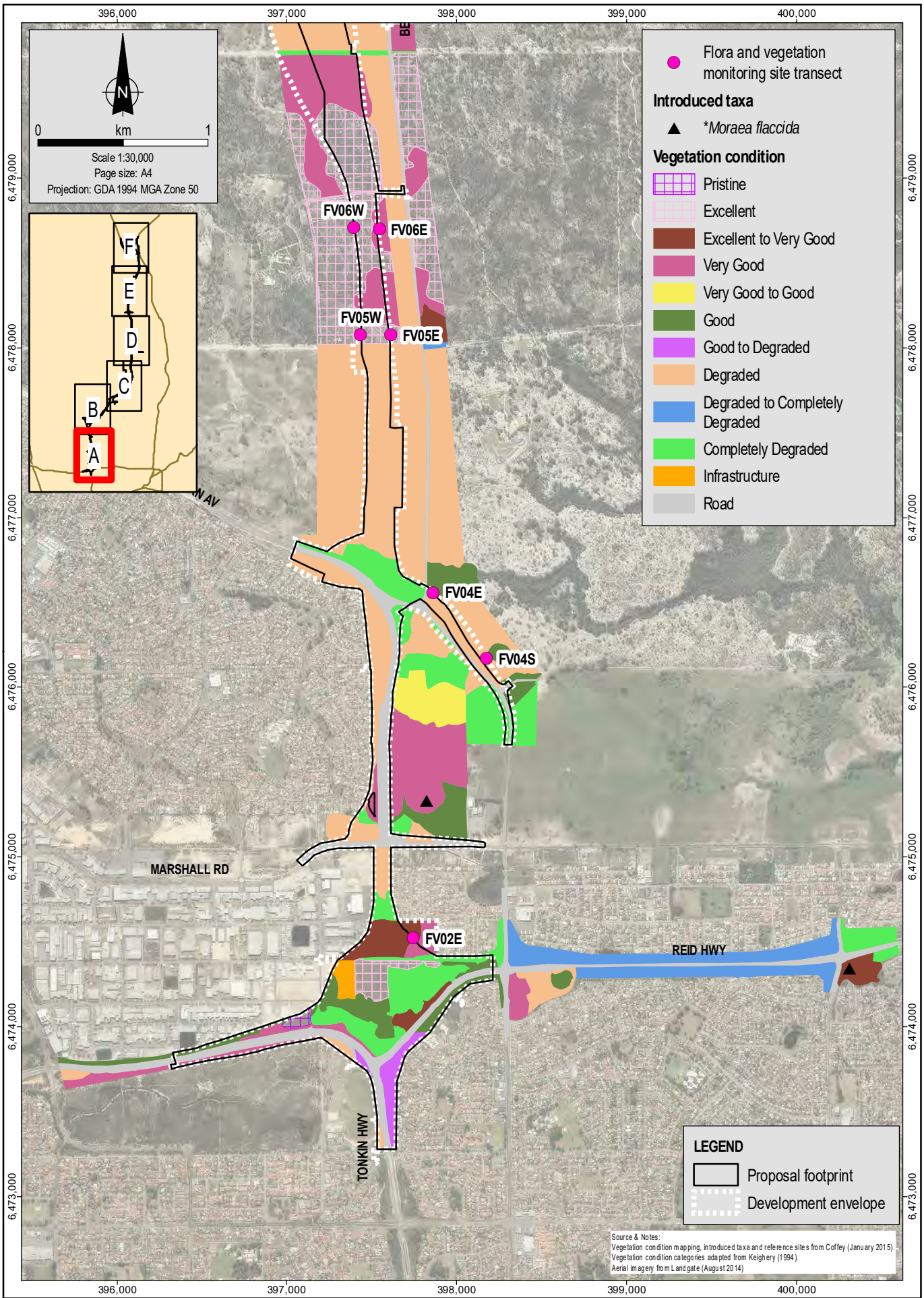
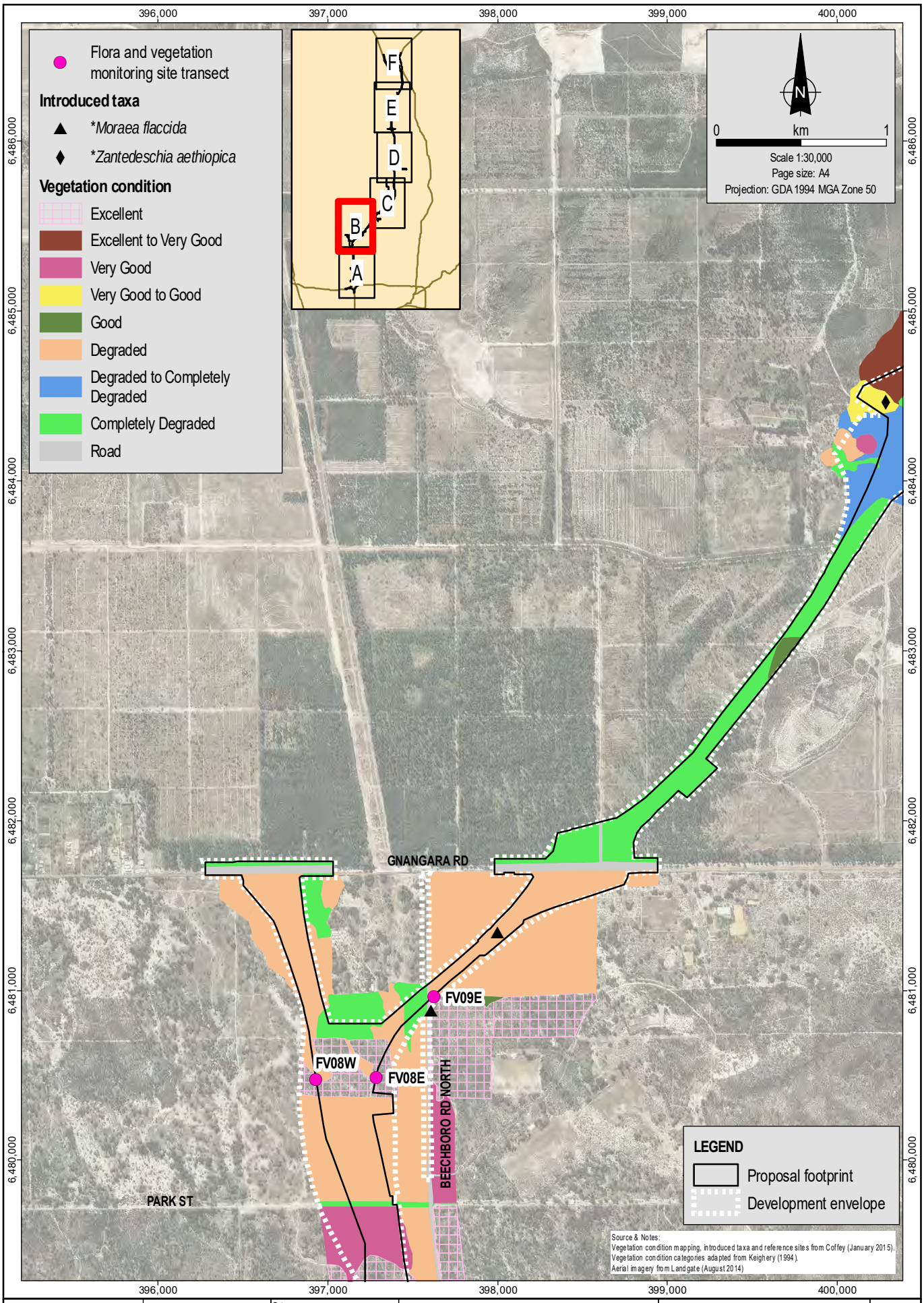
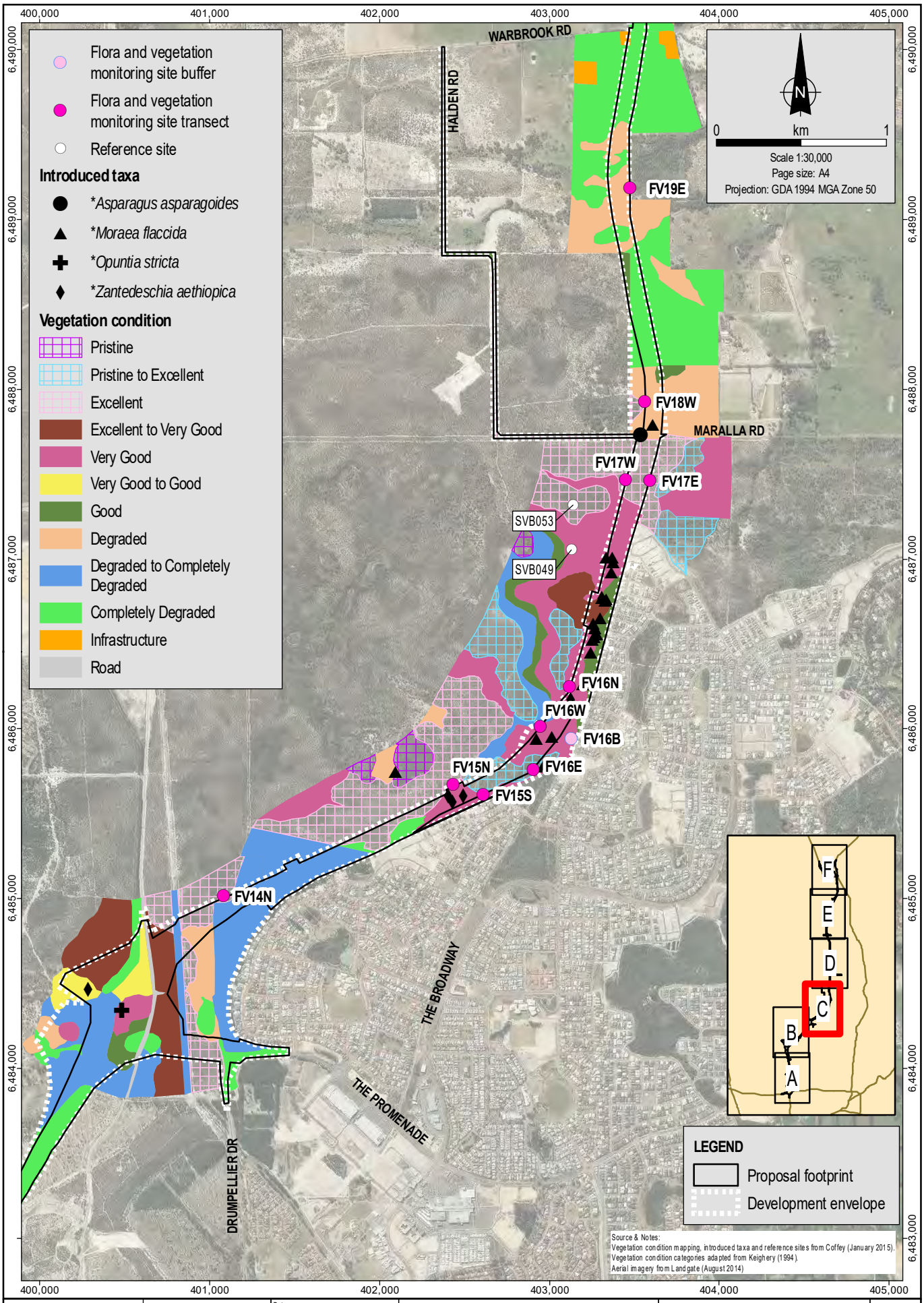


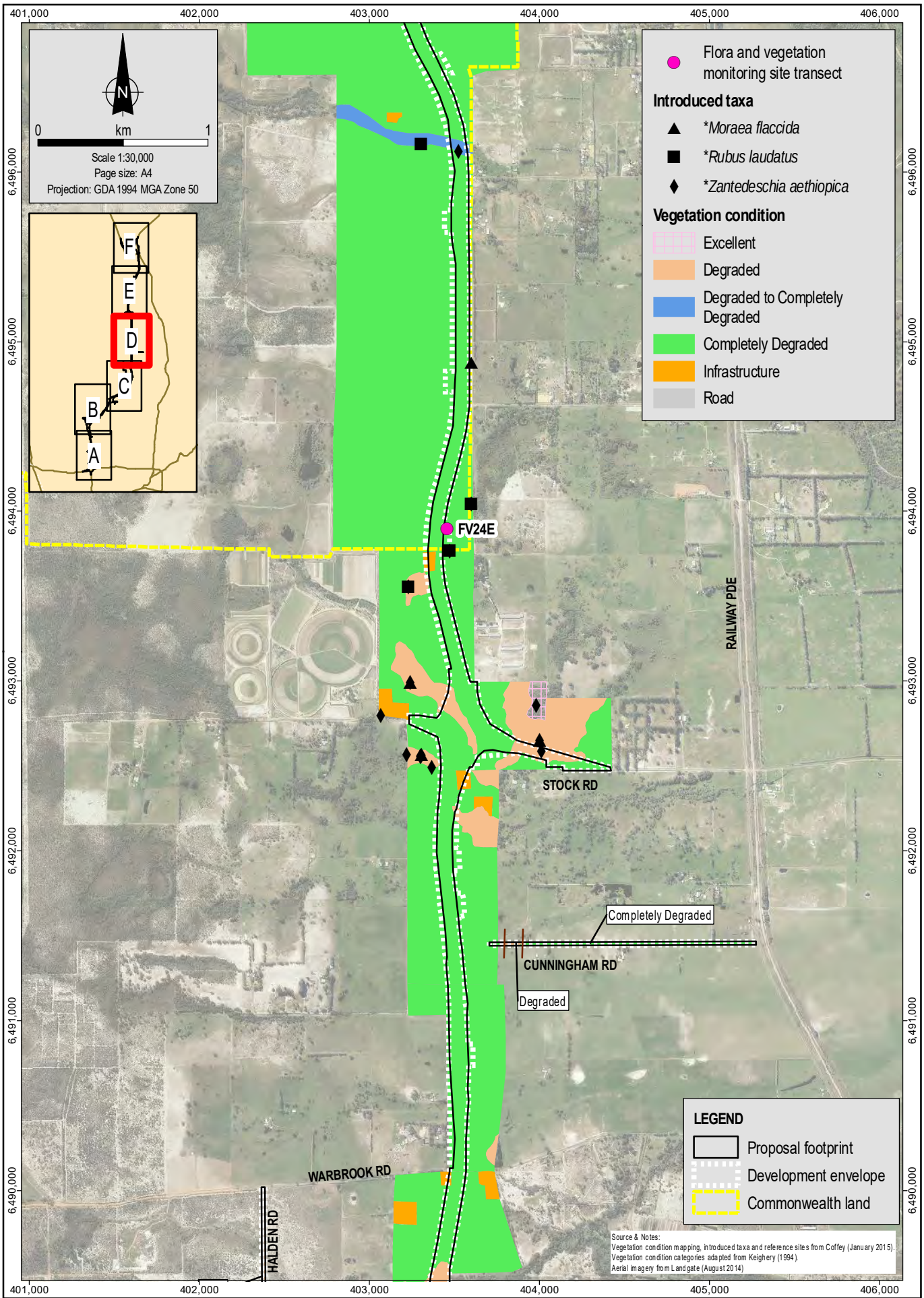
NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 01.02.2017 MXD: 4483AA_58_GIS004_2 File Name: 4483AA_03_AppB_F001_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 1 of 6	Figure No: 1



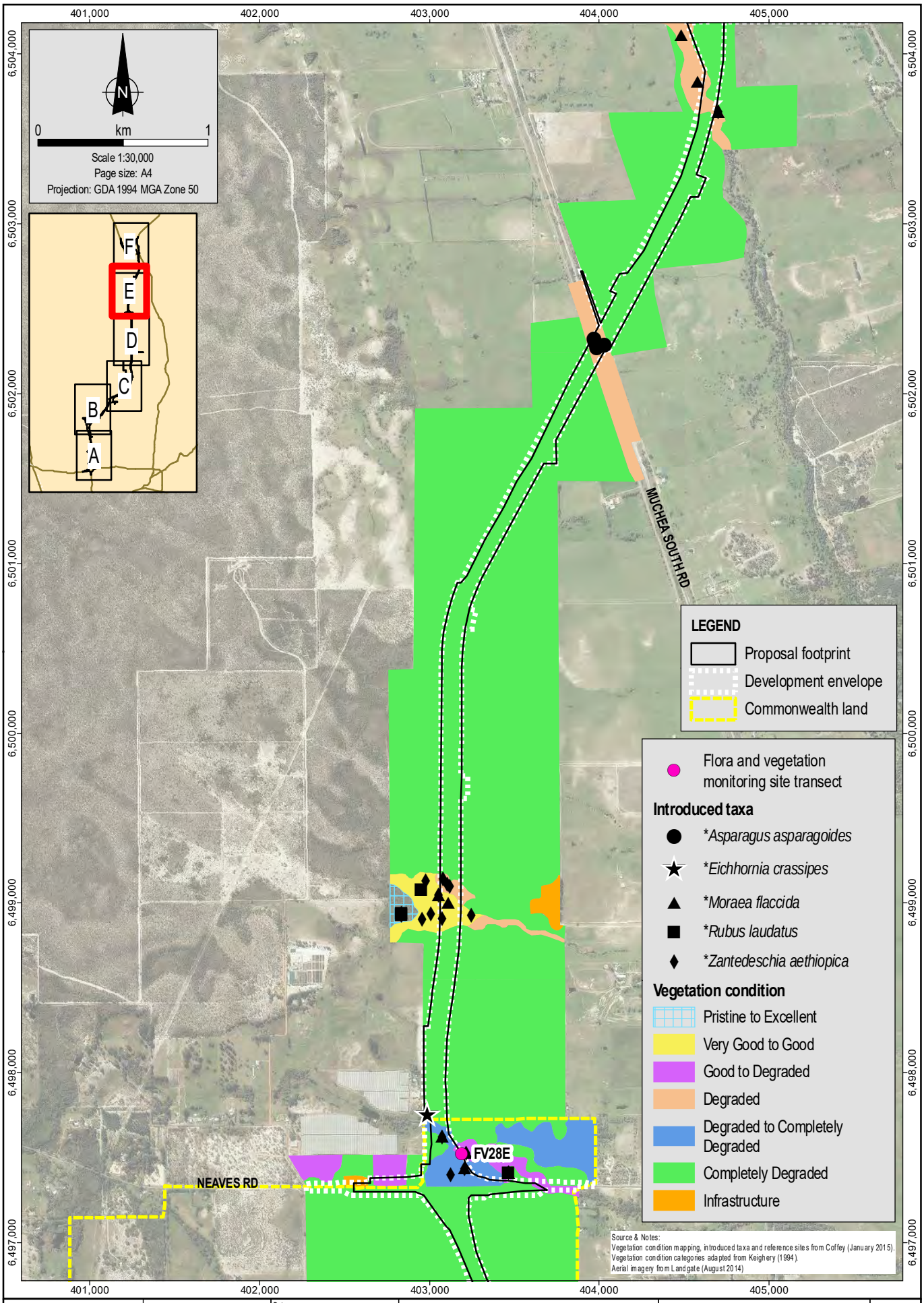
NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 01.02.2017 MXD: 4483AA_58_GIS004_2 File Name: 4483AA_03_AppB_F002_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 2 of 6	Figure No: 2



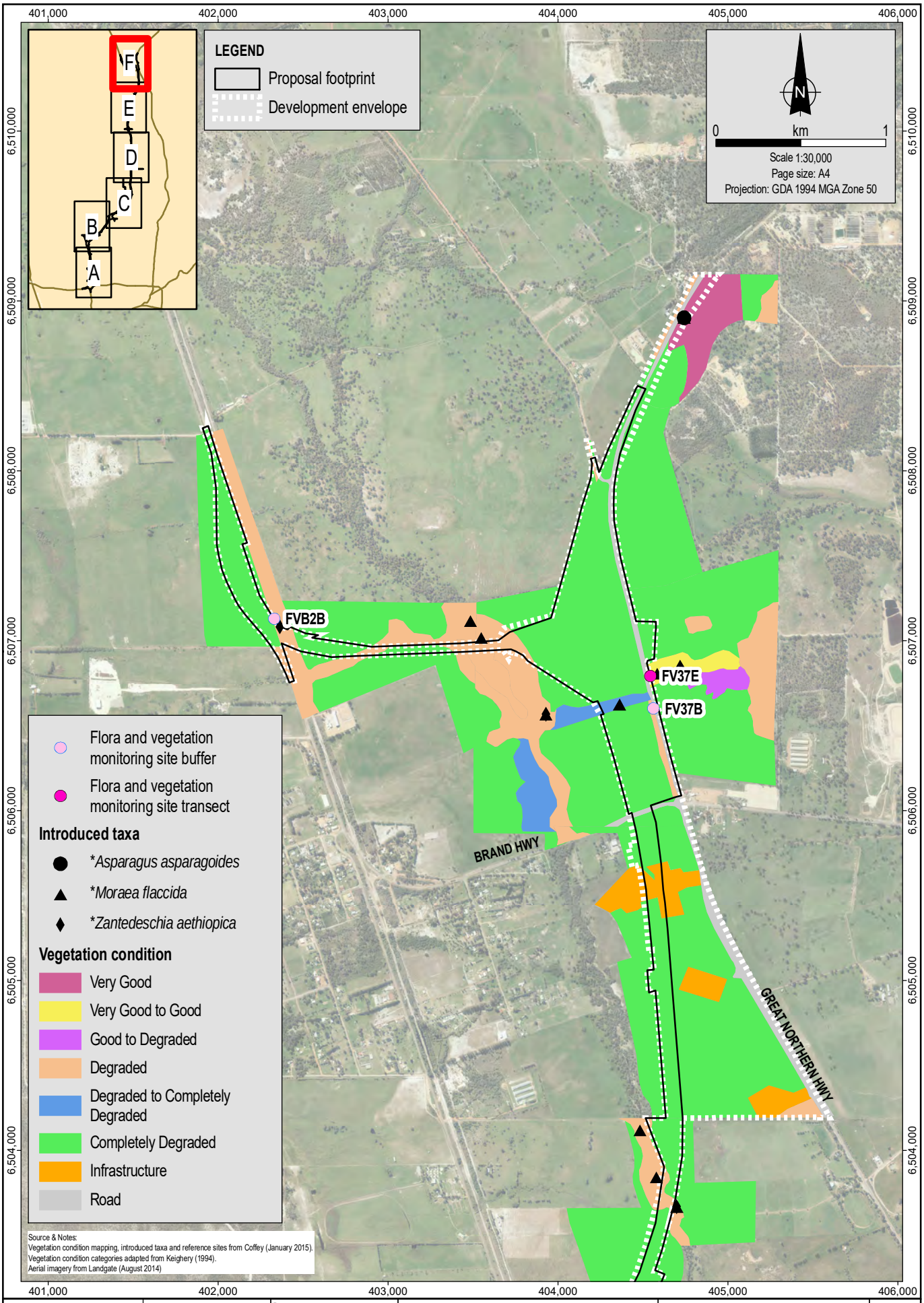
NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 01.02.2017 MXD: 4483AA_58_GIS004_3 File Name: 4483AA_03_AppB_F003_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 3 of 6	Figure No: 3



NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 01.02.2017 MXD: 4483AA_58_GIS004_2 File Name: 4483AA_03_AppB_F004_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 4 of 6	Figure No: 4



NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 01.02.2017 MXD: 4483AA_58_GIS004_2 File Name: 4483AA_03_AppB_F005_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 5 of 6	Figure No: 5



NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 09.02.2017 MXD: 4483AA_58_GIS004_4 File Name: 4483AA_03_AppB_F006_GIS	Perth-Darwin National Highway Flora and Vegetation Construction Condition EMP	Baseline mapping for weeds and vegetation condition Map 6 of 6	Figure No: 6

FLORA SAMPLING DATA

Weeds have been identified with an asterix i.e. *Weed

Site: 360Q02
Described: BL **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397531mE**;** 6478354mN
Habitat: Plain, very gentle east slope
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* sparse mid woodland over *Allocasuarina fraseriana* sparse low woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Patersonia occidentalis* subsp. *occidentalis* and *Dasypogon bromeliifolius* sparse mid herbland over *Lyginia barbata* sparse mid sedgeland over **Briza maxima* isolated low grasses over **Hypochaeris glabra* isolated low herbs
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 80%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia willdenowiana	+	0.4
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.1
Allocasuarina fraseriana	15	7
**Arctotheca calendula*	+	0.1
Bossiaea eriocarpa	+	0.2
**Briza maxima*	*1*	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.1
Calytrix fraseri forma Ellenbrook	+	0.6
Conostylis juncea	+	0.2
Corymbia calophylla	4	10
Dasypogon bromeliifolius	1	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.4
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus marginata subsp. *thalassica*	5	11
**Gladiolus caryophyllaceus*	+	0.3
Gompholobium tomentosum	+	0.2
Haemodorum spicatum	+	0.5
Hibbertia hypericoides	+	0.2
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.6
**Hypochaeris glabra*	2	0.1
Hypolaena exsulca	+	0.3
Kennedia prostrata	+	pr
Lepidosperma apricola	+	0.3
Lomandra sericea	+	0.3
Lomandra suaveolens	+	0.4

Lyginia barbata	+	0.6
Lyginia imberbis	6	0.6
Millotia tenuifolia var. *laevis*	+	0.1
Monotaxis occidentalis	+	0.1
Patersonia occidentalis var. *occidentalis*	3	0.7
Phlebocarya ciliata	+	0.2
Phyllangium paradoxum	+	0.1
Pterostylis sanguinea	+	0.1
Pterostylis sp. short sepals (W. Jackson BJ259)	+	0.1
Stylidium androsaceum	+	0.2
Stylidium schoenoides	+	0.3
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.2
**Ursinia anthemoides*	+	0.2
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	6	2.8

Site: 360Q03
Described: BL **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397515mE; 6478721mN
Habitat: Plain, very gentle SE slope
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia menziesii* and *Banksia attenuata* low woodland over *Calytrix fraseri* Ellenbrook Form, *Stirlingia latifolia* and *Beaufortia elegans* sparse mid shrubland over *Hibbertia hypericoides*, *Leucopogon conostephioides* and *Hibbertia aurea* open low shrubland over *Patersonia occidentalis* subsp. *occidentalis* isolated mid herbs over *Desmocladus flexuosus* sparse low rushland

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name		Cover (%)	Height (m)
Acacia sessilis		+	0.6
Acacia willdenowiana		+	0.3
**Aira cupaniana*		+	0.1
Alexgeorgea nitens		+	0.1
Allocasuarina humilis		+	1.5
Amphipogon turbinatus		+	0.3
Aotus procumbens		+	
Arnocrinum preissii		+	0.5
Astroloma xerophyllum		+	0.8
Austrostipa compressa		+	0.1
Austrostipa compressa		+	0.1
Banksia attenuata		15	6
Banksia menziesii		25	8
Beaufortia elegans		1	1.5
Bossiaea eriocarpa		+	0.3
**Briza maxima*	+	0.2	NC
**Bromus diandrus*		+	0.1
Burchardia congesta		+	0.6
Calytrix fraseri forma Ellenbrook		2	1.8
**Carpobrotus edulis*		+	0.1
Conostephium preissii		+	0.3
Conostephium preissii		+	0.4
Conostylis aculeata subsp. *cygnorum*		+	0.3
Dampiera linearis		+	0.1
Dasypogon bromeliifolius		+	0.3
Daviesia triflora		+	0.4
Desmocladus flexuosus		4	0.2
**Ehrharta calycina*		+	0.7
Eriochilus dilatatus subsp. *dilatatus*		+	0.1
Eriochilus dilatatus subsp. *dilatatus*		+	0.1
**Gladiolus caryophyllaceus*		+	0.3
Gompholobium tomentosum		+	0.3
Haemodorum laxum		+	0.5
Hensmania turbinata		+	0.2
Hibbertia aurea		+	0.3
Hibbertia hypericoides		20	0.6
Hibbertia sericosepala		+	0.4
Hibbertia subvaginata		+	0.3

Hyalosperma cotula	+	0.1
**Hypochaeris glabra*	+	0.1
Hypolaena exsulca	+	0.4
Lepidosperma apricola	+	0.4
Lepidosperma leptostachyum	+	0.3
Lepidosperma pubisquameum (flat form)	+	0.6
Leporella fimbriata	+	0.1
Leucopogon conostephioides	3	0.4
Levenhookia stipitata	+	0.1
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.3
Lomandra suaveolens	+	0.4
Lyginia barbata	+	0.3
Mesomelaena pseudostygia	+	0.5
Patersonia occidentalis var. *occidentalis*	1	0.6
Petrophile linearis	+	0.4
Phlebocarya ciliata	+	0.3
Phyllangium paradoxum	+	0.1
Pimelea sulphurea	+	0.3
Podotheca gnaphalioides	+	0.1
Rytidosperma acerosum	+	0.1
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	+	0.3
Stirlingia latifolia	2	1.3
Stylidium androsaceum	+	0.1
Stylidium araeophyllum	+	0.1
Stylidium repens	+	0.1
Stylidium saxifragoides	+	0.2
Thysanotus thyrsoideus	+	0.4
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2

Site: 360Q04
Described: BL **Date**: 23/09/2014 **Type:**Quadrat 10x10 m
MGA Zone: 50 397387mE; 6479169mN
Habitat: Low dune, midslope, gentle SW slope
Soil: Grey sand
Vegetation: *Banksia menziesii* and *Banksia attenuata* open low forest over *Eucalyptus todtiana* isolated mid mallee trees over *Hibbertia hypericoides*, *Calytrix flavescens*, *Scholtzia* aff. involucrata and *Hibbertia subvaginata* open low shrubland over *Patersonia occidentalis* subsp. *occidentalis* sparse mid herbland.
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 95%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
Alexgeorgea nitens	+	0.1
Banksia attenuata	20	6.5
Banksia menziesii	40	7
Beaufortia elegans	+	0.5
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	10	0.3
Calytrix fraseri forma Ellenbrook	+	
**Carpobrotus edulis*	+	0.1
Cassytha racemosa forma pilosa	+	cr
Conostephium minus	+	0.2
Conostephium preissii	+	0.2
Conostylis juncea	+	0.1
Dampiera linearis	+	0.1
Dasypogon bromeliifolius	+	0.2
Desmocladus flexuosus	+	0.1
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.1
Eremaea pauciflora var. *pauciflora*	+	0.4
Eucalyptus todtiana	1	6
Gastrolobium linearifolium	+	0.2
**Gladiolus caryophyllaceus*	+	0.4
Gompholobium scabrum	+	0.6
Gompholobium tomentosum	+	0.1
Hibbertia huegelii	+	0.2
Hibbertia hypericoides	15	0.5
Hibbertia sericosepala	+	0.3
Hibbertia subvaginata	1	0.3
Hypocalymma robustum	+	0.9
**Hypochaeris glabra*	+	0.1
Hypolaena exsulca	+	0.3
**Isolepis marginata*	+	0.1
Laxmannia ramosa subsp. *ramosa*	+	0.1
Lepidosperma apricola	+	0.3
Leucopogon conostephioides	+	0.1
Lomandra caespitosa	+	0.2

Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.4
Lomandra sericea	+	0.4
Lomandra suaveolens	+	0.3
Lyginia barbata	1	0.1
**Medicago sp.*	+	0.1
Patersonia occidentalis var. *occidentalis*	20	0.6
Petrophile linearis	+	0.4
Philotheca spicata	+	0.4
Phlebocarya ciliata	+	0.3
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	2	0.4
**Sonchus oleraceus*	+	0.1
Stylidium junceum	+	
Stylidium repens	+	0.1
Stylidium schoenoides	+	0.2
Thelymitra graminea	+	0.2
Thysanotus thyrsoideus	+	0.2
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.2
**Ursinia anthemoides*	+	0.1
Xanthosia huegelii	+	0.1

Site 360Q06
Described: BL **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397134mE; 6480487mN
Habitat: Plain, very gentle south slope
Soil: Grey sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Banksia attenuata* and *Banksia menziesii* low woodland over *Xanthorrhoea preissii* sparse mid shrubland over *Hibbertia hypericoides*, *Hypocalymma robustum* and *Hibbertia subvaginata* open low shrubland over **Briza maxima* isolated low grasses
Condition: Excellent
Fire Age: >10 years
Notes Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.2
Austrostipa compressa	+	0.1
Banksia attenuata	20	9
Banksia menziesii	2	4
Bossiaea eriocarpa	+	0.4
**Briza maxima*	*2*	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.1
Calandrinia corrigioloides	+	0.1
Calytrix flavescens	+	0.3
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.3
Corymbia calophylla	25	10
Crassula colorata var. *colorata*	+	0.1
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus marginata subsp. *thalassica*	+	
**Gladiolus caryophyllaceus*	+	0.9
Gompholobium tomentosum	+	0.3
Hibbertia hypericoides	30	0.7
Hibbertia subvaginata	1	0.3
Hyalosperma cotula	+	0.1
Hypocalymma robustum	4	0.7
**Hypochaeris glabra*	+	0.1
Jacksonia floribunda	+	0.9
Leporella fimbriata	+	0.2
Levenhookia stipitata	+	0.1
Lomandra caespitosa	+	0.2
Lomandra sericea	+	0.3
Lomandra suaveolens	+	0.2
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.4
Philotheca spicata	+	0.6
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Pterostylis sanguinea	+	0.2
Pyrorchis nigricans	+	0.1

Quinetia urvillei	+	0.1
Stylidium androsaceum	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1
Xanthorrhoea preissii	6	1.2
Xanthosia huegelii	+	0.1

Site: 360Q10
Described: CvdB **Date**: 19/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 401596mE; 6485248mN
Habitat: Dune crest, slopping west, upper
Soil: Grey white medium-grained sand
Rock Type: none
Vegetation: **Pinus radiata* sparse low woodland over *Eucalyptus todtiana* isolated mid mallee trees over *Adenanthos cygnorum* subsp. *cygnorum* and *Macrozamia fraseri* sparse tall shrubland over *Eremaea pauciflora* var. *pauciflora*, *Scholtzia* aff. involucrata and *Stirlingia latifolia* sparse mid shrubland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	4	4
Austrostipa compressa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.4
Conostephium preissii	+	0.3
Crassula colorata var. *colorata*	+	0.1
Daviesia triflora	+	0.3
Eremaea pauciflora var. *pauciflora*	5	1
Eucalyptus todtiana	out	5
**Gladiolus caryophyllaceus*	+	0.4
Hibbertia hypericoides	+	0.2
Hibbertia subvaginata	+	0.2
**Hypochaeris glabra*	+	0.2
Macrozamia fraseri	1	2
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.3
Phyllangium paradoxum	+	0.1
**Pinus radiata*	15	6
Podotheca gnaphalioides	+	0.2
**Rubus laudatus*	+	0.2
Scholtzia aff. involucrata EAG 5500	6	1.1
Stirlingia latifolia	+	0.4
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: 360Q12
Described: CvdB **Date**: 19/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 402017mE; 6485448mN
Habitat: Gentle slope to the South-west, mid to upper slope
Soil: Brown white course grained sand
Rock Type: none
Vegetation: *Eucalyptus todtiana* isolated mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* sparse low woodland over *Eremaea pauciflora* var. *pauciflora* sparse mid shrubland over *Hibbertia hypericoides*, *Hibbertia subvaginata* and *Scholtzia* aff. involucrata sparse low shrublands
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia huegelii	+	0.3
Acacia pulchella var. glaberrima	+	0.4
*Aira praecox	+	0.2
Austrostipa compressa	+	0.2
Banksia attenuata	5	8
Banksia menziesii	1	7
Boronia ramosa subsp. anethifolia	+	0.2
Bossiaea eriocarpa	+	0.3
*Briza maxima	+	0.2
Burchardia congesta	+	0.3
Caladenia flava subsp. flava	+	0.2
Calytrix flavescens	+	0.3
*Carpobrotus edulis	+	0.1
Cassytha pomiformis	+	cr
Conostephium preissii	+	0.3
Daviesia triflora	+	0.5
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
Eremaea pauciflora var. pauciflora	5	1.2
Eucalyptus todtiana	1	6
Hibbertia hypericoides	2	0.4
Hibbertia subvaginata	1	0.4
*Hypochaeris glabra	+	0.1
Hypolaena robusta	+	0.6
*Isolepis marginata	+	0.1
Jacksonia floribunda	+	2.5
Lagenophora huegelii	+	0.2
Levenhookia stipitata	+	0.1
Lyginia barbata	+	0.1
Nuytsia floribunda	+	6
Patersonia occidentalis var. occidentalis	+	0.4
Petrophile linearis	+	0.3
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Poranthera moorokatta	+	0.05

Scholtzia aff. involucrata EAG 5500	+	0.3
Stylidium rigidulum	+	0.2
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
*Ursinia anthemoides	+	0.2
Verticordia nitens	+	1.4
*Vulpia bromoides	+	0.2

Site: 360Q13
Described: CvdB **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402404mE; 6485603mN
Habitat: Gently sloping south-east, mid-slope
Soil: Brown grey organic medium grained sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Banksia attenuata* and *Banksia ilicifolia* sparse low woodland over *Xanthorrhoea preissii* and *Macrozamia fraseri* sparse tall shrubland over *Hibbertia hypericoides* sparse low shrubland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 75%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Banksia attenuata	out	6
Banksia ilicifolia	+	5
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Conostylis aculeata subsp. *cygnorum*	+	0.3
Corymbia calophylla	46	15
Daucus glochidiatus	+	0.2
Desmocladus flexuosus	+	0.2
Diuris magnifica	+	0.3
Drosera erythrorhiza	+	pr
Hibbertia hypericoides	+	0.4
Lagenophora huegelii	+	0.2
Levenhookia stipitata	+	cr
**Lupinus cosentinii*	+	0.3
Macrozamia fraseri	2	2.5
Microlaena stipoides	+	0.4
Patersonia occidentalis var. *occidentalis*	+	0.4
Persoonia saccata	+	0.8
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Pterostylis vittata	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
Xanthorrhoea preissii	8	3
**Zantedeschia aethiopica*	+	0.4

Site: 360Q14
Described: CvdB **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403115mE; 6485976mN
Habitat: Very gently sloping east, midslope
Soil: Grey, brown medium grained sand
Rock Type: None
Vegetation: *Eucalyptus todtiana* isolated mid mallee trees over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Beaufortia elegans*, *Scholtzia* aff. involucrata and *Allocasuarina humilis* sparse mid shrubland over *Eremaea purpurea*, *Hibbertia subvaginata* and *Hibbertia hypericoides* open low shrubland
Condition: Very good
Fire Age: >10 years
Notes: Quadrate is 30 m to the SE from 360's GPS point
Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	0.6
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.2
Allocasuarina humilis	out	1.3
Austrostipa compressa	+	0.2
Banksia attenuata	2	5
Banksia menziesii	4	6
Beaufortia elegans	3	2.5
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.2
Centrolepis drummondiana	+	0.1
Conostylis aculeata subsp. *aculeata*	+	0.2
Conostylis aculeata subsp. *cygnorum*	+	0.3
Daviesia triflora	+	0.4
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	+	0.5
Eremaea purpurea	20	2
Eucalyptus todtiana	out	6
**Gladiolus caryophyllaceus*	+	0.5
**Gladiolus caryophyllaceus*	+	0.3
Hibbertia hypericoides	2	0.4
Hibbertia subvaginata	1	0.4
**Isolepis marginata*	+	0.1
Lomandra micrantha	+	0.2
Lyginia barbata	+	0.3
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.3
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
Pterostylis vittata	+	0.1
**Rubus laudatus*	+	0.3
Scholtzia aff. involucrata EAG 5500	2	0.9
Stylidium repens	+	0.2

Stylidium rigidulum	+	0.2
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2

Site: 360Q15
Described: CvdB **Date**: 19/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403155mE; 6486211mN

Habitat: Relatively flat, with a very gentle slope to the east towards a small depression, low

Soil: Organic dark brown grey clayey sand

Rock Type: none

Vegetation: *Corymbia calophylla* and *Melaleuca preissiana* sparse mid woodland over *Banksia attenuata* and *Banksia ilicifolia* sparse low woodland over *Kunzea glabrescens* open tall shrubland

Condition: Very good

Fire Age: >10 years

Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia huegelii	+	0.3
**Aira cupaniana*	+	0.1
Banksia attenuata	4	8
Banksia ilicifolia	7	6
Banksia menziesii	+	5
**Briza maxima*	+	0.2
Caladenia flava subsp. *flava*	+	0.1
Conostephium preissii	+	0.3
Corymbia calophylla	1	18
Drosera macrantha	+	cr
Eriochilus dilatatus subsp. *undulatus*	+	0.2
**Gladiolus caryophyllaceus*	+	0.4
Haemodorum spicatum	+	0.3
Hibbertia hypericoides	+	0.3
Hibbertia subvaginata	+	0.3
Hypocalymma angustifolium	+	0.7
**Hypochaeris glabra*	+	0.1
Isolepis stellata	+	0.1
Kunzea glabrescens	32	4.5
Lagenophora huegelii	+	0.2
Leucopogon propinquus	+	0.4
Lomandra hermaphrodita	+	0.3
Melaleuca preissiana	3	13
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.1
Philotheca spicata	+	0.5
Phyllangium paradoxum	+	0.1
Pterostylis sp. short sepals (W. Jackson BJ259)	+	0.2
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Wahlenbergia preissii	+	0.1
Xanthosia huegelii	+	0.2

Site: 360Q16
Described: BL **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402963mE; 6485777mN
Habitat: Plain, very gentle West slope
Soil: Grey sand
Rock Type: None

Vegetation: *Melaleuca preissiana* and *Banksia attenuata* low woodland over *Macrozamia fraseri* isolated tall shrubs over *Eremaea purpurea* isolated mid shrubs over *Hibbertia hypericoides* and *Bossiaea eriocarpa* sparse low shrubland over **Ursinia anthemoides* and **Hypochaeris glabra* sparse low herbland

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	1.2
**Aira cupaniana*	+	0.1
**Arctotheca calendula*	+	0.2
Banksia attenuata	10	5
Banksia menziesii	+	2
Bossiaea eriocarpa	1	0.7
**Briza maxima*	+	0.2
Briza minor	+	0.2
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.2
Calandrinia corrigioloides	+	0.1
Conostephium preissii	+	0.6
Conostylis aculeata subsp. *cygnorum*	+	0.3
Crassula colorata var. *colorata*	+	0.1
Desmocladus flexuosus	+	0.1
Drosera erythrorhiza	+	0.1
**Ehrharta calycina*	+	0.3
Eremaea purpurea	2	1.1
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium tomentosum	+	0.5
Hibbertia hypericoides	7	0.6
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	3	0.2
**Isolepis marginata*	+	0.1
Lagenophora huegelii	+	0.2
**Lysimachia arvensis*	+	0.1
Macrozamia fraseri	1	2.2
Melaleuca preissiana	30	7
Millotia myosotidifolia	+	0.1
**Moraea flaccida*	+	0.5
Patersonia occidentalis var. *occidentalis*	+	0.3
Persoonia saccata	+	1
Petrophile linearis	+	0.6
Podotheca gnaphalioides	+	0.1
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
**Romulea rosea*	+	0.1
Rytidosperma acerosum	+	0.2

Siloxerus humifusus	+	0.1
**Sonchus oleraceus*	+	0.2
Sowerbaea laxiflora	+	0.2
Stylidium androsaceum	+	0.1
Stylidium rigidulum	+	0.2
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	3	0.4
**Vulpia bromoides*	+	0.1
Wahlenbergia preissii	+	0.2

Site: 360Q17
Described: BL **Date**: 19/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 402786mE; 6485743mN
Habitat: Lower slope of a dune, gentle SE slope
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica* mid woodland over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Hibbertia hypericoides* and *Xanthorrhoea preissii* low shrubland over *Patersonia occidentalis* var. *occidentalis* isolated low herbs
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.5
Acacia sessilis	+	
Acacia willdenowiana	+	0.3
**Aira cupaniana*	+	0.1
Anigozanthos humilis subsp. *humilis*	+	0.1
Austrostipa compressa	+	0.2
Banksia attenuata	8	9
Banksia menziesii	2	4
Bossiaea eriocarpa	+	0.4
**Briza maxima*	+	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.2
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.4
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus marginata subsp. *thalassica*	40	15
Gastrolobium linearifolium	+	0.2
**Gladiolus caryophyllaceus*	+	0.3
Hibbertia huegelii	+	0.2
Hibbertia hypericoides	60	0.6
Hibbertia stellaris	+	0.1
Hibbertia subvaginata	+	0.1
**Hypochaeris glabra*	+	0.2
**Isolepis marginata*	+	0.1
Lagenophora huegelii	+	0.2
Lepidosperma pubisquameum (flat form)	+	0.4
Leptomeria pauciflora	+	
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra suaveolens	+	0.3
Lyginia barbata	+	0.3
Macrozamia fraseri	+	0.2
Opercularia vaginata	+	
Patersonia occidentalis var. *occidentalis*	1	0.6
Petrophile linearis	+	0.4

Philotheca spicata	+	0.8
Podotheca chrysantha	+	0.1
Podotheca gnaphalioides	+	0.1
Quinetia urvillei	+	0.1
Rytidosperma acerosum	+	0.3
Scholtzia aff. involucrata EAG 5500	+	1.3
**Sonchus oleraceus*	+	0.1
Stylidium androsaceum	+	0.2
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.3
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	3	0.9

Site: 360Q20
Described: CvdB **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400155mE; 6484217mN
Habitat: Dampland, low
Soil: Dark brown sandy clay, peat?
Rock Type: none
Vegetation: *Eucalyptus rudis* subsp. *rudis* and **Pinus pinaster* (outside) mid woodland over *Melaleuca preissiana* isolated low trees over *Astartea scoparia* open mid shrubland over *Schoenus caespititius* isolated mid sedges over **Briza maxima* isolated low grasses
Condition: Very good
Fire Age: > 10 years

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
**Aira cupaniana*	+	0.1
**Aira praecox*	+	0.2
Astartea scoparia	24	1.6
**Briza maxima*	+	0.3
Briza minor	+	0.2
Eucalyptus rudis subsp. *rudis*	35	12
Eutaxia virgata	+	0.7
**Hypochaeris glabra*	+	0.1
Jacksonia furcellata	+	0.8
**Lotus subbiflorus*	+	0.1
**Lysimachia arvensis*	+	0.3
Melaleuca preissiana	out	8
Melaleuca teretifolia	+	0.4
**Pinus pinaster*	+	0.4
Schoenus caespititius	+	0.5
**Ursinia anthemoides*	+	0.1

Site: 360Q21
Described: CvdB **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400377mE; 6484640mN
Habitat: Relatively flat, mid slope
Soil: white grey brown medium grained sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Xanthorrhoea preissii* and *Macrozamia fraseri* sparse mid shrubland over *Eremaea pauciflora* var. *pauciflora, Hibbertia hypericoides* and *Astroloma xerophyllum* sparse low shrubland over *Lyginia barbata* sparse low sedgeland
Veg Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 50%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	0.7
Alexgeorgea nitens	+	0.1
Amphipogon turbinatus	+	0.3
Astroloma xerophyllum	+	0.5
Austrostipa compressa	+	0.2
Banksia attenuata	2	3
Banksia menziesii	7	7
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Calytrix flavescens	+	0.3
Conostephium preissii	+	0.3
Conostylis aculeata subsp. *cygnorum*	+	0.3
Dampiera linearis	+	0.3
Dasypogon bromeliifolius	+	0.5
Daviesia triflora	+	0.4
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	pr
**Ehrharta calycina*	+	0.2
Eremaea pauciflora var. *pauciflora*	1	0.6
Gastrolobium capitatum	+	0.4
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium tomentosum	+	0.3
Haemodorum sparsiflorum	+	0.5
Hibbertia huegelii	+	0.4
Hibbertia hypericoides	+	0.5
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	+	pr
Lagenophora huegelii	+	0.2
Lomandra micrantha	+	0.4
Lyginia barbata	10	0.4
Lyginia barbata	3	0.4
Macrozamia fraseri	out	2.2
Melaleuca seriata	+	cr
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
**Rubus laudatus*	+	0.2
Schoenus curvifolius	+	0.2

Scholtzia aff. involucrata EAG 5500	+	0.4
Stylidium saxifragoides	+	0.3
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1
Verticordia nitens	+	1.3
Xanthorrhoea preissii	5	1.2
Xanthosia huegelii	+	0.1

Site: 360Q22
Described: CvdB **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400720mE; 6484715mN
Habitat: Dune slope, western aspect, moderately sloping, mid to upper slope
Soil: Grey brown medium grained sand
Rock Type: none
Vegetation: *Eucalyptus todtiana* sparse mid mallee trees over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Verticordia nitens* isolated mid shrubs over *Eremaea pauciflora* var. *pauciflora*, *Scholtzia* aff. involucrata and *Hibbertia hypericoides* open low shrubland over *Lyginia barbata* isolated mid sedges over *Desmocladus flexuosus* sparse low rushland
Condition: Excellent - very good
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Alexgeorgea nitens	+	0.1
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Banksia attenuata	5	7
Banksia menziesii	7	6
Boronia purdieana subsp. *purdieana*	+	0.2
Boronia ramosa subsp. *anethifolia*	+	0.2
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.4
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Conostephium preissii	+	0.3
Crassula colorata var. *colorata*	+	0.1
Dasypogon bromeliifolius	+	0.4
Daviesia triflora	+	0.4
Desmocladus flexuosus	2	0.3
Drosera erythrorhiza	+	pr
**Ehrharta calycina*	+	0.3
Eremaea pauciflora var. *pauciflora*	20	0.6
Eucalyptus todtiana	8	6
**Gladiolus caryophyllaceus*	+	0.7
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium tomentosum	+	0.8
Hibbertia hypericoides	+	0.4
Hibbertia subvaginata	+	0.4
Hovea pungens	+	0.3
**Hypochaeris glabra*	+	0.1
Lagenophora huegelii	+	0.1
Laxmannia squarrosa	+	0.3
Lechenaultia floribunda	+	0.3
Leucopogon sprengelioides	+	0.3
Lomandra hermaphrodita	+	0.4
Lomandra preissii	+	0.3
Lyginia barbata	1	0.4
Lyginia barbata	+	0.2
Patersonia occidentalis var. *occidentalis*	1	0.5
Petrophile linearis	+	0.2
Philotheca spicata	+	1.6

Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Pterostylis sp. clubbed snail orchid (R. Davis 8088)	+	0.1
Pterostylis vittata	+	0.1
**Rubus laudatus*	+	0.3
Scholtzia aff. involucrata EAG 5500	17	0.4
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Verticordia nitens	+	1.2

Site: 360Q23
Described: CvdB **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400797mE; 6484295mN
Habitat: Dune slope near crest, moderately sloping west
Soil: White grey medium grained sand
Rock Type: none

Vegetation: *Eucalyptus todtiana* sparse mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* sparse low woodland over *Adenanthos cygnorum* and *Macrozamia fraseri* sparse tall shrubland over *Verticordia nitens*, *Jacksonia floribunda* and *Petrophile linearis* isolated mid shrubs over *Eremaea pauciflora* var. *pauciflora* and *Lechenaultia floribunda* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* sparse low herbland

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	12	4
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	2	0.4
Banksia attenuata	out	
Banksia menziesii	out	
Beaufortia elegans	+	0.2
Boronia purdieana subsp. *purdieana*	+	0.8
Bossiaea eriocarpa	+	0.5
**Briza maxima*	+	0.2
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.2
Conostephium preissii	+	0.2
Conostylis aculeata subsp. *cygnorum*	+	0.4
Dampiera linearis	+	0.3
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.2
Eremaea pauciflora var. *pauciflora*	+	0.5
Eucalyptus todtiana	40	5.5
**Gladiolus caryophyllaceus*	+	0.6
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium tomentosum	+	0.7
Haemodorum sp.	+	0.4
Hibbertia hypericoides	+	0.3
Hibbertia subvaginata	+	0.3
Hovea pungens	+	0.3
**Hypochaeris glabra*	+	0.1
Jacksonia floribunda	+	1.2
Lechenaultia floribunda	+	0.3
Lepidosperma pubisquameum (flat form)	+	0.3
Lyginia barbata	3	0.4
Macrozamia fraseri	out	
Millotia myosotidifolia	+	0.1
Nuytsia floribunda	out	6
Patersonia occidentalis var. *occidentalis*	3	0.6
Petrophile linearis	+	1.3

Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
**Rubus laudatus*	+	0.2
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	+	0.3
Stylidium brunonianum	+	0.2
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Verticordia nitens	+	1

Site: 360Q24
Described: CvdB **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403335mE; 6487007mN
Habitat: Lower wetland slope, very gently sloping east
Soil: Dark brown, grey medium - grained clayey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* and *Corymbia calophylla* sparse mid woodland over *Astartea scoparia* and *Hypocalymma angustifolium* open mid shrubland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira praecox*	+	0.2
Aotus gracillima	+	0.2
Astartea scoparia	25	2
Caladenia flava subsp. *flava*	+	0.1
Cassytha glabella	+	cr
Corymbia calophylla	1	17
Drosera glanduligera	+	0.1
Hibbertia racemosa	+	0.3
Homalosciadium homalocarpum	+	0.1
Hypocalymma angustifolium	5	0.6
**Hypochaeris glabra*	+	0.4
Lagenophora huegelii	+	0.2
Lepidosperma longitudinale	+	0.4
Lepidosperma striatum	+	0.3
Leucopogon australis	+	0.4
**Lysimachia arvensis*	+	0.1
Melaleuca preissiana	2	18
Microlaena stipoides	+	0.3
**Moraea flaccida*	+	0.3
Nuytsia floribunda	+	6
Patersonia occidentalis var. *occidentalis*	+	0.4
Poaceae sp.	+	0.1
Pterostylis sp. clubbed snail orchid (R. Davis 8088)	+	0.1
Pterostylis vittata	+	0.1
Siloxerus humifusus	+	0.1
**Sonchus oleraceus*	+	0.2
**Stellaria pallida*	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2

Site: 360Q25
Described: BL **Date:** 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403241mE; 6486353mN
Habitat: Plain, very gentle NE slope
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* low woodland over *Macrozamia fraseri* and *Eremaea pauciflora* var. *pauciflora* sparse mid shrubland over *Hibbertia hypericoides* and *Hibbertia subvaginata* sparse low shrubland over **Ursinia anthemoides* and **Hypochaeris glabra* sparse low herbland over **Ehrharta longiflora* isolated low grasses
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.2
Austrostipa compressa	+	0.2
Banksia attenuata	25	8
Banksia menziesii	10	6
Bossiaea eriocarpa	+	0.3
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.2
Calandrinia corrigioloides	+	
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.2
**Ehrharta longiflora*	1	0.3
Eremaea pauciflora var. *pauciflora*	2	1.6
**Gladiolus caryophyllaceus*	+	0.4
Haemodorum spicatum	+	0.4
Hibbertia hypericoides	6	0.7
Hibbertia subvaginata	1	0.4
**Hypochaeris glabra*	5	0.2
Lagenophora huegelii	+	0.2
Macrozamia fraseri	2	1.8
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Podotheca gnaphalioides	+	0.2
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	5	0.4
**Watsonia meriana* var. *meriana*	+	1.3

Site: 360Q26
Described: BL **Date**: 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403461mE; 6487255mN
Habitat: Crest of dune, gentle slope aspect WNW
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata* sparse low woodland over *Scholtzia* aff. involucrata and *Acacia pulchella* var. *pulchella* sparse tall shrubland over *Eremaea pauciflora* var. *pauciflora* sparse mid shrubland over *Hibbertia hypericoides* isolated low shrubs over *Lyginia barbata* isolated low sedges
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	2
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
Alexgeorgea nitens	+	0.1
Anigozanthos humilis subsp. *humilis*	+	0.2
Arnocrinum preissii	+	0.4
Astroloma xerophyllum	+	0.5
Austrostipa compressa	+	0.2
Banksia attenuata	6	5
Banksia menziesii	+	0.3
Bossiaea eriocarpa	+	0.4
**Briza maxima*	+	0.2
Burchardia congesta	+	0.7
Calandrinia liniflora	+	0.1
Calytrix angulata	+	
Calytrix flavescens	+	0.3
Calytrix sapphirina	+	0.3
**Carpobrotus edulis*	+	0.1
Conostephium preissii	+	0.3
Conostylis aculeata subsp. *cygnorum*	+	0.2
Crassula colorata var. *colorata*	+	0.1
Daviesia triflora	+	0.5
Desmocladus flexuosus	+	0.3
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	15	1.2
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.4
Gonocarpus pithyoides	+	0.1
Hibbertia hypericoides	1	0.5
Hibbertia subvaginata	+	0.3
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Laxmannia squarrosa	+	0.1
Lomandra hermaphrodita	+	0.2
Lomandra suaveolens	+	0.3
Lyginia barbata	1	0.3

Paracaleana nigrita	+	0.1
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.4
Philotheca spicata	+	0.5
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.1
Podotheca gnaphalioides	+	0.1
Pyrorchis nigricans	+	
Scholtzia aff. involucrata EAG 5500	6	2.5
Stirlingia latifolia	+	0.6
Stylidium repens	+	0.1
Stylidium rigidulum	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Wahlenbergia preissii	+	0.1

Site: 360Q27
Described: BL **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403278mE; 6486737mN
Habitat: Plain on the edge of dampland, very gentle slope SE
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* low woodland over *Xanthorrhoea preissii* and *Xanthorrhoea brunonis* sparse mid shrubland over *Hibbertia subvaginata* and *Petrophile linearis* sparse low shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 75%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Austrostipa compressa	+	0.2
Banksia attenuata	5	9
Banksia ilicifolia	10	9
Banksia menziesii	20	8
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Conostephium preissii	+	0.4
Drosera gigantea	+	0.2
**Ehrharta calycina*	+	0.2
Eucalyptus rudis subsp. *rudis*	+	1
Gastrolobium linearifolium	+	
**Gladiolus caryophyllaceus*	+	0.3
Gompholobium tomentosum	+	0.1
Goodenia pulchella	+	0.1
Hibbertia racemosa	+	0.3
Hibbertia subvaginata	8	0.4
**Hypochaeris glabra*	1	0.1
Lagenophora huegelii	+	0.2
Lepidosperma longitudinale	+	0.5
Lepidosperma pubisquameum (flat form)	+	0.3
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	cr
Lomandra suaveolens	+	0.4
Macrozamia fraseri	+	0.2
Pericalymma ellipticum var. *floridum*	+	0.4
Petrophile linearis	1	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.2
Rytidosperma acerosum	+	0.2
Scholtzia aff. involucrata EAG 5500	+	0.2
Siloxerus humifusus	+	0.1
Stylidium androsaceum	+	0.1
Stylidium araeophyllum	+	0.3
Stylidium dichotomum	+	0.1
Thysanotus sp.	+	0.2

Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.4
**Ursinia anthemoides*	+	0.2
Xanthorrhoea brunonis	1	1.1
Xanthorrhoea preissii	6	1.1
Xanthosia huegelii	+	0.1

Site: 360Q28
Described: BL **Date**: 17/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403524mE; 6487598mN
Habitat: Upper slope of sand dune, aspect N
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia menziesii* and *Banksia attenuata* low woodland over *Scholtzia* aff. involucrata isolated clumps of tall shrubs over *Beaufortia elegans* and *Macrozamia fraseri* sparse mid shrubland over *Eremaea pauciflora* var. *pauciflora*, *Hibbertia subvaginata* and *Stirlingia latifolia* sparse low shrubland over *Desmocladus flexuosus* isolated low rushes

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
Alexgeorgea nitens	+	0.1
Anigozanthos humilis subsp. *humilis*	+	0.2
**Arctotheca calendula*	+	0.1
Arnocrinum preissii	+	0.6
Astroloma xerophyllum	+	0.3
Austrostipa compressa	+	0.2
Austrostipa macalpinei	+	0.2
Banksia attenuata	5	4
Banksia menziesii	20	6
Beaufortia elegans	2	1.6
Bossiaea eriocarpa	+	0.3
**Bromus diandrus*	+	0.2
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	+	0.3
Calytrix sapphirina	+	0.4
**Carpobrotus edulis*	+	0.1
Conospermum incurvum	out	
Conostephium preissii	+	0.6
Conostylis aculeata subsp. *cygnorum*	+	0.3
Conostylis juncea	+	0.2
Crassula colorata var. *colorata*	+	0.1
Croninia kingiana	out	
Dasypogon bromeliifolius	+	0.3
Desmocladus flexuosus	1	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.2
Eremaea pauciflora var. *pauciflora*	15	0.9
**Gladiolus caryophyllaceus*	+	0.7
Gompholobium tomentosum	+	0.3
Gonocarpus pithyoides	+	0.1
Haemodorum spicatum	out	
Hibbertia sericosepala	+	0.4
Hibbertia subvaginata	1	0.6
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Jacksonia floribunda	out	

Leporella fimbriata	+	0.1
Leucopogon conostephioides	+	0.3
Lomandra caespitosa	+	0.4
Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.3
Macrozamia fraseri	1	1.4
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Philotheca spicata	1	0.5
Podotheca chrysantha	out	
Podotheca gnaphalioides	+	0.2
Regelia inops	out	
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	2	2.3
Stirlingia latifolia	+	0.7
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Verticordia nitens	out	
**Wahlenbergia capensis*	+	0.1

Site: 360Q29
Described: CvdB **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400594mE; 6484374mN
Habitat: Relatively flat dampland, low
Soil: Brown grey medium grained sand with some organic material
Rock Type: None
Vegetation: *Banksia attenuata*, *Banksia menziesii* and *Melaleuca preissiana* sparse low woodland over *Adenanthos cygnorum* subsp. *cygnorum*, *Regelia inops* and *Banksia ilicifolia* sparse tall shrubland over *Verticordia nitens* and *Astroloma xerophyllum* isolated mid shrubs over *Hibbertia subvaginata* and *Hypocalymma angustifolium* isolated low shrubs
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	12	4
**Aira cupaniana*	+	0.1
**Aira praecox*	+	0.1
Amperea simulans	+	0.1
Astroloma xerophyllum	+	0.5
Austrostipa compressa	+	0.2
Banksia attenuata	2	7
Banksia ilicifolia	+	4
Banksia menziesii	4	6
Boronia ramosa subsp. *anethifolia*	+	0.2
**Briza maxima*	+	0.3
Caladenia flava subsp. *flava*	+	0.2
**Carpobrotus edulis*	+	0.1
Centrolepis drummondiana	+	0.1
Dasypogon bromeliifolius	+	0.4
Drosera macrantha	+	cr
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium tomentosum	+	0.3
Hensmania turbinata	+	0.2
Hibbertia subvaginata	+	0.3
Hypocalymma angustifolium	+	0.6
**Hypochaeris glabra*	+	0.1
Hypolaena robusta	+	0.1
**Isolepis marginata*	+	0.1
Lepidosperma pubisquameum (flat form)	+	0.3
Leucopogon australis	+	0.3
Leucopogon squarrosus	+	0.2
Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.4
Lysinema pentapetalum	+	0.5
Macarthuria apetala	+	0.2
Melaleuca preissiana	out	7
Paracaleana nigrita	+	pr
Patersonia occidentalis var. *occidentalis*	+	0.4
Persoonia saccata	+	0.6
Petrophile linearis	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Regelia inops	2	2.1

**Solanum nigrum*	+	0.2
**Sonchus oleraceus*	+	0.1
Stylidium diuroides subsp. *paucifoliatum*	+	0.2
Stylidium repens	+	0.1
Stylidium saxifragoides	+	0.3
Thysanotus thyrsoideus	+	0.4
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.1
**Ursinia anthemoides*	+	0.1
Verticordia nitens	+	1
**Vulpia bromoides*	+	0.1
Xanthosia huegelii	+	0.2

Site: 360Q30
Described: CvdB **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400559mE; 6484520mN
Habitat: Relatively flat, low
Soil: White brown course grained sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica* isolated mid trees over *Melaleuca preissiana* isolated low trees over *Xanthorrhoea preissii* open mid shrubland over *Dasypogon bromeliifolius* and *Patersonia occidentalis* subsp. *occidentalis* sparse low herbland over **Ehrharta calycina* and **Briza maxima* isolated low grasses
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Beaufortia elegans	+	0.2
**Briza maxima*	+	0.3
Burchardia congesta	+	0.1
Caladenia flava subsp. *flava*	+	0.2
Dasypogon bromeliifolius	+	0.5
**Ehrharta calycina*	+	0.3
Eucalyptus marginata subsp. *thalassica*	+	9
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium scabrum	+	0.7
Hypocalymma angustifolium	+	0.9
**Hypochaeris glabra*	+	0.2
Lomandra hermaphrodita	+	0.3
Lomandra micrantha	+	0.2
Melaleuca preissiana	+	7
Patersonia occidentalis var. *occidentalis*	+	0.5
Podotheca gnaphalioides	+	0.2
Regelia inops	+	1.8
**Sonchus oleraceus*	+	0.2
Thysanotus manglesianus	+	0.1
**Ursinia anthemoides*	+	0.1
Xanthorrhoea preissii	+	1.2

Site: 360Q31
Described: CvdB **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400613mE; 6484554mN
Habitat: Plain/ Dampland
Soil: Grey brown sandy loam
Rock Type: None

Vegetation: *Eucalyptus marginata* subsp. *thalassica* isolated mid trees over *Banksia attenuata*, *Banksia ilicifolia* and *Melaleuca preissiana* open low forest over *Xanthorrhoea preissii*, *Hypocalymma angustifolium* and *Astroloma xerophyllum* sparse mid shrubland over *Dasypogon bromeliifolius* sparse low herbland over **Ehrharta longiflora* and **Briza maxima* isolated low grasses

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astroloma xerophyllum	+	0.5
Austrostipa compressa	1	0.2
Banksia attenuata	40	8
Banksia ilicifolia	1	7
**Briza maxima*	+	0.4
Burchardia congesta	+	0.3
Caladenia flava subsp. *flava*	+	0.2
Dasypogon bromeliifolius	3	0.4
Drosera macrantha	+	cr
**Ehrharta longiflora*	+	0.2
Eremaea pauciflora var. *pauciflora*	+	0.4
Eucalyptus marginata subsp. *thalassica*	out	11
**Gladiolus caryophyllaceus*	+	0.7
**Gladiolus caryophyllaceus*	+	0.1
Hyalosperma cotula	+	0.1
Hypocalymma angustifolium	2	1.3
**Hypochaeris glabra*	+	0.2
Leucopogon sprengelioides	+	0.4
**Lupinus cosentinii*	+	0.3
Melaleuca preissiana	+	4
Patersonia occidentalis var. *occidentalis*	+	0.4
Podotheca gnaphalioides	+	0.2
**Sonchus oleraceus*	+	0.2
Stylidium saxifragoides	+	0.1
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.1
**Ursinia anthemoides*	+	0.1
**Watsonia meriana* var. *meriana*	+	0.8
Xanthorrhoea preissii	6	1.2

Site: 360Q32
Described: BL **Date:** 17/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403502**mE;** 6487882**mN**
Habitat: Wetland, slope west, low
Soil: Black sandy clay
Rock Type: None
Vegetation: *Melaleuca preissiana* mid woodland over *Banksia littoralis* sparse low woodland over *Lepidosperma striatum* closed tall sedgeland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acetosella vulgaris*	+	0.2
Astartea scoparia	+	0.6
Banksia littoralis	9	6
Centella asiatica	+	0.1
**Hypochaeris glabra*	+	0.2
Lepidosperma striatum	80	1.2
**Lolium rigidum*	+	0.4
**Lotus subbiflorus*	+	0.2
Melaleuca preissiana	30	10
Poaceae sp.	+	0.2
Podotheca gnaphalioides	+	0.2
**Sonchus oleraceus*	+	0.1
Trachymene pilosa	+	0.2

Site: 360Q34
Described: CvdB **Date**: 16/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403075mE; 6498910mN
Habitat: Flat palusplain, low/flat
Soil: Dark brown moist sandy clay
Rock Type: none
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Astartea scoparia* open tall shrubland over **Zantedeschia aethiopica* and **Stellaria pallida* isolated mid herbs over **Holcus lanatus* isolated low grasses over *Desmocladus flexuosus* isolated low rushes
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 50%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Aotus gracillima	+	1.4
Aphelia cyperoides	+	0.1
Aphelia cyperoides	+	0.1
Astartea scoparia	40	4.5
**Briza maxima*	+	0.4
Desmocladus flexuosus	1	0.3
Eucalyptus rudis subsp. *rudis*	18	14
**Holcus lanatus*	1	0.3
**Hypochaeris radicata*	+	0.1
Isolepis stellata	+	0.1
**Lotus subbiflorus*	+	0.2
Microlaena stipoides	+	0.1
**Ornithopus compressus*	+	0.2
**Poa annua*	+	0.2
Podotheca gnaphalioides	+	0.2
Pterostylis sp. clubbed snail orchid (R. Davis 8088)	+	0.2
**Romulea rosea*	+	0.1
**Solanum nigrum*	+	0.4
**Sonchus oleraceus*	1	0.2
**Stellaria pallida*	+	0.2
**Trifolium* sp.	+	0.2
**Vulpia bromoides*	+	0.3
**Zantedeschia aethiopica*	1	1.2

Site: 360Q35
Described: BL **Date**: 16/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403120mE; 6499096mN
Habitat: Wetland periphery, very gentle S slope
Soil: Black clayey sand
Rock Type: None
Vegetation: *Kunzea glabrescens* tall shrubland over *Astartea scoparia* isolated mid shrubs over **Bromus diandrus*, **Vulpia bromoides* and **Holcus lanatus* low grassland over **Lotus subbiflorus*, **Hypochaeris glabra* and **Romulea rosea* var. *communis* open low herbland
Condition: Poor
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia salignaout	out	NC
**Acetosella vulgaris*	+	0.3
Aphelia cyperoides	+	0.1
**Arctotheca calendula*	+	0.2
Astartea scoparia	1	1.5
**Bromus diandrus*	50	0.2
Caladenia flava subsp. *flava*	+	0.1
Dielsia stenostachya	1	0.2
Drosera glanduligera	+	0.1
**Holcus lanatus*	1	0.4
**Hypochaeris glabra*	5	0.1
Isolepis stellata	+	0.1
Kunzea glabrescens	75	4
**Lotus subbiflorus*	25	0.2
**Poa annua*	+	0.1
**Romulea rosea* var. *communis*	3	0.2
**Vulpia bromoides*	5	0.1
**Zantedeschia aethiopica*	+	0.2

Site: 360Q36
Described: BL **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397172mE; 6479645mN
Habitat: Plain, very gentle east slope
Soil: Grey black sand
Rock Type: None
Vegetation: *Corymbia calophylla* open mid forest over *Xanthorrhoea preissii* open mid shrubland over *Patersonia occidentalis* subsp. *occidentalis* isolated mid herbs over **Briza maxima* sparse low grassland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 75%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.1
Austrostipa compressa	+	0.1
Beaufortia elegans	+	0.1
Bossiaea eriocarpa	+	0.3
**Briza maxima*	5	0.2
Burchardia congesta	+	0.4
Caladenia discoidea	+	0.1
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Centrolepis drummondiana	+	0.1
Corymbia calophylla	70	10
Dasypogon bromeliifolius	+	0.3
Desmocladus fasciculatus	+	0.1
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.6
**Ehrharta longiflora*	+	0.3
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.1
Hibbertia hypericoides	+	0.4
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.3
**Hypochaeris glabra*	1	0.2
**Isolepis marginata*	+	0.1
Kennedia prostrata	+	cr
Lepidosperma apricola	+	0.4
Lomandra hermaphrodita	+	0.2
Lomandra sericea	+	0.4
Lomandra suaveolens	+	0.3
Lyginia barbata	+	0.2
Millotia tenuifolia var. *laevis*	+	0.1
Nuytsia floribunda	+	1
Patersonia occidentalis var. *occidentalis*	1	0.7
Philotheca spicata	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.2
Pterostylis sanguinea	+	0.1

Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Pyrorchis nigricans	+	0.1
Quinetia urvillei	+	0.1
Rhodanthe citrina	+	0.1
Stylidium androsaceum	+	0.1
Stylidium schoenoides	+	0.2
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.3
**Ursinia anthemoides*	+	0.3
Wahlenbergia preissii	+	0.1
Waitzia suaveolens var. *suaveolens*	+	
Xanthorrhoea preissii	25	2.2

Site: 360Q37
Described: BL **Date**: 25/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 404008mE; 6492592mN
Habitat: Dampland, very gentle SE slope, low
Soil: Grey black sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Melaleuca preissiana* sparse low woodland over *Dielsia stenostachya* closed mid rushland over **Briza maxima* isolated low grasses over **Hypochaeris glabra* isolated low herbs
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 80%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	+	1.5
**Briza maxima*	3	0.2
Corymbia calophylla	30	15
Dielsia stenostachya	90	0.5
**Hesperantha falcata*	+	out
**Hypochaeris glabra*	2	0.1
Juncus pallidus	+	1
**Leucaena leucocephala*	+	out
Lobelia anceps	+	0.4
**Lotus subbiflorus*	+	0.2
**Medicago sp.*	+	0.2
Melaleuca preissiana	4	6
Microtis media subsp. *media*	+	0.3
**Ornithopus compressus*	+	0.1
Pterostylis sp. short sepals (W. Jackson BJ259)	+	0.1
***Romulea rosea var. australis*	+	0.2
**Sonchus oleraceus*	+	0.1
Thelymitra vulgaris	+	0.3
**Trifolium subterraneum*	+	0.2
**Ursinia anthemoides*	+	0.3
**Zantedeschia aethiopica*	+	0.2

Site: 360Q39
Described: CvdB **Date**: 24/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397511mE; 6478115mN
Habitat: Small dual rise, running NW to SE, relatively flat on top, upper
Soil: Grey brown medium grained sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica*, *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Adenanthos cygnorum* subsp. *cygnorum* sparse tall shrubland over *Allocasuarina humilis* and *Verticordia nitens* isolated mid shrubs over *Astroloma xerophyllum*, *Calytrix fraseri* and *Beaufortia elegans* sparse low shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	0.6
Acacia sessilis	+	0.4
Adenanthos cygnorum subsp. *cygnorum*	5	4
Alexgeorgea nitens	+	0.2
Allocasuarina humilis	1	1.5
Amphipogon turbinatus	+	0.2
Astroloma xerophyllum	2	0.4
Banksia attenuata	+	0.1
Banksia menziesii	1	6
Beaufortia elegans	+	0.6
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Calytrix fraseri	1	0.3
Conostephium preissii	+	0.2
Crassula colorata var. *colorata*	+	0.1
Dampiera linearis	+	0.3
Dasypogon bromeliifolius	+	0.4
Daviesia triflora	+	0.3
Desmocladus flexuosus	+	0.2
Drosera barbigera	+	pr
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.2
Eucalyptus marginata subsp. *thalassica*	out	7
**Gladiolus caryophyllaceus*	+	0.2
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.2
Hibbertia huegelii	+	0.3
Hibbertia hypericoides	+	0.4
Hibbertia subvaginata	+	0.3
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.2
**Hypochaeris glabra*	+	0.2
Leucopogon conostephioides	+	0.3
Lomandra hermaphrodita	+	0.2
Lomandra micrantha	+	0.3
Lyginia barbata	+	0.3

Lyginia barbata	+	0.3
Lysinema pentapetalum	+	0.6
Mesomelaena pseudostygia	+	0.3
Millotia tenuifolia var. *laevis*	+	0.1
Nuytsia floribunda	+	1.1
Petrophile linearis	+	0.2
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.2
Stirlingia latifolia	+	0.4
Stylidium repens	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1
Verticordia nitens	+	0.8
**Vulpia myuros* forma megalura	+	0.1

Site: SVB001
Described: CvdB **Date:** 25/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 395865mE; 6473711mN
Habitat: Very gently with a southerly aspect
Soil: Grey brown medium grained sand
Rock Type: None

Vegetation: *Eucalyptus marginata* and *Eucalyptus todtiana* sparse mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* sparse low woodland over *Stirlingia latifolia* isolated mid shrubs over *Hibbertia hypericoides* and *Daviesia triflora* sparse low shrubland over *Mesomelaena pseudostygia* isolated low sedges over *Alexgeorgea nitens* isolated low rushes

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	0.7
**Aira cupaniana*	+	0.2
Alexgeorgea nitens	1	0.1
Austrostipa compressa	+	0.1
Banksia attenuata	3	7
Banksia menziesii	2	7
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Caladenia longicauda subsp. *calcigena*	+	0.3
Calandrinia corrigioloides	+	0.1
Calytrix angulata	+	0.5
Calytrix flavescens	+	0.3
Calytrix fraseri	+	0.6
Conostephium preissii	+	0.2
Conostylis aculeata subsp. *cygnorum*	+	0.3
Conostylis setigera subsp. *setigera*	+	0.2
Corynotheca micrantha var. *elongata*	+	0.3
Dampiera linearis	+	0.2
Dasypogon bromeliifolius	+	0.4
Daviesia triflora	+	0.5
Diuris magnifica	+	0.3
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.4
Eucalyptus marginata subsp. *thalassica*	12	8
Eucalyptus todtiana	out	6
Gastrolobium capitatum	+	0.4
**Gladiolus caryophyllaceus*	+	0.4
Gompholobium tomentosum	+	0.2
**Heliophila pusilla*	+	0.4
Hibbertia huegelii	+	0.3
Hibbertia hypericoides	2	0.5
Hybanthus calycinus	+	0.3
**Hypochaeris glabra*	+	0.3
Laxmannia squarrosa	+	0.2
Lepidosperma pubisquameum (flat form)	+	0.3
Leucopogon conostephioides	+	0.3

Lomandra integra	+	0.2
Lyginia barbata	+	0.4
Mesomelaena pseudostygia	+	0.6
Nuytsia floribunda	out	8
Opercularia vaginata	+	0.2
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.4
Philotheca spicata	+	0.2
Podotheca angustifolia	+	0.1
Pterostylis vittata	+	0.1
**Romulea rosea*	+	0.2
Stirlingia latifolia	+	1.5
Stylidium androsaceum	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: SVB002
Described: BL **Date**: 24/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397066mE; 6474059mN
Habitat: Dampland, very gentle west slope, low
Soil: Grey black peaty sand
Rock Type: None
Vegetation: *Astartea scoparia*, *Melaleuca lateritia* and *Eutaxia virgata* closed mid shrubland over *Lepidosperma striatum* sparse tall sedgeland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	1
Astartea scoparia	9	2
Astartea scoparia	85	1.8
Baumea articulata	+	1.1
Centella asiatica	+	0.1
Eutaxia virgata	3	1.2
Hakea varia	+	
**Hypochaeris glabra*	+	0.1
Lepidosperma striatum	15	1.2
Lobelia anceps	+	0.3
Meeboldina decipiens subsp. *decipiens*	+	1.2
Meeboldina scariosa	+	1.2
Melaleuca lateritia	4	1.8
Thysanotus multiflorus	+	0.3

Site: SVB003
Described: BL **Date**: 24/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397269mE; 6474141mN
Habitat: Undulating plain, gentle south slope, lowerslope
Soil: Grey sand
Rock Type:
Vegetation: *Banksia menziesii*, *Banksia ilicifolia* and *Nuytsia floribunda* sparse low woodland over *Eremaea pauciflora* var. *pauciflora* and *Xanthorrhoea preissii* sparse low shrubland over **Ehrharta calycina* and *Avena barbata* sparse mid grassland over **Ursinia anthemoides*, **Hypochaeris glabra* and *Phlebocarya ciliata* sparse low herbland
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	1	1.3
Alexgeorgea nitens	+	0.1
Arnocrinum preissii	+	0.3
Avena barbata	3	0.8
Banksia ilicifolia	4	7
Banksia menziesii	8	5
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.3
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.2
Calytrix fraseri forma Ellenbrook	+	1.1
Conostylis juncea	+	0.2
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
**Ehrharta calycina*	10	1
Eremaea pauciflora var. *pauciflora*	15	0.7
**Gladiolus caryophyllaceus*	+	0.9
Gompholobium tomentosum	+	0.5
Hibbertia hypericoides	+	0.3
Hovea pungens	+	0.4
**Hypochaeris glabra*	1	0.1
Leucopogon conostephioides	+	0.4
Lyginia barbata	+	0.5
Microtis media subsp. *media*	+	0.4
Nuytsia floribunda	2	5
Opercularia vaginata	+	0.3
Petrophile linearis	+	0.3
Phlebocarya ciliata	1	0.5
**Romulea rosea*	+	0.4
Schoenus curvifolius	+	0.4
**Sonchus oleraceus*	+	0.2
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.2
**Ursinia anthemoides*	3	0.3
Xanthorrhoea preissii	3	0.9

Site: SVB004
Described: CvdB **Date**: 24/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397708mE: 6474066mN
Habitat: Relatively flat, low
Soil: Grey brown sandy clay
Rock Type: None
Vegetation: *Banksia attenuata* isolated low trees over *Eucalyptus todtiana* isolated low mallee trees over *Melaleuca seriata*, *Eremaea pauciflora* var. *pauciflora* and *Xanthorrhoea preissii* sparse low shrubland over *Phlebocarya ciliata* open low herbland
Condition: Very good - excellent
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	0.6
Adenanthos obovatus	+	0.6
**Aira cupaniana*	+	0.1
Banksia attenuata	+	1
Bossiaea eriocarpa	+	0.3
Calandrinia corrigioloides	+	0.1
Calytrix flavescens	+	0.2
Centrolepis drummondiana	+	0.1
Crassula colorata var. colorata	+	0.1
Dampiera linearis	+	0.3
Dasypogon bromeliifolius	+	0.4
Diuris sp.	+	0.2
Eremaea pauciflora var. *pauciflora*	+	0.7
Eucalyptus todtiana	2	6
Hibbertia subvaginata	+	0.3
Hovea trisperma var. trisperma	+	0.3
Hypocalymma angustifolium	+	0.2
**Hypochaeris glabra*	+	0.3
Hypolaena exsulca	+	0.3
Jacksonia floribunda	+	2
Lechenaultia floribunda	+	0.3
Leucopogon polymorphus	+	0.4
Lomandra integra	+	0.4
Lomandra sericea	1	0.4
Melaleuca seriata	14	0.7
Patersonia occidentalis var. *occidentalis*	+	0.5
Philotheca spicata	+	0.6
Phlebocarya ciliata	35	0.4
Podotheca gnaphalioides	+	0.1
**Sonchus oleraceus*	+	0.1
Stylidium saxifragoides	+	0.2
Trachymene pilosa	+	0.1
**Urospermum picroides*	+	0.2
Xanthorrhoea preissii	4	2

Site: SVB005
Described: BL **Date**: 24/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397567mE; 6474327mN
Habitat: Dampland, very gentle south slope, low
Soil: Grey black peaty sand
Rock Type: None
Vegetation: *Astartea scoparia*, *Melaleuca lateritia*, *Eutaxia virgata* and *Calothamnus lateralis* closed mid shrubland over *Lepidosperma striatum* and *Lepidosperma longitudinale* sparse tall sedgeland over *Meeboldina tephrina*, *Hypolaena exsulca* and *Meeboldina decipiens* subsp. *decipiens* ms sparse tall rushland
Condition: Excellent
Fire Age: >5 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	
Astartea scoparia	5	1.9
Astartea scoparia	85	1.6
Baumea articulata	+	0.8
Calothamnus lateralis	1	1
Cassytha glabella	+	pr
Centella asiatica	+	0.1
Eutaxia virgata	2	1.2
Goodenia pulchella	+	0.1
Hakea varia	+	
**Hypochaeris glabra*	+	0.1
Hypolaena exsulca	1	1
Lepidosperma longitudinale	2	1.1
Lepidosperma striatum	15	1.2
Meeboldina decipiens subsp. *decipiens*	1	1.1
Meeboldina scariosa	+	1
Meeboldina tephrina	4	1
Melaleuca lateritia	4	1
Melaleuca preissiana	+	
**Pelargonium capitatum*	+	0.1
**Sonchus oleraceus*	+	0.1
Thelymitra graminea	+	0.3
Thysanotus multiflorus	+	0.3
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2

Site: SVB006
Described: CvdB **Date**: 25/09/2014 **Type:** Relevés
MGA Zone: 50 397564mE; 6474531mN
Habitat: Wetland
Soil: Black grey sandy clay
Rock Type: None
Vegetation: *Melaleuca preissiana* isolated low trees over *Astartea scoparia*, *Melaleuca teretifolia* and *Melaleuca lateritia* closed tall shrubland over *Lepidosperma longitudinale* sparse mid sedgeland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	75	2.1
Eutaxia virgata	+	1.2
Lepidosperma longitudinale	20	0.9
Meeboldina scariosa	+	0.9
Melaleuca lateritia	1	1.8
Melaleuca preissiana	1	9
Melaleuca teretifolia	1	2.4

Site: SVB007
Described: CvdB **Date**: 24/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397739mE; 6474564mN
Habitat: Wetland, low
Soil: Black, dark brown clayey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* sparse low woodland over *Pericalymma crassipes*, *Hypocalymma angustifolium* and *Xanthorrhoea preissii* open tall shrubland over *Lepidosperma striatum* and *Lepidosperma longitudinale* tall sedgeland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	1
Aotus gracillima	+	1.4
Calothamnus lateralis	+	1.5
Cassytha pomiformis	+	CR
Cyathochaeta teretifolia	+	0.6
Drosera gigantea	+	0.6
Eutaxia virgata	+	0.4
Hakea varia	+	1
Hypocalymma angustifolium	2	1.2
Hypolaena exsulca	+	0.6
Lepidosperma striatum	50	1.1
**Lolium rigidum*	2	0.9
Melaleuca preissiana	2	5
Pericalymma crassipes	26	2
Xanthorrhoea preissii	14	2.2

Site: SVB008
Described: CvdB **Date**: 24/09/2014 **Type**: Relevés
MGA Zone: 50 397819mE; 6474467mN
Habitat: Dampland
Soil: Grey brown medium grained sand
Rock Type: None
Vegetation: *Corymbia calophylla* isolated mid trees over *Melaleuca preissiana* isolated low trees over *Xanthorrhoea preissii* sparse mid shrubland over *Dasypogon bromeliifolius* and *Phlebocarya ciliata* sparse low herbland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name

Austrostipa compressa
Banksia ilicifolia
Briza minor
Corymbia calophylla
Dampiera linearis
Dasypogon bromeliifolius
Diuris longifolia
**Gladiolus caryophyllaceus*
Hybanthus calycinus
Hypocalymma angustifolium
Jacksonia furcellata
Melaleuca preissiana
Phlebocarya ciliata
**Ursinia anthemoides*
Wahlenbergia tumidifructa
Xanthorrhoea preissii

Site: SVB008A
Described: CvdB **Date**: 24/09/2014 **Type:** Relevés
MGA Zone: 50 397816mE; 6474519mN
Habitat: Dampland, low
Soil: Black grey sandy clay
Rock Type: None
Vegetation: *Melaleuca preissiana* isolated low trees over *Xanthorrhoea preissii* sparse mid shrubland over *Lepidosperma longitudinale* sparse mid sedgeland
Condition: Very good
Fire Age: <6 months
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Hypocalymma angustifolium	+	0.3
Kennedia prostrata	+	CR
Lepidosperma longitudinale	2	0.4
Melaleuca preissiana	+	12
Wurmbea dioica	+	0.2
Xanthorrhoea preissii	2	1.6

Site: SVB009
Described: BL **Date**: 24/09/2014 **Type:** Relevés
MGA Zone: 50 397474mE; 6475138mN
Habitat: Plain, very gentle south slope, low
Soil: Grey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* and **Acacia longifolia* subsp. *longifolia* sparse low woodland over *Xanthorrhoea preissii* sparse mid shrubland over **Bromus diandrus*, **Ehrharta calycina* and *Avena barbata* tall grassland over **Ursinia anthemoides, *Hypochaeris glabra* and **Urospermum picroides* sparse low herbland
Condition: Degraded
Fire Age: >5 years
Notes: Leaf Litter: 5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acacia longifolia* subsp. *longifolia*	3	4
Avena barbata	2	0.8
**Bromus diandrus*	70	0.2
**Ehrharta calycina*	5	1
**Gladiolus caryophyllaceus*	1	1
**Hypochaeris glabra*	1	0.1
Lyginia imberbis	+	0.6
Melaleuca preissiana	5	4.5
Nuytsia floribunda	1	4
Patersonia occidentalis var. *occidentalis*	+	0.5
**Urospermum picroides*	1	0.3
**Ursinia anthemoides*	5	0.3
Xanthorrhoea preissii	20	1.9

Site: SVB010
Described: BL **Date**: 24/09/2014 **Type:** Relevés
MGA Zone: 50 397746mE; 6475089mN
Habitat: Wetland, very gentle west slope, low
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* and *Melaleuca preissiana* sparse low woodland over **Acacia longifolia* subsp. *longifolia* closed tall shrubland over *Astartea scoparia* sparse mid shrubland over *Lepidosperma longitudinale* isolated tall sedges over *Hypolaena exsulca* isolated tall rushes over **Briza maxima* and **Bromus diandrus* isolated low grasses
Condition: Degraded
Fire Age: >5 years
Notes: Leaf Litter: 100%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acacia longifolia* subsp. *longifolia*	95	3.5
Astartea scoparia	15	1.3
**Briza maxima*	2	0.3
**Bromus diandrus*	1	0.3
Eucalyptus rudis subsp. *rudis*	5	8
Hypolaena exsulca	1	1.1
Lepidosperma longitudinale	2	1.1
Lobelia anceps	+	0.3
Melaleuca preissiana	2	4.5
**Sonchus oleraceus*	+	0.2
**Urospermum picroides*	+	0.2

Site: SVB011
Described: BL **Date**: 24/09/2014 **Type:**Quadrat 10x10 m
MGA Zone: 50 397503mE; 6475322mN
Habitat: Dampland, very gentle east slope, low
Soil: Grey black peaty sand
Rock Type: None
Vegetation: *Melaleuca preissiana* low woodland over **Acacia longifolia* subsp. *longifolia* sparse tall shrubland over *Hypocalymma angustifolium* and *Astartea scoparia* mid shrubland over *Cyathochaeta avenacea* open mid sedgeland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acacia longifolia* subsp. *longifolia*	15	2.3
Acacia pulchella var. *pulchella*	+	0.3
Acacia stenoptera	+	0.3
**Aira cupaniana*	+	0.1
Astartea scoparia	2	1.4
**Briza maxima*	1	0.3
Briza minor	1	0.1
Burchardia congesta	+	0.3
Chamaescilla versicolor	+	0.2
Cyathochaeta avenacea	40	0.8
**Ehrharta calycina*	+	0.7
**Gladiolus caryophyllaceus*	+	0.5
Hypocalymma angustifolium	50	1.2
**Hypochaeris glabra*	+	0.1
Juncus pallidus	+	1
Lobelia anceps	+	0.3
**Lotus subbiflorus*	+	0.1
Melaleuca preissiana	40	6
Pterostylis sanguinea	+	0.2
Schoenus efoliatus	+	0.4
**Sonchus oleraceus*	+	0.2
Xanthorrhoea preissii	1	0.8

Site: SVB012
Described by: BL **Date**: 24/09/201 **Type:** Quadrat 10x10 m
MGA Zone: 50 397794mE; 6475334mN
Habitat: Dune, moderate south slope, upperslope
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia menziesii* and *Banksia attenuata* sparse low woodland over *Allocasuarina humilis*, *Jacksonia floribunda* sparse tall shrubland over *Hibbertia hypericoides*, *Eremaea pauciflora* var. *pauciflora*, *Conostephium preissii* and *Leucopogon conostephioides* open low shrubland over *Dasypogon bromeliifolius* isolated mid herbs over **Briza maxima* and **Ehrharta calycina* sparse mid grassland over *Alexgeorgea nitens* and *Lyginia barbata* sparse low rushland

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.4
Acacia sessilis	+	0.3
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
Alexgeorgea nitens	5	0.2
Allocasuarina humilis	12	2.1
Amphipogon turbinatus	+	0.3
Anigozanthos humilis subsp. *humilis*	+	0.3
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Banksia attenuata	17	6
Banksia menziesii	3	6
Bossiaea eriocarpa	+	0.4
**Briza maxima*	3	0.3
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.4
Calectasia narragara	out	
Calytrix flavescens	+	0.2
Calytrix fraseri forma Ellenbrook	+	
Cassytha racemosa forma pilosa	+	cr
Conostephium preissii	1	0.6
Conostylis aculeata subsp. *cygnorum*	+	0.3
Cryptandra nutans	+	0.2
Dampiera linearis	+	0.2
Dasypogon bromeliifolius	2	0.3
Daviesia triflora	+	0.4
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Drosera pallida	+	cr
**Ehrharta calycina*	1	0.7
Eremaea pauciflora var. *pauciflora*	3	0.3
Eucalyptus todtiana	+	
**Gladiolus caryophyllaceus*	+	1.1
Gompholobium tomentosum	+	0.3
Haemodorum spicatum	+	0.6
**Heliophila pusilla*	+	0.3
Hensmania turbinata	+	0.3

Hibbertia huegelii	+	0.3
Hibbertia hypericoides	15	0.6
Hibbertia subvaginata	+	0.3
Hovea trisperma var. *trisperma*	+	0.3
Jacksonia floribunda	1	2
Laxmannia squarrosa	+	0.1
Lepidosperma leptostachyum	+	0.6
Leucopogon conostephioides	2	0.4
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.4
Lomandra sericea	+	0.4
Lyginia barbata	1	0.6
Lyginia imberbis	+	0.6
Macrozamia fraseri	+	0.6
Mesomelaena pseudostygia	+	0.4
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Philotheca spicata	+	1
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Scaevola repens var. repens	out	
Scaevola repens var. repens	+	0.1
Schoenus clandestinus	out	
Schoenus curvifolius	+	0.2
Scholtzia aff. involucrata EAG 5500	+	0.4
Stirlingia latifolia	+	1
Stylidium cygnorum	+	0.1
Stylidium repens	+	0.1
Synaphea spinulosa subsp. *spinulosa*	out	
Thysanotus thyrsoideus	+	0.4
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.3
**Wahlenbergia capensis*	+	0.1
Xanthosia huegelii	+	0.1

Site: SVB013
Described: CvdB **Date**: 24/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397783mE; 6475728mN
Habitat: South facing aspect of small dunal rise, mid to upper
Soil: Grey medium grained sand
Rock Type: None
Vegetation: *Eucalyptus todtiana* isolated mid mallee trees over *Banksia menziesii*, *Banksia attenuata* and *Nuytsia floribunda* sparse low woodland over *Hibbertia hypericoides* and *Eremaea pauciflora* var. *pauciflora* sparse low shrubland over *Alexgeorgea nitens* sparse low rushland
Condition: Excellent - very good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia sessilis	+	0.3
**Aira cupaniana*	+	0.3
Alexgeorgea nitens	4	0.1
Austrostipa compressa	+	0.3
Austrostipa compressa	+	0.3
Banksia menziesii	2	6
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Conostephium preissii	+	0.1
Conostylis juncea	+	0.2
Dampiera linearis	+	0.3
Dasypogon bromeliifolius	+	0.4
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
**Ehrharta calycina*	+	1.2
Eremaea pauciflora var. *pauciflora*	7	0.4
Eucalyptus todtiana	6	5
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium scabrum	+	0.4
Gompholobium tomentosum	+	0.7
Hibbertia huegelii	+	0.3
Hibbertia hypericoides	3	0.4
Hovea pungens	+	0.2
Hypolaena exsulca	+	0.4
Jacksonia floribunda	+	1.3
Leucopogon conostephioides	+	0.4
Lomandra preissii	+	0.4
Lomandra sericea	+	0.4
Lyginia barbata	1	0.4
Nuytsia floribunda	out	6
Opercularia vaginata	+	0.3
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Philotheca spicata	+	1
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	+	0.4
Stirlingia latifolia	+	0.4

Stylidium repens	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: SVB014
Described: CvdB **Date**: 24/09/2014 **Type**: Relevés
MGA Zone: 50 397658mE; 6475972mN
Vegetation: *Melaleuca preissiana* isolated low trees over *Xanthorrhoea preissii* mid shrubland over **Ehrharta calycina* sparse mid grassland
Condition: Good

SPECIES LIST:

Name
Melaleuca preissiana
Xanthorrhoea preissii

Site: SVB014A
Described: CvdB **Date**: 24/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397647mE; 6475785mN
Habitat: Small dunal rise, on southern aspect, upper
Soil: Grey medium grained sand
Rock Type: None

Vegetation: *Eucalyptus todtiana* isolated mallee trees over *Banksia menziesii* sparse tall shrubland over *Allocasuarina humilis* and *Jacksonia floribunda* sparse mid shrubland over *Hibbertia hypericoides* and *Calytrix flavescens* sparse low shrubland over *Schoenus efoliatus* sparse low sedgeland and *Alexgeorgea nitens* sparse low rushland

Condition: Very good - excellent
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia sessilis	+	0.3
Alexgeorgea nitens	3	0.1
Allocasuarina humilis	4	1.3
Amphipogon turbinatus	+	0.3
Arnocrinum preissii	+	0.4
Astroloma xerophyllum	+	0.4
Banksia menziesii	2	3
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.3
Calectasia narragara	+	0.3
Calytrix flavescens	1	0.4
Cassytha pomiformis	+	cr
Comesperma calymega	+	0.3
Conostephium preissii	+	0.2
Conostylis setigera subsp. *setigera*	+	0.2
Dasypogon bromeliifolius	+	0.3
Daviesia triflora	+	0.4
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.3
Eucalyptus todtiana	out	4
**Gladiolus caryophyllaceus*	+	0.5
Haemodorum laxum	+	0.5
Haemodorum simplex	+	0.6
Hemiandra linearis	+	0.3
Hibbertia aurea	+	0.2
Hibbertia huegelii	+	0.2
Hibbertia hypericoides	3	0.3
Hibbertia subvaginata	+	0.4
Hypolaena exsulca	+	0.3
Jacksonia floribunda	+	1.9
Lepidosperma leptostachyum	+	0.5
Lomandra hermaphrodita	+	0.4
Lomandra sericea	+	0.4
Lyginia barbata	+	0.4
Lyginia barbata	+	0.4
Macarthuria australis	+	0.4
Mesomelaena pseudostygia	+	0.4
Mesomelaena pseudostygia	+	0.3
Patersonia occidentalis var. *occidentalis*	+	0.5

Petrophile linearis	+	0.3
Philotheca spicata	+	1
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.4
**Rubus laudatus*	+	0.2
Scaevola repens var. *repens*	+	0.1
Schoenus efoliatus	1	0.4
Stirlingia latifolia	+	0.5
Stylidium cygnorum	+	0.1
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.1
**Ursinia anthemoides*	+	0.1
Xanthorrhoea preissii	+	1

Site: SVB015
Described: CvdB **Date**: 24/09/2014 **Type:** Relevés
MGA Zone: 50 397553mE; 6476821mN
Habitat: Drainage line, low
Soil: grey brown sandy loam, organic?
Rock Type: None
Vegetation: *Melaleuca preissiana* sparse low woodland over *Xanthorrhoea preissii* sparse mid shrubland over **Ehrharta calycina* and **Briza maxima* sparse low grassland
Condition: Degraded - completely degraded
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Briza maxima*	8	0.3
Dasypogon bromeliifolius	+	0.3
**Ehrharta calycina*	12	0.4
**Gladiolus caryophyllaceus*	+	0.6
Hakea varia	+	1.6
Melaleuca preissiana	7	10
Xanthorrhoea preissii	6	1.6

Site: SVB015A
Described: CvdB **Date**: 24/09/2014 **Type:** Relevés
MGA Zone: 50 397547mE; 6476854mN
Habitat: gentle slope to the south into drainage line, mid-slope
Vegetation: *Corymbia calophylla* isolated clumps of mid trees over *Xanthorrhoea preissii* sparse mid shrubland over **Ehrharta calycina* and **Briza maxima* sparse low grassland
Condition: Degraded
Fire Age: >10 years

SPECIES LIST:

Name	Cover
**Briza maxima*	8
Corymbia calophylla	+
**Ehrharta calycina*	12
Xanthorrhoea preissii	2

Site: SVB016
Described: BL **Date**: 25/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 398383mE; 6474225mN
Habitat: Undulating plain, gentle east slope, midslope
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia menziesii*, *Nuytsia floribunda* and *Allocasuarina fraseriana* low woodland over *Allocasuarina humilis* open mid shrubland over *Eremaea pauciflora* var. *pauciflora*, *Hibbertia hypericoides*, *Gompholobium tomentosum* and *Melaleuca seriata* open low shrubland over *Mesomelaena pseudostygia* and *Lyginia barbata* sparse low sedgeland
Condition: Very godd
Fire Age: >10 years
Notes: Leaf Litter: 50%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia willdenowiana	+	0.3
Alexgeorgea nitens	1	0.2
Allocasuarina fraseriana	3	6
Allocasuarina humilis	25	1.7
Amphipogon turbinatus	+	0.2
Anigozanthos humilis subsp. *humilis*	+	0.2
Banksia menziesii	25	5
Bossiaea eriocarpa	+	0.4
**Briza maxima*	1	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.2
Conostephium preissii	+	0.5
Conostylis aculeata subsp. *cygnorum*	+	0.3
Conostylis teretifolia subsp. *teretifolia*	+	0.1
Daviesia triflora	+	0.5
Desmocladus flexuosus	+	0.2
Drosera macrantha	+	cr
**Ehrharta calycina*	1	0.8
Eremaea pauciflora var. *pauciflora*	3	0.8
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium tomentosum	2	0.7
Haemodorum laxum	+	0.4
**Heliophila pusilla*	+	0.2
Hibbertia huegelii	+	0.2
Hibbertia hypericoides	20	0.8
**Hypochaeris glabra*	+	0.1
Jacksonia floribunda	+	1
Lepidosperma apricola	+	0.4
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.5
Lomandra sericea	+	0.4
Lyginia barbata	2	0.5
Melaleuca seriata	2	0.8
Mesomelaena pseudostygia	2	0.5
Nuytsia floribunda	4	5.5
Patersonia occidentalis var. *occidentalis*	1	0.5
Petrophile linearis	+	0.6
**Romulea rosea*	+	0.2

Scholtzia aff. involucrata EAG 5500	1	0.4
Stirlingia latifolia	+	1
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Thysanotus sparteus	+	1.2
**Urospermum picroides*	+	0.1
**Ursinia anthemoides*	1	0.3
**Wahlenbergia capensis*	+	0.1

Site: SVB017
Described: BL **Date**: 25/09/2014 **Type:** Relevés
MGA Zone: 50 400032mE; 6474422mN
Habitat: Plain, very gentle east slope
Soil: Grey sand
Rock Type: None
Vegetation: *Corymbia calophylla* and *Eucalyptus rudis* subsp. *rudis* isolated clumps of low trees over *Jacksonia furcellata* sparse tall shrubland over *Xanthorrhoea preissii* and *Hypocalymma angustifolium* sparse mid shrubland over **Ehrharta calycina*, **Bromus diandrus* and **Ehrharta longiflora* closed mid grassland
Condition: Completely degraded
Fire Age: >10 years
Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Bromus diandrus*	2	0.6
**Carpobrotus edulis*	2	0.3
**Chamaecytisus palmensis*	1	2.5
Corymbia calophylla	3	9
**Ehrharta calycina*	90	0.9
**Ehrharta longiflora*	3	0.5
Eucalyptus rudis subsp. *rudis*	2	8
Hypocalymma angustifolium	2	1
Jacksonia furcellata	5	4
**Ricinus communis*	2	3
**Romulea rosea*	2	0.4
Xanthorrhoea preissii	2	1.6

Site: SVB018
Described: BL **Date**: 25/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400341mE; 6474340mN
Habitat: Floodplain, very gentle east slope, low
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* open mid forest over *Pteridium esculentum* subsp. *esculentum* tall herbland with *Hardenbergia comptoniana* over *Opercularia hispidula* isolated low herbs
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 100%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Briza maxima*	+	0.2
Eucalyptus rudis subsp. *rudis*	60	20
Hardenbergia comptoniana	8	cr
**Hesperantha falcata*	+	0.3
Lepidosperma longitudinale	+	1
Opercularia hispidula	2	0.4
Pteridium esculentum subsp. *esculentum*	60	1.8
**Trifolium micranthum*	+	0.1

Site: SVB019
Described: BL **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397312mE; 6478177mN
Habitat: Undulating plain, lowerslope, gentle SW slope
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Xanthorrhoea preissii*, *Calytrix fraseri* Ellenbrook Form and *Verticordia nitens* open mid shrubland over *Hibbertia hypericoides* and *Leucopogon conostephioides* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* isolated mid herbs
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 50%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia willdenowiana	+	0.4
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.1
Amphipogon turbinatus	+	0.4
Anigozanthos humilis subsp. *humilis*	+	0.3
**Arctotheca calendula*	+	0.2
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Austrostipa compressa	+	0.1
Banksia attenuata	7	6
Banksia menziesii	3	6
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Briza minor	+	0.1
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.1
Calandrinia corrigioloides	+	0.1
Calytrix angulata	+	0.3
Calytrix fraseri forma Ellenbrook	10	1.5
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.3
Crassula colorata var. *colorata*	+	0.1
Dampiera linearis	+	0.1
Dasypogon bromeliifolius	+	0.3
Daviesia triflora	+	0.4
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.2
Hibbertia aurea	+	0.4
Hibbertia hypericoides	10	0.6
Hibbertia subvaginata	+	0.2
Hyalosperma cotula	+	0.1
**Hypochaeris glabra*	+	0.1
Leporella fimbriata	+	0.1

Leucopogon conostephioides	5	0.4
Levenhookia stipitata	+	0.1
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.1
Lyginia barbata	+	0.5
Millotia tenuifolia var. *laevis*	+	0.1
Patersonia occidentalis var. *occidentalis*	1	0.5
Petrophile linearis	+	0.3
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Quinetia urvillei	+	0.1
**Sonchus oleraceus*	+	0.1
Stirlingia latifolia	+	0.6
Stylidium androsaceum	+	0.2
Stylidium repens	+	0.1
Stylidium saxifragoides	+	0.2
Thysanotus thyrsoideus	+	0.3
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1
Verticordia nitens	1	1.2
**Vulpia bromoides*	+	0.1
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	10	1.9

Site: SVB020
Described: BL **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397321mE; 6478441mN
Habitat: Plain, very gently SE slope
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia menziesii*, *Allocasuarina fraseriana* and *Nuytsia floribunda* isolated low trees over *Xanthorrhoea preissii* sparse tall shrubland over *Verticordia nitens* sparse mid shrubland over *Eremaea pauciflora* var. *pauciflora* and *Scholtzia* aff. involucrata sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* and *Dasypogon bromeliifolius* sparse mid herbland over *Lyginia barbata* sparse mid sedgeland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.1
Allocasuarina fraseriana	1	4
Arnocrinum preissii	+	0.4
Austrostipa compressa	+	0.2
Banksia menziesii	1	2
Bossiaea eriocarpa	+	0.2
**Bromus diandrus*	+	0.1
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	+	0.3
Centrolepis drummondiana	+	0.1
Crassula colorata var. *colorata*	+	0.1
Dampiera linearis	+	0.2
Dasypogon bromeliifolius	1	0.3
Eremaea pauciflora var. *pauciflora*	8	0.9
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.3
Haemodorum spicatum	+	0.4
Hibbertia hypericoides	+	0.2
Hibbertia subvaginata	+	0.3
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.4
**Hypochaeris glabra*	+	0.2
Hypolaena exsulca	+	0.3
**Isolepis marginata*	+	0.1
Laxmannia ramosa subsp. *ramosa*	+	0.1
Lepidosperma apricola	+	0.3
Leucopogon conostephioides	+	0.5
Leucopogon polymorphus	+	0.3
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra sericea	+	0.3
Lyginia barbata	6	0.6
Millotia tenuifolia var. *laevis*	+	0.1
Nuytsia floribunda	+	4
Patersonia occidentalis var. *occidentalis*	6	0.6
**Pentaschistis airoides*	+	0.1

Petrophile linearis	+	0.3
Phlebocarya ciliata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.2
Prasophyllum parvifolium	+	0.4
Schoenus curvifolius	+	0.2
Scholtzia aff. involucrata EAG 5500	2	0.4
Stylidium androsaceum	+	0.2
Stylidium araeophyllum	+	0.1
Stylidium repens	+	0.1
Stylidium saxifragoides	+	0.2
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.3
Verticordia nitens	5	1.5
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	5	2.5

Site: SVB021
Described: BL **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397322mE; 6478846mN
Habitat: plain, very gentle SE slope
Soil: Grey sand
Rock Type: None
Vegetation: *Corymbia calophylla* and *Eucalyptus marginata* subsp. *thalassica* sparse mid woodland over *Banksia menziesii* and *Allocasuarina fraseriana* sparse low woodland over *Xanthorrhoea preissii* sparse mid shrubland over *Patersonia occidentalis* subsp. *occidentalis*, *Dasypogon bromeliifolius* and *Phlebocarya ciliata* open mid herbland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 80%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia stenoptera	+	0.3
Acacia willdenowiana	+	0.3
Alexgeorgea nitens	+	0.1
Allocasuarina fraseriana	2	5
Banksia menziesii	2	5
Burchardia congesta	+	0.7
Caladenia flava subsp. *flava*	+	0.2
Conostephium preissii	+	0.5
Conostylis juncea	+	0.2
Corymbia calophylla	8	17
Dampiera linearis	+	0.3
Dasypogon bromeliifolius	3	0.4
Diuris tinkeri	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus marginata subsp. *thalassica*	2	4
**Gladiolus caryophyllaceus*	+	1
Hibbertia hypericoides	+	0.5
Hibbertia subvaginata	+	0.3
Hypocalymma robustum	+	0.8
**Hypochaeris glabra*	+	0.1
Hypolaena exsulca	+	0.3
Laxmannia ramosa subsp. *ramosa*	+	0.2
Lepidosperma apricola	+	0.3
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.4
Lomandra sericea	+	0.4
Lyginia barbata	+	0.5
Opercularia vaginata	+	
Patersonia occidentalis var. *occidentalis*	40	0.7
Phlebocarya ciliata	1	0.3
Pterostylis sanguinea	+	0.3
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Scaevola repens var. *repens*	+	0.3
**Sonchus oleraceus*	+	0.1
Stylidium androsaceum	+	0.2
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.3

**Ursinia anthemoides*	+	0.2
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	4	1.6

Site: SVB022
Described: BL **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397451mE; 6478983mN
Habitat: Plain, very gentle west slope
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia attenuata*, *Banksia menziesii*, *Banksia ilicifolia* and *Allocasuarina fraseriana* low woodland over *Xanthorrhoea preissii* sparse mid shrubland over *Scholtzia* aff. involucrata, *Eremaea pauciflora* var. *pauciflora*, *Hibbertia hypericoides* and *Calytrix flavescens* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* open mid herbland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 75%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Alexgeorgea nitens	+	0.1
Allocasuarina fraseriana	1	4
Austrostipa compressa	+	0.1
Banksia attenuata	15	5
Banksia ilicifolia	1	4
Banksia menziesii	20	6
Bossiaea eriocarpa	+	0.4
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	1	0.3
Conostephium preissii	+	0.3
Dampiera linearis	+	0.1
Dasypogon bromeliifolius	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	pr
Eremaea pauciflora var. *pauciflora*	2	0.8
Gastrolobium linearifolium	+	0.2
**Gladiolus caryophyllaceus*	+	0.3
Gompholobium confertum	+	0.2
Hibbertia aurea	+	0.3
Hibbertia huegelii	+	0.4
Hibbertia hypericoides	1	0.6
Hibbertia sericosepala	+	0.3
Hibbertia subvaginata	+	0.4
Hovea trisperma var. *trisperma*	+	0.3
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.7
**Hypochaeris glabra*	+	0.1
Jacksonia floribunda	+	1.2
Lepidosperma apricola	+	0.3
Lepidosperma apricola	+	
Leporella fimbriata	+	0.1
Leucopogon conostephioides	+	0.2
Leucopogon conostephioides	+	0.5
Lomandra caespitosa	+	0.2
Lomandra caespitosa	+	0.1
Lomandra hermaphrodita	+	0.2
Lomandra nigricans	+	0.3
Lomandra preissii	+	0.3

Lomandra sericea	+	0.3
Lyginia barbata	+	0.3
Patersonia occidentalis var. *occidentalis*	25	0.6
Petrophile linearis	+	0.5
Philotheca spicata	+	0.5
Phlebocarya ciliata	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	5	0.7
Stylidium saxifragoides	+	0.3
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.3
Tricoryne elatior	+	0.3
**Ursinia anthemoides*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea gracilis	+	0.4
Xanthorrhoea preissii	5	1.8
Xanthosia huegelii	+	0.1

Site: SVB023
Described: BL **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397478mE; 6478534mN
Habitat: Plain, very gentle south slope
Soil: Grey sand
Rock Type: None

Vegetation: *Corymbia calophylla* isolated mid trees over *Calytrix fraseri* Ellenbrook Form, *Verticordia nitens* and *Xanthorrhoea preissii* open mid shrubland over *Eremaea asterocarpa* subsp. *asterocarpa*, *Scholtzia* aff. involucrata and *Leucopogon conostephioides* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* and *Dasypogon bromeliifolius* open mid herbland over *Lyginia barbata* and *Lyginia imberbis* isolated low sedges
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
**Aira cupaniana*	+	0.2
Alexgeorgea nitens	+	0.2
Amphipogon turbinatus	+	0.2
Austrostipa compressa	+	0.3
Austrostipa compressa	+	0.1
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.3
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.6
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	+	0.2
Calytrix fraseri forma Ellenbrook	20	1.6
Corymbia calophylla	3	20
Dasypogon bromeliifolius	2	0.2
Daviesia physodes	+	
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.5
Eremaea asterocarpa subsp. *asterocarpa*	3	0.8
**Gladiolus caryophyllaceus*	+	0.6
Gompholobium scabrum	+	0.6
Hibbertia subvaginata	+	0.3
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.2
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lechenaultia floribunda	+	0.3
Lepidosperma apricola	+	0.3
Leucopogon conostephioides	1	0.5
Lomandra hermaphrodita	+	0.1
Lomandra sericea	+	0.3
Lyginia barbata	1	0.5
Lyginia imberbis	1	0.5
Patersonia occidentalis var. *occidentalis*	20	0.6
**Pentaschistis airoides*	+	0.1
Philotheca spicata	+	0.5
Phlebocarya ciliata	+	0.3

Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Regelia ciliata	+	
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	2	0.6
Stylidium androsaceum	+	0.1
Stylidium repens	+	0.1
Thysanotus thyrsoideus	+	0.4
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
Verticordia nitens	3	1.4
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	3	1.5

Site: SVB024
Described: BL **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 397233mE; 6479291mN
Habitat: Crest of dune, gentle SE slope, low
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* low woodland over *Adenanthos cygnorum* subsp. *cygnorum* sparse tall shrubland over *Beaufortia elegans* and *Allocasuarina humilis* mid shrubland over *Scholtzia* aff. involucrata, *Calytrix flavescens*, *Calytrix angulata* and *Calytrix fraseri* sparse low shrubland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	20	3.2
Alexgeorgea nitens	+	0.1
Allocasuarina humilis	4	1.3
Amphipogon turbinatus	+	0.4
Amphipogon turbinatus	+	0.3
Arnocrinum preissii	+	0.5
Astroloma xerophyllum	+	0.9
Austrostipa compressa	+	0.1
Banksia attenuata	2	5
Banksia menziesii	30	6
Beaufortia elegans	50	1.4
Boronia ramosa subsp. *anethifolia*	+	0.3
Bossiaea eriocarpa	+	0.4
Burchardia congesta	+	0.5
Calytrix angulata	2	0.4
Calytrix flavescens	2	0.3
Calytrix fraseri	2	0.2
Calytrix fraseri	+	0.4
Daviesia triflora	+	0.8
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eucalyptus todtiana	+	
**Gladiolus caryophyllaceus*	+	0.6
Hemiandra linearis	+	0.3
Hibbertia hypericoides	+	0.4
Hibbertia subvaginata	+	0.3
Jacksonia floribunda	+	0.6
Laxmannia squarrosa	+	0.3
Leptospermum spinescens	+	0.6
Leucopogon conostephioides	+	0.3
Leucopogon polymorphus	+	
Lomandra hermaphrodita	+	0.2
Lomandra sericea	+	0.3
Lomandra suaveolens	+	0.5
Lyginia imberbis	+	0.7
Lysinema pentapetalum	+	
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3

Podotheca gnaphalioides	+	0.1
Schoenus curvifolius	+	0.4
Scholtzia aff. involucrata EAG 5500	4	0.6
Stirlingia latifolia	+	0.7
Thelymitra campanulata	+	0.3
**Ursinia anthemoides*	+	0.2
Verticordia nitens	+	

Site: SVB025
Described: BL **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397328mE; 6479568mN
Habitat: Plain, very gentle SE slope
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* mid woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Calytrix fraseri* Ellenbrook Form and *Jacksonia sternbergiana* sparse mid shrubland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Alexgeorgea nitens	+	0.1
Allocasuarina fraseriana	+	
**Arctotheca calendula*	+	0.1
Austrostipa compressa	+	0.1
Bossiaea eriocarpa	+	0.4
**Briza maxima*	1	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.2
Calytrix fraseri forma Ellenbrook	2	1.3
**Carpobrotus edulis*	+	0.1
Centrolepis drummondiana	+	0.1
Corymbia calophylla	20	8
Dasypogon bromeliifolius	+	0.2
**Disa bracteata*	+	0.1
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.6
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus marginata subsp. *thalassica*	5	11
**Gladiolus caryophyllaceus*	+	0.4
Hibbertia subvaginata	+	0.2
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.7
**Hypochaeris glabra*	1	0.2
Jacksonia floribunda	+	0.3
Jacksonia sternbergiana	2	1.3
Lepidosperma apricola	+	0.3
Lepidosperma pubisquameum (flat form)	+	0.3
Levenhookia stipitata	+	0.1
Lomandra caespitosa	+	0.1
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra sericea	+	0.3
Lyginia barbata	+	0.4
Millotia tenuifolia var. *laevis*	+	0.1
Patersonia occidentalis var. *occidentalis*	+	0.4

**Pentaschistis airoides*	+	0.1
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Pterostylis sanguinea	+	0.2
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Siloxerus humifusus	+	0.1
Stylidium androsaceum	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.1
Waitzia suaveolens var. *suaveolens*	+	0.2
Xanthorrhoea preissii	10	2.5

Site: SVB026
Described: CvdB **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397707mE; 6479503mN
Habitat: Relatively flat sandplain, low
Soil: Grey brown loamy sand
Rock Type: None

Vegetation: *Corymbia calophylla* sparse mid woodland over *Banksia menziesii*, *Banksia attenuata* and *Nuytsia floribunda* sparse low woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Hibbertia hypericoides*, *Calytrix flavescens* and *Petrophile linearis* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* sparse low herbland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 65%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia stenoptera	+	0.3
**Aira cupaniana*	+	0.1
**Aira cupaniana*	+	0.1
Banksia attenuata	2	9
Banksia menziesii	6	12
Bossiaea eriocarpa	+	0.2
Calytrix flavescens	+	0.3
Conostylis juncea	+	0.2
Corymbia calophylla	3	14
Crassula colorata var. *colorata*	+	0.1
Dampiera linearis	+	0.3
Drosera erythrorhiza	+	pr
Drosera pallida	+	cr
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium confertum	+	0.7
Hibbertia huegelii	+	0.3
Hibbertia hypericoides	2	0.3
Hibbertia subvaginata	+	0.3
Hyalosperma cotula	+	0.2
Hypocalymma angustifolium	+	0.3
**Hypochaeris glabra*	+	0.2
Levenhookia stipitata	+	0.1
Lomandra hermaphrodita	+	0.2
Lomandra hermaphrodita	+	0.2
Nuytsia floribunda	out	9
Patersonia occidentalis var. *occidentalis*	2	0.5
Petrophile linearis	+	0.1
Philotheca spicata	+	0.2
Phyllangium paradoxum	+	0.1
Pyrorchis nigricans	+	pr
Stylidium androsaceum	+	0.3
Stylidium brunonianum	+	0.3
Stylidium saxifragoides	+	0.3
Stylidium schoenoides	+	0.2
Thysanotus thyrsoideus	+	0.2
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.2
Tricoryne humilis	+	0.2
**Ursinia anthemoides*	+	0.1

Xanthorrhoea preissii	12	1.7

Site: SVB028
Described: BL **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 396898mE; 6480470mN
Habitat: Plain, very gentle SE slope
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* low woodland over *Xanthorrhoea preissii* sparse mid shrubland over *Hibbertia hypericoides*, *Hibbertia subvaginata* and *Scholtzia* aff. involucrata open low shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	1.2
Alexgeorgea nitens	+	0.1
**Arctotheca calendula*	+	0.1
Arnocrinum preissii	+	0.3
Austrostipa compressa	+	0.2
Banksia attenuata	20	9
Banksia dallanneyi var. *dallanneyi*	+	0.1
Banksia menziesii	25	9
**Briza maxima*	+	0.3
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.2
Conostylis juncea	+	0.2
Corymbia calophylla	2	3
Dasypogon bromeliifolius	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.4
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
**Gladiolus caryophyllaceus*	+	0.6
Gonocarpus pithyoides	+	0.1
Hibbertia hypericoides	25	0.6
Hibbertia subvaginata	5	0.6
Hyalosperma cotula	+	0.1
Hypocalymma robustum	+	0.4
**Hypochaeris glabra*	1	0.1
**Isolepis marginata*	+	0.1
Lepidosperma apricola	+	0.3
Leucopogon conostephioides	+	0.3
Lomandra sericea	+	0.3
Lyginia barbata	+	0.2
Nuytsia floribunda	1	6
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.3
Philotheca spicata	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Pterostylis sanguinea	+	0.2

Pyrorchis nigricans	+	0.1
Rytidosperma acerosum	+	0.3
Scholtzia aff. involucrata EAG 5500	2	0.4
Stirlingia latifolia	+	0.8
Stylidium androsaceum	+	0.1
Stylidium araeophyllum	+	0.1
Stylidium repens	+	0.1
Thysanotus thyrsoideus	+	0.2
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
**Vulpia bromoides*	+	0.1
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.3
Xanthorrhoea preissii	8	1.6

Site: SVB029
Described: BL **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397752mE; 6480585mN
Habitat: Plain, very gentle SE slope
Soil: Grey sand
Rock Type: None
Vegetation: *Corymbia calophylla* sparse mid woodland over *Banksia attenuata* low woodland over *Xanthorrhoea preissii* sparse mid shrubland over *Patersonia occidentalis* var. *occidentalis* sparse mid herbland over *Hibbertia aurea* isolated low shrubs
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 75%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	1
**Aira cupaniana*	+	0.1
**Arctotheca calendula*	+	0.1
Austrostipa compressa	+	0.1
Banksia attenuata	30	6
Banksia menziesii	+	
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
**Bromus diandrus*	+	0.1
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Centrolepis drummondiana	+	0.1
Corymbia calophylla	4	13
Crassula colorata var. *colorata*	+	0.1
Dasypogon bromeliifolius	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	
**Gladiolus caryophyllaceus*	+	0.3
Gompholobium tomentosum	+	0.1
Hibbertia aurea	1	0.3
Hibbertia hypericoides	+	0.4
Hibbertia sericosepala	+	0.3
Hyalosperma cotula	+	0.1
**Hypochaeris glabra*	+	0.1
Levenhookia stipitata	+	0.1
Lobelia tenuior		
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra sericea	+	0.4
Lyginia barbata	+	0.3
Millotia tenuifolia var. *laevis*	+	0.1
Patersonia occidentalis var. *occidentalis*	4	0.6
**Pentaschistis airoides*	+	0.1
Petrophile linearis	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Quinetia urvillei	+	0.1
Schoenus curvifolius	+	0.1

Scholtzia aff. involucrata EAG 5500	+	0.3
Stylidium androsaceum	+	0.1
Stylidium schoenoides		
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.3
**Ursinia anthemoides*	+	0.1
**Vulpia bromoides*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	11	1.7

Site: SVB030
Described: BL **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 397772mE; 6480790mN
Habitat: Low dune, crest, gentle east slope
Soil: Grey sand
Rock Type: None
Vegetation: *Eucalyptus todtiana* isolated mid mallee trees over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Allocasuarina humilis* and *Jacksonia floribunda* open mid shrubland over *Scholtzia* aff. involucrata, *Hibbertia hypericoides*, *Eremaea pauciflora* var. *pauciflora* and *Calytrix angulata* sparse low shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.5
Acacia sessilis	+	0.7
Alexgeorgea nitens	+	0.1
Allocasuarina humilis	20	1.6
Amphipogon turbinatus	+	0.1
Anigozanthos humilis subsp. *humilis*	+	0.2
Arnocrinum preissii	+	0.3
Astroloma xerophyllum	+	0.3
Austrostipa compressa	+	0.1
Banksia attenuata	3	3
Banksia menziesii	10	5
Beaufortia elegans	+	1.2
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.4
**Bromus diandrus*	+	0.1
Caladenia flava subsp. *flava*	+	0.1
Calandrinia corrigioloides	+	0.1
Calytrix angulata	2	0.3
Calytrix flavescens	+	0.3
Calytrix fraseri forma Ellenbrook	+	0.4
**Carpobrotus edulis*	+	0.1
Conospermum stoechadis subsp. *stoechadis*	+	1
Conostephium minus	1	0.9
Conostephium preissii	+	0.4
Crassula colorata var. *colorata*	+	0.1
Dasypogon bromeliifolius	+	0.3
Desmocladus flexuosus	+	0.1
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.8
Eremaea pauciflora var. *pauciflora*	4	0.7
Eucalyptus todtiana	2	5
**Gladiolus caryophyllaceus*	+	0.4
Gompholobium tomentosum	+	0.2
Haemodorum spicatum	+	0.4
Hibbertia huegelii	+	0.4
Hibbertia hypericoides	7	0.7

Hibbertia subvaginata	1	0.3
Hyalosperma cotula	+	0.1
**Hypochaeris glabra*	+	0.1
Jacksonia floribunda	4	1.2
Leucopogon conostephioides	+	0.3
Levenhookia stipitata	+	0.1
Lomandra caespitosa	+	0.1
Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.3
Lyginia imberbis	+	0.3
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.3
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Scaevola repens var. repens	+	0.1
Scholtzia aff. involucrata EAG 5500	8	0.6
Stirlingia latifolia	1	0.7
Stylidium araeophyllum	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
**Wahlenbergia capensis*	+	0.1

Site: SVB031
Described: BL **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50396765mE; 6481548mN
Habitat: Plain, very gentle south slope
Soil: Grey sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Xanthorrhoea preissii* and *Jacksonia furcellata* sparse tall shrubland over **Ursinia anthemoides*, **Hypochaeris glabra* and **Erodium botrys* low herbland over **Briza maxima* and **Bromus diandrus* open low grassland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.1
**Briza maxima*	20	0.3
**Bromus diandrus*	1	0.2
Burchardia congesta	+	0.1
Caladenia flava subsp. *flava*	+	0.1
Corymbia calophylla	30	12
Crassula colorata var. *colorata*	+	0.1
**Ehrharta calycina*	+	0.3
**Erodium botrys*	10	0.2
**Gladiolus caryophyllaceus*	+	0.5
**Hypochaeris glabra*	20	0.2
Jacksonia sternbergiana	3	3.5
**Medicago sp.*	+	0.1
**Parentucellia latifolia*	+	
**Petrorhagia dubia*	+	
Podotheca gnaphalioides	1	0.2
**Romulea rosea*	+	0.2
**Trifolium subterraneum*	+	0.1
**Ursinia anthemoides*	20	0.4
Xanthorrhoea preissii	10	2.4

Site: SVB034
Described: CvdB **Date**: 22/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400951mE; 6484082mN
Habitat: Dune swale, rising gently to the west, low
Soil: Brown, grey medium grained sand
Rock Type: none

Vegetation: *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* sparse low woodland over *Allocasuarina humilis* and *Jacksonia floribunda* isolated mid shrubs over *Xanthorrhoea brunonis* and *Eremaea pauciflora* var. *pauciflora* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* sparse low herbland over *Lyginia barbata* and *Schoenus curvifolius* sparse low sedgeland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 45%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	1.1
Alexgeorgea nitens	+	0.1
Allocasuarina humilis	4	1.5
Banksia attenuata	8	7
Banksia ilicifolia	4	8
Banksia menziesii	4	7
Bossiaea eriocarpa	+	0.1
**Briza maxima*	+	0.3
Burchardia congesta	+	0.2
Caladenia sp.	+	0.3
Calytrix flavescens	+	0.3
Conostephium preissii	+	0.4
Conostylis juncea	+	0.2
Dasypogon bromeliifolius	+	0.2
Desmocladus flexuosus	+	0.2
Desmocladus flexuosus	+	0.2
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	3	0.6
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.7
Hibbertia aurea	+	0.4
Hibbertia sericosepala	+	0.3
Hibbertia subvaginata	+	0.4
Hovea pungens	+	0.3
**Hypochaeris glabra*	+	0.2
Hypolaena exsulca	+	0.3
Jacksonia floribunda	+	1.5
Lepidosperma pubisquameum (flat form)	+	0.3
Leptomeria cunninghamii	+	0.5
Leucopogon sprengelioides	+	0.3
Lyginia barbata	3	0.3
Patersonia occidentalis var. *occidentalis*	11	0.5
Petrophile linearis	+	0.3
Philotheca spicata	+	0.3
Phlebocarya ciliata	+	0.3
Pithocarpa pulchella var. *pulchella*	+	0.3
Podotheca chrysantha	+	0.2

**Rubus laudatus*	+	0.3
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	+	0.3
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.4
Tricoryne elatior	+	0.3
**Ursinia anthemoides*	+	0.1
Xanthorrhoea brunonis	9	1
Xanthorrhoea brunonis	3	1

Site: SVB035
Described: CvdB **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400231mE: 6484488mN
Habitat: slight rise on the edge of dampland
Soil: grey dark brown sand
Rock Type: None

Vegetation: *Corymbia calophylla* sparse mid woodland over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Macrozamia fraseri* and *Jacksonia furcellata* isolated tall shrubs over *Xanthorrhoea brunonis* sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* and *Dasypogon bromeliifolius* open low herbland

Condition: Very good- good
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Alexgeorgea nitens	+	0.1
Aotus procumbens	+	0.3
Avena barbata	+	0.8
Banksia attenuata	+	0.3
Banksia menziesii	out	7
**Briza maxima*	+	0.3
Burchardia congesta	+	0.2
Conostephium preissii	+	0.3
Corymbia calophylla	18	13
Dasypogon bromeliifolius	4	0.6
Diuris magnifica	+	0.4
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.2
**Ehrharta longiflora*	+	0.2
**Gladiolus caryophyllaceus*	+	0.6
Haemodorum sparsiflorum	+	0.5
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	+	pr
Jacksonia furcellata	+	2.3
Lagenophora huegelii	+	pr
Lepidosperma pubisquameum (flat form)	+	0.1
Lomandra preissii	+	0.4
**Lysimachia arvensis*	+	0.1
Macrozamia fraseri	out	1.4
Patersonia occidentalis var. *occidentalis*	16	0.6
Pterostylis vittata	+	0.1
Pyrorchis nigricans	+	0.2
**Sonchus oleraceus*	+	0.2
Stylidium androsaceum	+	0.3
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.4
**Urospermum picroides*	+	0.3
**Ursinia anthemoides*	+	0.1
Xanthorrhoea brunonis	7	1

Site: SVB036
Described: CvdB **Date**: 23/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 400246mE; 6484775mN
Habitat: Top of low rise, relatively flat, upper
Soil: Grey brown medium grained sand
Rock Type: None

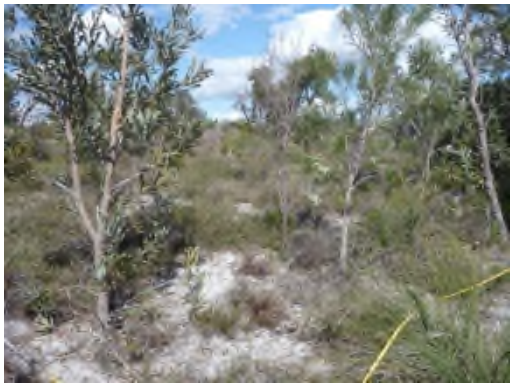
Vegetation: *Eucalyptus todtiana* isolated mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* sparse low woodland over *Macrozamia fraseri*, *Adenanthos cygnorum* subsp. *cygnorum* and *Jacksonia floribunda* isolated tall shrubs over *Hibbertia hypericoides*, *Eremaea pauciflora* var. *pauciflora* and *Scholtzia* aff. involucrata sparse low shrubland over *Lyginia barbata* sparse low sedgeland
Condition: Excellent - very good
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	+	3.5
Alexgeorgea nitens	+	0.2
Amphipogon turbinatus	+	0.3
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Banksia attenuata	6	8
Banksia menziesii	5	7
Boronia ramosa subsp. *anethifolia*	+	0.2
Bossiaea eriocarpa	+	0.2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Conostephium preissii	+	0.5
Conostylis aculeata subsp. *cygnorum*	+	0.2
Dampiera linearis	+	0.3
Daviesia triflora	+	0.4
Desmocladus flexuosus	+	0.2
Diuris magnifica	+	0.2
Drosera erythrorhiza	+	pr
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	2	0.3
Eucalyptus todtiana	+	7
**Gladiolus caryophyllaceus*	+	0.4
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium tomentosum	+	0.3
Haemodorum sparsiflorum	+	0.5
Hibbertia hypericoides	8	0.5
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	+	pr
**Isolepis marginata*	+	0.1
Jacksonia floribunda	+	1.6
Lomandra micrantha	+	0.4
**Lupinus cosentinii*	+	0.1
Lyginia barbata	1	0.4
Lyginia barbata	1	0.4
Macrozamia fraseri	+	1.5
Patersonia occidentalis var. *occidentalis*	+	0.5

Persoonia saccata	+	0.3
Petrophile linearis	+	0.3
Philotheca spicata	+	0.6
Phlebocarya ciliata	+	0.2
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
**Rubus laudatus*	+	0.2
Scaevola repens var. repens	+	0.2
Scholtzia aff. involucrata EAG 5500	1	0.3
Stylidium brunonianum	+	0.3
Stylidium repens	+	0.1
Stylidium saxifragoides	+	0.3
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: SVB037
Described: CvdB **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400776mE; 6484575mN
Habitat: Dune slope near crest, moderately sloping west, upper
Soil: Grey brown medium grained sand
Rock Type: None



Vegetation: *Eucalyptus todtiana* Isolated mid mallee trees over *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Adenanthos cygnorum* subsp. *cygnorum* isolated tall shrubs over *Xanthorrhoea preissii* isolated mid shrubs over *Scholtzia* aff. involucrata, *Hibbertia hypericoides* and *Astroloma xerophyllum* open low shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	2	4
Alexgeorgea nitens	+	0.1
Astroloma xerophyllum	1	0.5
Austrostipa compressa	+	0.2
Banksia attenuata	4	8
Banksia menziesii	3	8
Boronia ramosa subsp. *anethifolia*	+	0.1
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.3
Conostephium preissii	+	0.3
Conostylis teretiuscula	+	0.3
Daviesia triflora	+	0.4
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	+	0.4
Eucalyptus todtiana	2	7
Gastrolobium capitatum	+	0.5
**Gladiolus caryophyllaceus*	+	0.7
Gompholobium tomentosum	+	0.3
Gonocarpus pithyoides	+	0.2
Hibbertia hypericoides	2	1
Hibbertia subvaginata	+	0.3
**Hypochaeris glabra*	+	0.2
Jacksonia floribunda	+	1.3
Laxmannia squarrosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.3
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.3
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
Schoenus curvifolius	+	0.2
Scholtzia aff. involucrata EAG 5500	25	0.4
Stylidium brunonianum	+	0.2
Stylidium diuroides subsp. paucifoliatum	+	0.3
Stylidium repens	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1

**Ursinia anthemoides*	+	0.1
**Wahlenbergia capensis*	+	0.1
Xanthorrhoea preissii	+	1

Site: SVB038
Described: CvdB **Date**: 22/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400912mE; 6484936mN
Habitat: Dune slope, moderately sloping east, mid-slop
Soil: Grey, brown medium grained sand
Rock Type: None

Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Jacksonia floribunda*, *Conospermum stoechadis* subsp. *stoechadis* and *Regelia inops* isolated tall shrubs over *Eremaea pauciflora* var. *pauciflora*, *Scholtzia* aff. involucrata, *Astroloma xerophyllum*, *Hibbertia subvaginata* and *Melaleuca seriata* sparse low shrubland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *glaberrima*	+	1.4
**Aira cupaniana*	+	0.1
Amphipogon turbinatus	+	0.2
Anigozanthos ? *manglesii*	+	0.2
Astroloma xerophyllum	2	0.3
Austrostipa compressa	+	0.2
Banksia attenuata	2	5
Banksia menziesii	4	5
Boronia ramosa subsp. *anethifolia*	+	0.2
Bossiaea eriocarpa	+	0.4
**Briza maxima*	+	0.2
Cassytha pomiformis	+	cr
Conospermum acerosum subsp. *acerosum*	+	0.3
Conospermum stoechadis subsp. *stoechadis*	out	2.5
Conostephium preissii	+	0.4
Conostylis aculeata subsp. *aculeata*	+	0.3
Crassula colorata var. *colorata*	+	0.2
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	8	0.6
**Gladiolus caryophyllaceus*	+	0.2
**Gladiolus caryophyllaceus*	+	0.96
Gompholobium tomentosum	+	0.2
Gonocarpus pithyoides	+	0.2
Haemodorum spicatum	+	0.4
Hibbertia hypericoides	+	0.4
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	+	0.3
**Isolepis marginata*	+	0.1
Jacksonia floribunda	+	2.4
Laxmannia squarrosa	+	0.2
Lechenaultia floribunda	+	0.3
Lyginia barbata	+	0.4
Melaleuca seriata	+	0.6
Patersonia occidentalis var. *occidentalis*	+	0.5
Petrophile linearis	+	0.2
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
Regelia inops	+	2.5

Schoenus curvifolius	+	0.4
Scholtzia aff. involucrata EAG 5500	5	0.4
Stirlingia latifolia	+	0.5
Stylidium brunonianum	+	0.3
Stylidium repens	+	0.3
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
**Wahlenbergia capensis*	+	0.1

Site:

Described: BL **Date**: 25/09/2014 **Type:** Quadrat 10x10 m

MGA Zone: 50 401734mE; 6485445mN

Habitat: High dune, steep NW slope, upper slope

Soil: Grey sand

Rock Type: None

Vegetation: *Banksia attenuata* and *Banksia menziesii* low woodland over *Eucalyptus todtiana* sparse mid mallee woodland over *Adenanthos cygnorum* subsp. *cygnorum* sparse tall shrubland over *Eremaea pauciflora* var. *pauciflora* sparse mid shrubland over *Hibbertia hypericoides*, *Calytrix flavescens* and *Bossiaea eriocarpa* sparse low shrubland over *Mesomelaena pseudostygia* isolated low sedges.

Condition: Excellent

Fire Age: >10 years

Notes: Leaf Litter: 80%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover	Height
Acacia pulchella var. *pulchella*	+	0.6
Acacia sessilis	+	0.4
Adenanthos cygnorum subsp. *cygnorum*	7	3.5
Anigozanthos humilis subsp. *humilis*	+	0.1
Arnocrinum preissii	+	0.3
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Banksia attenuata	20	6
Banksia menziesii	3	5
Beaufortia elegans	+	0.9
Boronia ramosa subsp. *anethifolia*	+	0.3
Bossiaea eriocarpa	1	0.5
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	2	0.3
Calytrix fraseri forma Ellenbrook	+	0.6
Cassytha racemosa forma pilosa	+	cr
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.4
Corynotheca micrantha	+	0.2
Dasypogon bromeliifolius	+	0.2
Desmocladus flexuosus	+	0.1
Drosera pallida	+	pr
Eremaea pauciflora var. *pauciflora*	20	1.2
Eucalyptus todtiana	8	5
**Gladiolus caryophyllaceus*	+	0.5
Gompholobium tomentosum	+	0.4
Hibbertia huegelii	+	0.5
Hibbertia hypericoides	15	0.6
Hibbertia subvaginata	+	0.3
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lomandra hermaphrodita	+	0.2
Lomandra nigricans	+	0.2
Lyginia barbata	+	0.3
Mesomelaena pseudostygia	1	0.7

Patersonia occidentalis var. *occidentalis*	+	0.7
Petrophile linearis	+	0.3
Philotheca spicata	+	0.6
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Rytidosperma acerosum	+	0.2
Stirlingia latifolia	+	1
Stylidium araeophyllum	+	0.1
Stylidium repens	+	0.1
Stylidium rigidulum	+	0.1
Stylidium saxifragoides	+	0.3
Synaphea spinulosa subsp. *spinulosa*	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
Tricoryne elatior	+	0.3
**Ursinia anthemoides*	+	0.2
Wahlenbergia preissii	+	0.1
Xanthosia huegelii	+	0.1

Site: SVB040
Described: BL **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402133mE; 6485710mN
Habitat: Dampland, open depression, very gentle SE slope, low
Soil: Grey black peaty clayey sand
Rock Type: None
Vegetation: *Banksia littoralis* and *Melaleuca preissiana* low woodland over *Astartea scoparia* and *Kunzea glabrescens* open tall shrubland over *Meeboldina scariosa* sparse tall rushland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 90%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	40	2.2
Banksia ilicifolia	+	
Banksia littoralis	40	7
Baumea articulata	+	1
Goodenia pulchella	+	0.1
**Hypochaeris glabra*	+	0.1
Jacksonia furcellata	+	1.2
Kunzea glabrescens	3	3
**Leptospermum laevigatum*	+	
Meeboldina scariosa	+	
Melaleuca preissiana	2	6
Melaleuca teretifolia	+	1.6
Pericalymma crassipes	+	1
Prasophyllum parvifolium	+	0.3
Pterostylis recurva	+	0.4
Schoenus caespititius	20	1.5
Thelymitra vulgaris	+	0.2

Site: SVB041
Described: BL **Date**: 19/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 402267mE; 6485836mN
Habitat: Dampland/ open depression, very gentle SE slope, low
Soil: Grey black clayey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* low woodland over *Astartea scoparia* open tall shrubland over *Baumea articulata* sparse tall sedgeland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.1
Banksia littoralis	+	
Baumea articulata	2	1
Centella asiatica	+	0.1
Chamaescilla sp.	+	0.1
Drosera glanduligera	+	0.1
Eucalyptus rudis subsp. *rudis*	+	
Goodenia pulchella	+	0.1
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lobelia anceps	+	0.1
**Lotus subbiflorus*	+	0.1
**Lysimachia arvensis*	+	0.1
Melaleuca preissiana	30	7
**Pelargonium capitatum*	+	0.1
Podotheca gnaphalioides	+	0.1
Poranthera moorokatta	+	0.1
**Rorippa nasturtium-aquaticum*	30	2.5
Thelymitra vulgaris	+	0.2
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: SVB042
Described: CvdB **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402571mE; 6485919 mN
Habitat: Floodplain / edge of dampland
Soil: Dark brown, white sandy clay
Rock Type: None
Vegetation: *Melaleuca preissiana* isolated mid trees over *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* sparse low woodland over *Hypocalymma angustifolium* and *Xanthorrhoea preissii* mid shrubland
Condition: Very good - excellent
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Austrostipa compressa	+	0.1
Banksia attenuata	1	6
Banksia attenuata	3	6
Banksia ilicifolia	+	4
Cassytha pomiformis	+	cr
Dasypogon bromeliifolius	+	0.2
Euchilopsis linearis	+	0.3
Hibbertia subvaginata	+	0.4
Hypocalymma angustifolium	65	1.5
**Hypochaeris glabra*	+	0.2
Lepidosperma striatum	+	0.4
Melaleuca preissiana	+	9
Pericalymma ellipticum var. *floridum*	1	0.2
Phyllangium paradoxum	+	0.1
Stylidium repens	+	0.2
**Ursinia anthemoides*	+	0.1
Xanthorrhoea brunonis	+	1.5

Site: SVB043
Described: BL **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402889mE; 6485929mN
Habitat: undulating plain, very gentle SE slope
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Kunzea glabrescens* isolated tall shrubs over *Hibbertia hypericoides*, *Scholtzia* aff. involucrata, *Beaufortia elegans* and *Hibbertia subvaginata* sparse low shrubland over **Ursinia anthemoides* and **Hypochaeris glabra* sparse low herbland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Anigozanthos humilis subsp. *humilis*	+	0.3
Austrostipa compressa	+	0.2
Banksia attenuata	15	7
Banksia menziesii	1	4
Beaufortia elegans	2	0.4
Bossiaea eriocarpa	+	0.3
**Bromus diandrus*	+	0.2
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	+	0.5
**Gladiolus caryophyllaceus*	+	0.2
Hibbertia hypericoides	3	0.6
Hibbertia subvaginata	1	0.3
**Hypochaeris glabra*	2	0.2
Kunzea glabrescens	1	3.5
Leporella fimbriata	+	0.1
Lomandra hermaphrodita	+	0.2
Millotia myosotidifolia	+	0.1
Patersonia occidentalis var. *occidentalis*	+	0.3
Philotheca spicata	+	1.1
Podotheca gnaphalioides	+	0.2
Poranthera moorokatta	+	0.1
Pyrorchis nigricans	+	0.1
Rytidosperma acerosum	+	0.2
Scholtzia aff. involucrata EAG 5500	6	0.8
Stylidium androsaceum	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	5	0.3
Wahlenbergia preissii	+	0.2
**Watsonia meriana* var. *meriana*	+	0.8

Site: SVB044
Described: BL **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402881mE; 6486159mN
Habitat: Wetland, Low lying, open depression, very gently N slope
Soil: Grey black peaty sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis*, *Melaleuca preissiana* and *Melaleuca rhaphiophylla* low woodland over *Astartea scoparia* closed tall shrubland over *Meeboldina scariosa* sparse tall rushland and *Baumea articulata* sparse tall sedgeland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 80%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	90	2.5
Baumea articulata	2	1.5
Centella asiatica	+	0.1
Eucalyptus rudis subsp. *rudis*	15	7
**Hypochaeris glabra*	+	0.1
Meeboldina scariosa	3	1.4
Meeboldina scariosa	3	1.4
Melaleuca lateritia	+	1.5
Melaleuca preissiana	10	5
Melaleuca rhaphiophylla	10	6
Thelymitra graminea	+	0.3
Thelymitra vulgaris	+	0.2
Trachymene pilosa	+	0.1

Site: SVB045
Described: BL **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402766mE; 6486301mN
Habitat: Dampland, open depression, very gentle slope to N, low
Soil: Grey peaty sand
Rock Type: None
Vegetation: *Pericalymma crassipes* and *Astartea scoparia* closed mid shrubland over *Schoenus caespititius* open tall sedgeland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 90%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Astartea scoparia	60	1
Baumea articulata	+	0.4
Calothamnus lateralis	+	
Eutaxia virgata	+	0.4
**Hypochaeris glabra*	+	0.1
Melaleuca lateritia	+	0.6
Melaleuca teretifolia	+	1.3
Pericalymma crassipes	25	1.6
Phyllangium paradoxum	+	0.1
**Pinus radiata*	+	
Podotheca gnaphalioides	+	0.1
Schoenus caespititius	25	1
Thelymitra vulgaris	+	0.2
Trachymene pilosa	+	0.1

Site: SVB046
Described: BL **Date**: 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403040mE; 6486307mN
Habitat: Undulating plain, gentle slope to SE
Soil: Grey black sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Taxandria linearifolia* and *Xanthorrhoea preissii* sparse tall shrubland over *Xanthorrhoea brunonis* isolated low shrubs
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 90%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.2
**Arctotheca calendula*	+	0.2
Astartea scoparia	+	0.9
Austrostipa compressa	+	0.4
Banksia ilicifolia	+	4.5
Briza minor	+	0.2
Caladenia flava subsp. *flava*	+	0.2
**Carpobrotus edulis*	+	0.1
Chamaescilla corymbosa	+	0.1
Corymbia calophylla	35	20
Daucus glochidiatus	+	0.2
Dielsia stenostachya	+	0.3
Diuris tinkeri	+	0.3
Drosera macrantha	+	cr
Eriochilus dilatatus subsp. *dilatatus*	+	0.2
Eucalyptus marginata subsp. *thalassica*	1	4
Hibbertia subvaginata	+	0.1
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lagenophora huegelii	+	0.2
Lobelia tenuior	+	0.1
Lomandra preissii	+	0.4
Lomandra suaveolens	+	0.4
**Lysimachia arvensis*	+	0.1
Macrozamia fraseri	+	0.1
Pterostylis sanguinea	+	0.3
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.2
Rytidosperma acerosum	+	0.2
**Sonchus oleraceus*	+	0.1
Taxandria linearifolia	4	3.5
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.2
**Vulpia bromoides*	+	0.2
Wahlenbergia preissii	+	0.1
Xanthorrhoea brunonis	2	0.6
Xanthorrhoea preissii	12	3

Site: SVB047
Described: CvdB **Date**: 17/09/2014 **Type:** Quadrat 10x10m
MGA Zone: 50 402959mE; 6486562mN
Habitat: Gentle slope towards east, just off dune crest, middle slope
Soil: white brown grey medium grained sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* low woodland over *Scholtzia* aff. involucrata sparse mid shrubland over *Hibbertia subvaginata* and *Beaufortia elegans* sparse low shrubland over **Hypochaeris glabra* and **Ursinia anthemoides* isolated low herbs
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.3
Austrostipa compressa	+	0.2
Banksia attenuata	7	7
Banksia menziesii	16	5.5
Beaufortia elegans	+	0.8
Caladenia flava subsp. *flava*	+	0.1
Calandrinia liniflora	+	0.1
Desmocladus flexuosus	+	0.2
Drosera macrantha	+	cr
**Ehrharta brevifolia* var. *cuspidata*	+	0.2
**Ehrharta longiflora*	+	0.2
Gompholobium tomentosum	+	0.3
Hibbertia hypericoides	+	0.3
Hibbertia subvaginata	2	0.4
Homalosciadium homalocarpum	+	0.1
**Hypochaeris glabra*	+	0.2
Lagenophora huegelii	+	0.1
Macrozamia fraseri	+	1.2
Millotia myosotidifolia	+	0.1
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
**Rubus laudatus*	+	0.2
Scholtzia aff. involucrata EAG 5500	4	1.6
Stylidium rigidulum	+	0.2
Thysanotus manglesianus	+	cr
**Ursinia anthemoides*	+	0.2

Site: SVB048
Described: CvdB **Date**: 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403044mE; 6486779mN
Habitat: Dampland, very gently sloping east, low
Soil: Black, dark brown sandy clay, organic
Rock Type: None
Vegetation: *Melaleuca preissiana* sparse low woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Astartea scoparia* and *Taxandria linearifolia* sparse mid shrubland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Apium annuum	+	0.1
Astartea scoparia	2	2.5
Drosera macrantha	+	cr
Homalosciadium homalocarpum	+	0.1
Hypocalymma angustifolium	+	0.4
**Hypochaeris glabra*	+	0.2
Lagenophora huegelii	+	0.1
Levenhookia stipitata	+	0.1
**Lysimachia arvensis*	+	0.1
Melaleuca preissiana	9	8
Microtis sp.	+	0.3
Podotheca gnaphalioides	+	0.2
Poranthera microphylla	+	0.1
Rhodanthe citrina	+	0.1
**Sonchus oleraceus*	+	0.2
Taxandria linearifolia	+	1
Tricoryne humilis	+	0.2
**Ursinia anthemoides*	+	0.1
Xanthorrhoea preissii	18	4

Site: SVB049 – Reference/Control Site (Weeds)
Described: CvdB **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403132mE; 6487053mN
Habitat: Dune crest on eastern side, gently sloping east, upper
Soil: Light grey, brown medium grained sand
Rock Type: None
Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Jacksonia furcellata* isolated tall shrubs over *Scholtzia* aff. involucrata and *Beaufortia elegans* sparse mid shrubland over *Eremaea pauciflora* var. *pauciflora*, *Hibbertia subvaginata* and *Hibbertia hypericoides* sparse low shrubland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astroloma xerophyllum	+	0.4
Austrostipa compressa	+	0.2
Banksia attenuata	6	6
Banksia menziesii	8	10
Beaufortia elegans	1	1.1
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	+	0.4
Conostylis aculeata subsp. *aculeata*	+	0.3
Crassula colorata var. *colorata*	+	0.1
Croninia kingiana	+	0.4
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	6	0.5
**Gladiolus caryophyllaceus*	+	0.6
Hibbertia hypericoides	3	0.5
Hibbertia subvaginata	1	0.5
**Hypochaeris glabra*	+	0.2
Jacksonia furcellata	1	3
Lagenophora huegelii	+	0.2
Leporella sp.	+	0.01
Leucopogon sprengelioides	+	0.4
Lomandra hermaphrodita	+	0.2
Macrozamia fraseri	+	3
Millotia myosotidifolia	+	0.1
Patersonia occidentalis var. *occidentalis*	+	0.3
Petrophile linearis	+	0.3
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.2
Podotheca gnaphalioides	+	0.2
Pyrorchis nigricans	+	0.1
Scholtzia aff. involucrata EAG 5500	17	2.2
Stylidium brunonianum	+	0.3
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.3

Site: SVB050
Described: CvdB **Date**: 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 402679mE; 6486623mN
Habitat: Dampland, relatively flat
Soil: Organic moist dark brown, black sandy clay
Rock Type: None
Vegetation: *Pericalymma ellipticum* var. *floridum*, *Astartea scoparia*, *Melaleuca teretifolia* and *Melaleuca lateritia* closed mid shrubland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Aphelia cyperoides	+	0.1
Astartea scoparia	30	1.7
Austrostipa variabilis	+	0.5
**Briza maxima*	+	0.3
Cassytha glabella	+	cr
Centrolepis aristata	+	0.1
**Gladiolus caryophyllaceus*	+	0.4
Hibbertia stellaris	+	0.2
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.4
Levenhookia stipitata	+	0.2
**Lysimachia arvensis*	+	0.2
Melaleuca lateritia	1	1
Melaleuca teretifolia	2	1.6
Pericalymma ellipticum var. *floridum*	55	1.1
Podotheca gnaphalioides	+	0.2
Trachymene pilosa	+	0.1

Site: SVB051
Described: CvdB **Date**: 17/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403076mE; 6487384mN
Habitat: Dampland, relatively flat wetland depression, low
Soil: Organic, moist, dark brown clay
Rock Type: None
Vegetation: *Melaleuca preissiana* and *Banksia littoralis* (outside) open low forest over *Melaleuca lateritia* and *Melaleuca teretifolia* sparse mid shrubland over *Schoenus caespititius* sparse mid sedgeland
Condition: Very Good
Fire Age: >10 years
Notes: Leaf Litter: 45%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Banksia littoralis	+	4
Caladenia sp.	+	0.1
Desmocladus flexuosus	+	0.1
**Galium murale*	+	0.1
Hibbertia subvaginata	+	0.4
**Hypochaeris glabra*	+	0.1
**Hypochaeris radicata*	+	pr
Lagenophora huegelii	+	0.1
**Lysimachia arvensis*	+	0.1
Melaleuca lateritia	1	1.4
Melaleuca preissiana	60	8
Melaleuca teretifolia	1	1.3
Pterostylis vittata	+	0.1
Rhodanthe citrina	+	0.2
Schoenus caespititius	12	0.5
Trachymene pilosa	+	0.2

Site: SVB052
Described: CvdB **Date**: 18/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403306mE; 6487373mN
Habitat: Dampland, low wetland depression, relatively flat, low
Soil: Dark brown, black moist organic clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca preissiana* sparse low woodland over *Astartea scoparia* and *Melaleuca teretifolia* mid shrubland over *Baumea articulata* sparse tall sedgeland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: >70%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Astartea scoparia	70	2.5
Baumea articulata	5	1.2
Caladenia paludosa	+	0.1
Caladenia arenicola		
Cassytha glabella	+	cr
Eucalyptus rudis subsp. *rudis*	2	12
**Hypochaeris glabra*	+	0.1
Lagenophora huegelii	+	0.2
Lobelia anceps	+	0.2
**Lysimachia arvensis*	+	0.1
Melaleuca preissiana	7	8
Melaleuca teretifolia	+	1.6
Ornduffia albiflora	+	0.1
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.2
Trachymene pilosa	+	0.2

Site: SVB053 – Reference/Control Site (no weeds)
Described: CvdB **Date**: 17/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403142mE; 6487319mN
Habitat: Dampland, flat depression, low
Soil: Dark brown clay (peat?)
Rock Type: None
Vegetation: *Banksia littoralis* and *Melaleuca preissiana* sparse low woodland over *Astartea scoparia*, *Hypocalymma angustifolium*, *Melaleuca teretifolia* and *Melaleuca lateritia* closed tall shrubland
Condition: Excellent
Fire Age: >10 yrears
Notes: Leaf Litter: 100%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia saligna	+	10
Astartea scoparia	75	3
Banksia littoralis	3	9
Baumea articulata	+	1
Cassytha glabella	+	cr
Eucalyptus rudis subsp. *rudis*	+	1.3
Gastrolobium obovatum	+	2.2
Hypocalymma angustifolium	10	3
Melaleuca lateritia	1	2
Melaleuca preissiana	1	3
Melaleuca teretifolia	2	3

Site: SVB054
Described: BL **Date**: 18/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403502mE; 6487471mN
Habitat: Upperslope of dune, moderate slope to SE
Soil: Grey sand
Rock Type: None

Vegetation: *Eucalyptus todtiana* sparse mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* sparse low woodland over *Eremaea pauciflora* var. *pauciflora*, *Beaufortia elegans*, *Macrozamia fraseri* and *Scholtzia* aff. involucrata sparse mid shrubland over *Hibbertia hypericoides* and *Calytrix flavescens* sparse low shrubland over *Patersonia occidentalis* var. *occidentalis* and **Ursinia anthemoides* sparse low herbland

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.3
Adenanthos cygnorum subsp. *cygnorum*	+	0.1
Alexgeorgea nitens	+	0.1
**Arctotheca calendula*	+	0.1
Astroloma xerophyllum	+	0.6
Austrostipa compressa	+	0.2
Banksia attenuata	6	6
Banksia menziesii	2	6
Beaufortia elegans	1	1.4
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.1
Calytrix flavescens	1	0.3
**Carpobrotus edulis*	+	0.1
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.4
Conostylis aculeata subsp. *cygnorum*	+	0.3
Crassula colorata var. *colorata*	+	0.1
Dasypogon bromeliifolius	+	0.3
Desmocladus flexuosus	2	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	4	1.2
Eucalyptus todtiana	10	5
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium tomentosum	+	0.7
Hibbertia hypericoides	7	0.8
Hibbertia subvaginata	+	0.3
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Jacksonia furcellata	+	2
Leporella fimbriata	+	0.1
Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.4
Macrozamia fraseri	1	1.7
Millotia myosotidifolia	+	

Nuytsia floribunda	1	6
Patersonia occidentalis var. *occidentalis*	1	0.4
Petrophile linearis	+	0.3
Philotheca spicata	+	0.2
Podotheca chrysantha	+	0.2
Podotheca gnaphalioides	+	0.1
Rytidosperma acerosum	+	0.3
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	1	1.5
Stylidium repens	+	0.1
Stylidium rigidulum	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	2	0.4
**Wahlenbergia capensis*	+	0.1

Site: SVB055
Described: BL **Date**: 17/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403759mE; E6487512mN
Habitat: Open depression, gentle slope to NE, low
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia ilicifolia* sparse mid woodland over *Banksia attenuata* and *Banksia menziesii* low woodland over *Xanthorrhoea brunonis* closed mid shrubland over *Dasypogon bromeliifolius* sparse low herbland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Allocasuarina fraseriana	out	
Banksia attenuata	30	8
Banksia ilicifolia	3	12
Banksia menziesii	4	7
Bossiaea sp. Waroona (B.J. Keighery & N. Gibson 229)	+	0.1
**Briza maxima*	+	0.3
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.2
Conostylis juncea	+	0.2
Dasypogon bromeliifolius	10	0.2
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
**Ehrharta calycina*	+	0.3
Eremaea pauciflora var. *pauciflora*	+	0.7
**Gladiolus caryophyllaceus*	+	0.6
Hibbertia hypericoides	+	0.5
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lagenophora huegelii	+	0.2
Leporella fimbriata	+	0.1
**Lotus subbiflorus*	+	0.1
Patersonia occidentalis var. *occidentalis*	+	0.4
Petrophile linearis	+	0.5
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
**Romulea rosea*	+	0.2
**Stellaria pallida*	+	0.1
Trachymene pilosa	+	0.2
Tricoryne elatior	+	0.5
**Ursinia anthemoides*	+	0.2
Xanthorrhoea brunonis	90	1.2

Site: SVB056
Described: BL **Date**: 17/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 403727mE; 6487192mN
Habitat: Dampland, gentle slope to SE, low
Soil: Grey-black peaty-sand
Rock Type: None
Vegetation: *Melaleuca preissiana* mid woodland over *Banksia littoralis* sparse low woodland over *Xanthorrhoea preissii* and *Taxandria linearifolia* open tall shrubland over *Hypocalymma angustifolium* sparse low shrubland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover	Height
**Aira cupaniana*	+	0.1
Apium annuum	+	0.1
**Arctotheca calendula*	+	0.1
Astartea scoparia	+	1.2
Banksia ilicifolia	+	
Banksia littoralis	3	7
Baumea juncea	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.1
Cassytha racemosa forma pilosa	+	
Corymbia calophylla	+	
Dielsia stenostachya	+	0.2
Drosera glanduligera	+	0.1
Drosera macrantha	+	cr
Elythranthera brunonis	+	0.2
Hypocalymma angustifolium	3	0.9
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Lagenophora huegelii	+	0.1
Lepidosperma striatum	+	0.8
Leucopogon australis	+	1.5
**Lysimachia arvensis*	+	0.1
Melaleuca preissiana	28	10
Millotia tenuifolia var. *laevis*	+	0.1
Paracaleana nigrita	+	0.1
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Poranthera moorokatta	+	0.1
Prasophyllum fimbria	+	0.6
Pterostylis sanguinea	+	0.1
Rhodanthe citrina	+	0.1
Rytidosperma acerosum	+	0.2
Siloxerus humifusus	+	0.1
**Solanum nigrum*	+	0.1
**Sonchus oleraceus*	+	0.1
Stylidium androsaceum	+	0.1
Taxandria linearifolia	1	2
Thysanotus sp.	+	0.1
Trachymene pilosa	+	0.1

**Urospermum picroides*	+	0.3
**Ursinia anthemoides*	+	0.2
**Vulpia* sp.	+	0.1
**Wahlenbergia capensis*	+	0.1
Wahlenbergia preissii	+	0.1
Xanthorrhoea preissii	30	3.5

Site: SVB057
Described: BL **Date**: 17/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403394mE; 6487655mN
Habitat: Upperslope of dune, slope moderate to the NE
Soil: Grey sand
Rock Type: None
Vegetation: *Banksia menziesii*, *Banksia attenuata* and *Nuytsia floribunda* low woodland over *Scholtzia* aff. involucrata, *Beaufortia elegans* and *Acacia pulchella* var. *pulchella* isolated mid shrubs over *Eremaea pauciflora* var. *pauciflora*, *Hibbertia hypericoides* and *Hibbertia subvaginata* sparse low shrubland over *Patersonia occidentalis* var. *occidentalis* isolated low herbs
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia huegelii	+	0.3
Acacia pulchella var. *pulchella*	+	2
Alexgeorgea nitens	+	0.1
Anigozanthos humilis subsp. *humilis*	+	0.3
**Arctotheca calendula*	+	0.3
Arnocrinum preissii	+	0.4
Astroloma xerophyllum	+	0.6
Austrostipa compressa	+	0.2
Austrostipa macalpinei	+	0.1
Banksia attenuata	20	6
Banksia menziesii	6	7
Beaufortia elegans	1	1
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
**Bromus diandrus*	+	0.1
Burchardia congesta	+	0.4
Caladenia flava subsp. *flava*	+	0.2
Calandrinia liniflora	out	out
Calytrix flavescens	+	0.3
**Carpobrotus edulis*	+	0.1
Conostephium preissii	+	0.3
Conostylis aculeata subsp. *cygnorum*	+	0.3
Conostylis juncea	+	0.2
Crassula colorata var. *colorata*	+	0.1
Dasypogon bromeliifolius	+	0.3
Desmocladus flexuosus	+	0.2
Drosera pallida	+	-
**Ehrharta calycina*	+	0.3
**Ehrharta longiflora*	+	0.4
Eremaea pauciflora var. *pauciflora*	5	0.9
Eucalyptus todtiana	out	out
**Gladiolus caryophyllaceus*	+	0.3
Hibbertia hypericoides	7	0.9
Hibbertia subvaginata	+	0.3
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Leucopogon conostephioides	+	0.1

Lomandra caespitosa	+	0.2
Lomandra hermaphrodita	+	0.2
Lomandra preissii	+	0.3
Lyginia barbata	+	0.4
**Lysimachia arvensis*	+	0.1
Macarthuria australis	out	out
Nuytsia floribunda	3	8
Patersonia occidentalis var. *occidentalis*	1	0.5
Petrophile linearis	+	0.4
Phyllangium paradoxum	3	0.1
Podotheca gnaphalioides	+	0.2
Pterostylis sanguinea	+	0.2
Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	+	1.2
Stirlingia latifolia	+	0.2
Stylidium repens	+	0.1
Stylidium rigidulum	+	0.2
Stylidium schoenoides	+	0.3
Thysanotus manglesianus	+	-
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	3	0.4
**Vulpia bromoides*	+	0.1
**Wahlenbergia capensis*	+	0.1

Site: SVB058
Described: CvdB **Date**: 17/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403812mE; 6487649mN
Habitat: South-east very gentle slope
Soil: White brown course grained sand
Rock Type: None
Vegetation: *Corymbia calophylla* and *Eucalyptus marginata* open mid forest over *Banksia attenuata* and *Banksia ilicifolia* sparse low woodland over *Xanthorrhoea brunonis* open low shrubland over *Dasypogon bromeliifolius* sparse low herbland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Banksia attenuata	19	7
Banksia ilicifolia	1	5
Bossiaea eriocarpa	+	0.4
Conostylis juncea	+	0.3
Corymbia calophylla	27	15
Dasypogon bromeliifolius	4	0.3
Drosera erythrorhiza	+	pr
Hibbertia hypericoides	+	0.4
Hovea trisperma var. *trisperma*	+	0.3
**Hypochaeris radicata*	+	0.1
Lomandra preissii	+	0.3
Melaleuca amydra	+	2.3
Persoonia saccata	+	1.2
Petrophile linearis	+	0.4
Pterostylis sp. clubbed snail orchid (R. Davis 8088)	+	0.2
Trachymene pilosa	+	0.1
Tricoryne tenella	+	0.3
Xanthorrhoea brunonis	40	1

Site: SVB059
Described: BL **Date**: 17/09/2014 **Type:** Relevés
MGA Zone: 50 403610mE; 6487793mN
Habitat: Upperslope of dune, west slope
Soil: Grey sand
Rock Type: None

Vegetation: *Eucalyptus todtiana* sparse mid mallee trees over *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* sparse low woodland over *Adenanthos cygnorum* subsp. *cygnorum* and *Jacksonia furcellata* sparse tall shrubland over *Eremaea pauciflora* var. *pauciflora* sparse low shrubland over *Dasypogon bromeliifolius*, **Carpobrotus edulis*, *Podotheca gnaphalioides* and **Ursinia anthemoides* open herbland

Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Adenanthos cygnorum subsp. *cygnorum*	3	2
Banksia attenuata	3	4
Banksia ilicifolia	1	4
Banksia menziesii	2	4
**Carpobrotus edulis*	6	0.2
Dasypogon bromeliifolius	3	0.6
Eremaea pauciflora var. *pauciflora*	4	0.8
Eucalyptus todtiana	4	6
**Gladiolus caryophyllaceus*	+	0.6
**Hypochaeris glabra*	2	0.1
Jacksonia furcellata	2	2
**Moraea flaccida*	+	0.5
Podotheca gnaphalioides	5	0.2
**Ursinia anthemoides*	4	0.3

Site: SVB065
Described: CvdB **Date**: 25/09/2014 **Type:** Relevés
MGA Zone: 50 406312mE; 6492160mN
Habitat: Sumpland with flow line, low
Soil: Black moist clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over **Schinus terebinthifolius* sparse low woodland over **Zantedeschia aethiopica* sparse tall herbland over low grassland (dominated by pasture species)
Condition: Degraded - completely degraded
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name

**Callitriche stagnalis*
Eucalyptus rudis subsp. *rudis*
**Ficus carica*
**Lotus subbiflorus*
**Lupinus cosentinii*
**Rorippa nasturtium-aquaticum*
**Schinus terebinthifolius*
**Zantedeschia aethiopica*

Site: SVB066
Describe: CvdB **Date**: 25/09/2014 **Type:** Relevés
MGA Zone: 50 403298mE; 6492553mN
Habitat: Wetland
Soil: Black peat clay
Rock Type: None
Vegetation: *Corymbia calophylla* and *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Astartea scoparia*, *Jacksonia furcellata* and *Taxandria linearifolia* tall shrubland over **Zantedeschia aethiopica* sparse mid herbland over sparse low grassland (of weeds)
Condition: None
Fire Age: >10 years
Notes: Leaf Litter: 5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	45	2.2
**Briza maxima*	+	0.2
Briza minor	+	0.1
Cassytha glabella	+	cr
Corymbia calophylla	10	13
Desmocladus flexuosus	+	0.1
Drosera macrantha	+	cr
Eucalyptus rudis subsp. *rudis*	10	13
**Hypochaeris radicata*	+	0.2
Jacksonia furcellata	+	3.1
**Lotus subbiflorus*	+	0.1
Stylidium junceum	+	0.2
Taxandria linearifolia	+	2.1
Thelymitra mucida	+	0.2
**Zantedeschia aethiopica*	1	0.7

Site: SVB067
Described: CvdB **Date**: 25/09/2014 **Type**: Relevés
MGA Zone: 50 403239mE; 6492993mN
Habitat: Wetland/ stream
Soil: Black clay
Rock Type: None

Vegetation: *Corymbia calophylla* isolated mid trees over *Melaleuca preissiana* low woodland over *Astartea scoparia* and *Taxandria linearifolia* tall shrubland over *Juncus pallidus* open tall sedgeland over **Zantedeschia aethiopica* sparse tall herbland over **Cotula coronopifolia* sparse low herbland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acetosella vulgaris*	+	0.3
**Arctotheca calendula*	+	0.3
Astartea scoparia	50	2.1
Corymbia calophylla	out	10
Desmocladus flexuosus	2	0.4
Juncus pallidus	40	1.3
**Lotus subbiflorus*	+	0.2
Melaleuca preissiana	25	8
**Moraea flaccida*	+	0.3
**Phytolacca octandra*	+	0.4
**Sparaxis bulbifera*	+	0.4
Taxandria linearifolia	+	2
**Zantedeschia aethiopica*	14	1

Site: SVB068
Described: BL **Date**: 25/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403982mE; 6492858mN
Habitat: Dampland, gentle SE slope, low
Soil: Grey black sand
Rock Type: None
Vegetation: *Corymbia calophylla* mid woodland over *Melaleuca preissiana* low woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Dielsia stenostachya* open mid rushland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 100%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	+	2
**Briza maxima*	+	0.2
Burchardia congesta	+	0.6
Corymbia calophylla	30	15
Dielsia stenostachya	25	0.6
Hypocalymma angustifolium	+	1
Lepidosperma longitudinale	+	0.7
Lomandra preissii	+	0.3
Lomandra suaveolens	+	0.4
Melaleuca preissiana	40	9
Microtis media subsp. *media*	+	0.4
Xanthorrhoea preissii	12	4
**Zantedeschia aethiopica*	+	0.2

Site: SVB069
Described: CvdB **Date**: 18/11/2014 **Type**: Relevés
MGA Zone: 50 403230mE; 6493556mN
Habitat: Wetland with open water
Rock Type: None
Vegetation: *Melaleuca preissiana* low woodland over *Taxandria linearifolia* and *Astartea scoparia* open tall shrubland over **Rubus laudatus* mid shrubland over **Typha orientalis* and *Juncus pallidus* isolated clumps of tall herbs over **Cynodon dactylon*, *Cenchrus clandestinum* and **Holcus lanatus* low grassland
Condition: Very Degraded
Fire Age: >10 years
Notes: Leaf Litter:
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name

Astartea scoparia
Desmocladus flexuosus
**Holcus lanatus*
Juncus pallidus
Melaleuca preissiana
**Rubus laudatus*
Taxandria linearifolia
**Typha orientalis*
**Zantedeschia aethiopica*

Site: SVB070
Described: BL **Date**: 25/09/2014 **Type:** Relevés
MGA Zone: 50 403522mE; 6496121mN
Habitat: Drainage line, very gentle east slope, low
Soil: Black peaty clayey wet sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis*, *Corymbia calophylla*, *Melaleuca rhaphiophylla* and *Melaleuca preissiana* sparse low woodland over *Juncus planifolius* and **Rumex crispus* open tall herbland over *Cenchrus clandestinum* and **Holcus lanatus* closed low grassland
Condition: Completely degraded
Fire Age: >10 years
Notes: Leaf Litter: 2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Callitriche stagnalis*	+	aquatic
**Cenchrus clandestinus*	80	0.4
**Cirsium vulgare*	+	1.9
Corymbia calophylla	2	10
Eucalyptus rudis subsp. *rudis*	6	8
**Holcus lanatus*	3	0.5
Juncus pallidus	+	1.6
Juncus planifolius	30	1
**Lotus subbiflorus*	1	0.3
Melaleuca preissiana	2	10
Melaleuca rhaphiophylla	2	5
**Rorippa nasturtium-aquaticum*	1	0.3
**Rumex crispus*	2	1.7
**Sonchus asper*	+	0.3
**Zantedeschia aethiopica*	+	1

Site: SVB071
Described: CvdB **Date**: 25/09/2014 **Type** Relevés
MGA Zone: 50 403303mE; 6496161mN
Habitat: Banks of an intermittent creek, low
Soil: Black moist loamy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* isolated clumps of mid trees over **Rubus laudatus* isolated clumps of mid shrubs over *Juncus pallidus* and *Baumea articulata* isolated clumps of tall sedges over **Holcus lanatus* (and other introduced grasses) closed mid grassland
Condition: Completely degraded
Fire Age: >10 years
Notes: Leaf Litter: 60%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name

**Acetosella vulgaris*
Baumea articulata
**Cenchrus clandestinus*
**Cyperus polystachyos*
**Ehrharta calycina*
Eucalyptus rudis subsp. *rudis*
**Holcus lanatus*
Juncus pallidus
**Rubus laudatus*

Site: SVB072
Described: BL **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 403120mE; 6497394mN

Vegetation: *Corymbia calophylla*, *Eucalyptus camaldulensis* and *Eucalyptus todtiana* low woodland over *Calothamnus quadrifidus* and *Banksia nivea* sparse mid shrubland over **Bromus diandrus* and **Ehrharta calycina* sparse mid grassland over **Ursinia anthemoides* and **Hypochaeris glabra* sparse low herbland

Notes: (Revegetation site)

SPECIES LIST:

Name

Banksia nivea
**Bromus diandrus*
Calothamnus quadrifidus
Corymbia calophylla
**Ehrharta calycina*
Eucalyptus camaldulensis
Eucalyptus todtiana
**Hypochaeris glabra*
**Ursinia anthemoides*

Site: SVB073
Described: CvdB **Date**: 15/09/2014 **Type:** Relevés
MGA Zone: 50 403217mE; 6497526mN
Habitat: Wetland with a slight creek, low
Soil: White brown organic sandy clay
Rock Type: None
Vegetation: *Melaleuca preissiana* and *Melaleuca rhaphiophylla* low woodland over **Zantedeschia aethiopica* and **Typha orientalis* open mid herbland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Callitriche stagnalis*	+	0.1
Cycnogeton lineare	+	0.3
Juncus pallidus	+	1
**Lotus subbiflorus*	+	0.2
Melaleuca preissiana	35	7
Melaleuca rhaphiophylla	5	5
Microtis media subsp. *media*	+	0.2
**Moraea flaccida*	+	0.4
**Ranunculus muricatus*	+	0.4
**Rorippa nasturtium-aquaticum*	+	0.2
**Rumex crispus*	+	0.3
**Typha orientalis*	8	3
**Zantedeschia aethiopica*	30	2

Site: SVB073A
Described: BL **Date**: 15/09/2014 **Type:** Relevés
MGA Zone: 50 403467mE; 6497411mN
Habitat: Wetland, low/flat
Soil: Black loamy sand
Rock Type: None
Vegetation: *Melaleuca preissiana* sparse low woodland over *Taxandria linearifolia* and *Astartea scoparia* sparse tall shrubland over *Juncus pallidus*, *Lepidosperma longitudinale* and *Tetraria capillaris* sparse tall sedgeland over **Zantedeschia aethiopica* sparse tall herbland over *Cenchrus clandestinum* and **Holcus lanatus* sparse mid grassland over *Centella asiatica* sparse low herbland
Condition: Degraded
Fire Age: >10 years

SPECIES LIST:

Name	Cover (%)	Height (m)
Astartea scoparia	3	2
**Cenchrus clandestinus*	3	0.4
Centella asiatica	5	0.2
**Holcus lanatus*	4	0.5
Juncus pallidus	3	1.8
Juncus planifolius	+	0.9
Lepidosperma longitudinale	2	1
Melaleuca preissiana	15	5.5
Taxandria linearifolia	2	2.2
Tetraria capillaris	3	1
**Zantedeschia aethiopica*	+	

Site: SVB074
Described: BL **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 403338mE; 6497428mN

Vegetation: *Corymbia calophylla*, *Eucalyptus camaldulensis* and *Eucalyptus todtiana* low woodland over *Calothamnus quadrifidus* and *Banksia nivea* sparse mid shrubland over **Bromus diandrus* and **Ehrharta calycina* sparse mid grassland over **Ursinia anthemoides* and **Hypochaeris glabra* sparse low herbland (Revegetation site)

SPECIES LIST:

Name

Banksia nivea
**Bromus diandrus*
Calothamnus quadrifidus
Corymbia calophylla
**Ehrharta calycina*
Eucalyptus camaldulensis
Eucalyptus todtiana
**Hypochaeris glabra*

Site: SVB075
Described: CvdB **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 403440mE; 6497521mN
Habitat: Banks of a creek line
Soil: Brown white sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca preissiana* and *Melaleuca rhaphiophylla* low woodland over **Zantedeschia aethiopica* and *Rorippa nasturtium-aquaticum open mid herbland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Cycnogeton lineare	+	0.2
Eucalyptus rudis subsp. *rudis*	1	12
Juncus planifolius	+	0.5
Melaleuca preissiana	20	8
Melaleuca rhaphiophylla	11	8
**Rorippa nasturtium-aquaticum*	2	0.4
**Solanum nigrum*	+	0.4
Taxandria linearifolia	+	2.5
**Typha orientalis*	+	3
**Zantedeschia aethiopica*	30	2

Site: SVB076
Described: CvdB **Date**: 16/09/2014 **Type:**Quadrat 10x10 m
MGA Zone: 50 403248mE; 6498931mN
Habitat: Palusplain with small creekline, low
Soil: Darkbrown moist sandy clay ?peat
Rock Type: none
Vegetation: *Corymbia calophylla* and *Eucalyptus rudis* subsp. *rudis* sparse mid woodland (on edges and outside) over *Melaleuca preissiana* low woodland over *Astartea scoparia* open tall shrubland over **Poa annua* and **Holcus lanatus* isolated low grasses over *Desmocladus flexuosus* isolated low rushes
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%
Water cover: 30%
Water depth: 5-10cm

SPECIES LIST:

Name	Cover (%)	Height (m)
**Acetosella vulgaris*	+	0.2
**Acetosella vulgaris*	+	0.2
Aotus gracillima	+	0.2
Astartea scoparia	22	4.5
Corymbia calophylla	1	6
**Cotula coronopifolia*	+	0.3
Desmocladus flexuosus	+	0.2
Eucalyptus rudis subsp. *rudis*	+	14
**Holcus lanatus*	+	0.2
Homalosciadium homalocarpum	+	0.1
**Hypochaeris glabra*	+	0.2
**Hypochaeris radicata*	+	0.2
Isolepis cyperoides	+	0.1
**Isolepis marginata*	+	0.1
Isolepis stellata	+	0.1
Lepidosperma longitudinale	+	0.4
**Lotus subbiflorus*	+	0.3
Melaleuca preissiana	21	7
**Ornithopus compressus*	+	0.2
**Poa annua*	+	0.3
Pterostylis sp. clubbed snail orchid (R. Davis 8088)	+	0.2
Pterostylis sp. short sepals (W. Jackson BJ259)	+	0.2
**Romulea rosea*	+	0.2
**Sonchus asper*	+	0.3
**Stellaria pallida*	+	0.1
Taxandria linearifolia	+	1.5
**Trifolium hirtum*	+	0.2
**Trifolium repens* var. *repens*	+	0.1
**Ursinia anthemoides*	+	0.2
**Zantedeschia aethiopica*	+	1.2

Site: SVB077
Described: CvdB **Date**: 16/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403108mE; 6499000mN
Habitat: Floodplain/ Dampland
Soil: Black clay ?peet
Rock Type: none
Vegetation: *Astartea scoparia* tall shrubland over **Holcus lanatus* isolated low grasses over **Romulea rosea* and *Hypochaeris glabra isolated low herbs over *Aphelia cyperoides* isolated low sedges
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: 8%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Aotus gracillima	+	0.3
Aphelia cyperoides	1	0.1
**Arctotheca calendula*	+	0.2
**Arctotheca calendula*	+	0.2
Astartea scoparia	60	4
**Cotula coronopifolia*	+	0.1
Desmocladus flexuosus	+	0.4
Drosera glanduligera	+	0.1
**Holcus lanatus*	1	0.3
**Hypochaeris glabra*	1	0.1
Juncus pallidus	+	0.8
Kunzea glabrescens	+	2
Lobelia anceps	+	0.2
**Lotus subbiflorus*	+	0.1
Microtis sp.	+	0.3
**Moraea flaccida*	+	0.4
**Romulea rosea*	1	0.1
Taxandria linearifolia	+	1.5

Site: SVB078
Described: BL **Date**: 16/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 402834mE; 6498938mN
Habitat: Wetland, gentle slope to the SE, low
Soil: Black clayey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* closed low forest over *Histiopteris incisa* and *Pteridium esculentum* subsp. *esculentum* sparse tall herbland over *Cyathochaeta teretifolia* open mid sedgeland
Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 10%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Bromus diandrus*	+	0.2
Cyathochaeta teretifolia	35	1.5
**Ehrharta longiflora*	+	0.3
Genus Unknown sp.	+	0.1
Histiopteris incisa	10	2
Hovea trisperma var. *trisperma*	+	out
**Hypochaeris glabra*	+	0.1
**Isolepis prolifera*	+	0.3
Lobelia anceps	+	0.2
Melaleuca preissiana	80	9
Poaceae sp.	+	0.2
Pteridium esculentum subsp. *esculentum*	2	2
**Rubus laudatus*	+	1
Taxandria linearifolia	+	1.7
**Zantedeschia aethiopica*	+	0.2

Site: SVB079
Described: BL **Date**: 16/09/2014 **Type**: Quadrat 10X10 m
MGA Zone: 50 402811m; E6499037mN
Habitat: Wetland, Flat, low
Soil: Black clayey sand
Rock Type: None
Vegetation: *Melaleuca preissiana* low woodland over *Astartea scoparia*, *Taxandria linearifolia* and *Aotus gracillima* open tall shrubland over *Juncus pallidus* closed tall sedgeland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Aotus gracillima	2	2
Astartea scoparia	35	3
Burchardia congesta	1	0.8
Cassytha glabella	+	-
Dielsia stenostachya	+	0.3
Drosera macrantha	+	0.5
Genus Unknown sp.	+	0.1
Hypocalymma angustifolium	1	2.5
Juncus pallidus	95	3
Lepidosperma sp.	+	0.4
Leucopogon australis	+	1.5
Melaleuca preissiana	25	9
Taxandria linearifolia	5	2.5
Xanthorrhoea preissii	+	1

Site: SVB079A
Described: BL **Date**: 16/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402949mE; 6499079mN
Habitat: Periphery of wetland, wetland edge, very gentle SE slope
Soil: Black clayey sand
Rock Type: None
Vegetation: *Corymbia calophylla* open mid forest over *Melaleuca preissiana* sparse low woodland over *Taxandria linearifolia*, *Astartea scoparia* and *Aotus gracillima* open tall shrubland over closed low sedgeland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 20%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia saligna	+	out
Aotus gracillima	3	2
Astartea scoparia	15	3
Burchardia congesta	+	0.2
Corymbia calophylla	60	13
Dampiera linearis	+	out
Dielsia stenostachya	95	0.4
Hovea trisperma var. *trisperma*	+	0.3
**Hypochaeris glabra*	+	0.1
Kunzea glabrescens	+	1.5
Lepidosperma longitudinale	+	0.7
Lepidosperma sp.	+	0.1
Lobelia anceps	+	0.2
**Lolium rigidum*	+	0.2
**Lotus subbiflorus*	+	0.2
**Medicago sp.*	+	0.1
Melaleuca preissiana	3	7
Microtis media subsp. *media*	+	0.3
Patersonia juncea	+	0.2
Pterostylis sp. short sepals (W. Jackson BJ259)	+	0.2
Regelia ciliata	+	out
**Rubus laudatus*	+	1
Schoenus efoliatus	+	0.4
Taxandria linearifolia	8	2.5
Thelymitra sp.	+	0.3
*Trifolium subterraneum	+	0.2

Site: SVB080
Described: CvdB **Date**: 16/09/2014 **Type:** Relevés
MGA Zone: 50 404700mE; 6503665mN
Habitat: Floodplain banks of the Ellen Brook, low
Soil: Dark brown sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* isolated mid trees over *Melaleuca rhaphiophylla* sparse low woodland over **Lolium rigidum* open low grassland over **Cotula coronopifolia* and **Moraea flaccida* sparse low herbland
Condition: Completely degraded
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Cotula coronopifolia*	1	0.1
Eucalyptus rudis subsp. *rudis*	1	12
**Lolium rigidum*	20	0.2
Melaleuca rhaphiophylla	2	10
**Moraea flaccida*	2	0.3
**Typha orientalis*	+	1.3
**Watsonia* sp.	+	0.6
**Zantedeschia aethiopica*	+	0.6

Site: SVB081
Described: CvdB **Date**: 16/09/2014 **Type:** Relevés
MGA Zone: 50 404580mE; 650384mN
Habitat: Floodplain on the banks of the Ellen Brook, low
Soil: Dark browm sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca rhaphiophylla* sparse low woodland over **Lolium rigidum* and **Ehrharta longiflora* low grassland over **Lotus subbiflorus* and **Moraea flaccida* sparse low herbland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia saligna	+	8
**Cotula coronopifolia*	+	0.3
**Cynodon dactylon*	+	0.4
**Ehrharta longiflora*	15	0.3
Eucalyptus rudis subsp. *rudis*	1	8
Juncus pallidus	+	0.4
**Lolium rigidum*	65	0.3
**Lotus subbiflorus*	10	0.2
Melaleuca rhaphiophylla	4	12
**Moraea flaccida*	1	0.4
**Rumex crispus*	+	0.5
Sowerbaea laxiflora	+	0.4
**Typha orientalis*	+	1.5

Site: SVB082
Described: CvdB **Date**: 16/09/2014 **Type**: Relevés
MGA Zone: 50 404483mE; 6504117mN
Habitat: Floodplain on the bank of the Ellen Brook, Low
Soil: White brown moist sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca rhaphiophylla* sparse low woodland over **Ehrharta longiflora* closed low grassland over **Moraea flaccida* sparse low herbland
Condition: Completely degraded
Fire Age: >10 years
Notes: Leaf Litter: <5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.2
**Cynodon dactylon*	+	0.4
**Ehrharta longiflora*	80	0.3
Eucalyptus rudis subsp. *rudis*	3	11
Juncus pallidus	+	0.8
Melaleuca rhaphiophylla	1	6
**Moraea flaccida*	3	0.4
**Watsonia* sp.	+	0.5

Site: SVB083
Described: BL **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 404365mE; 6506624mN
Habitat: Flat/ plain, planted corridor
Soil: Grey black sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis*, *Casuarina obesa* and *Melaleuca* sp. open low forest over **Lolium rigidum*, **Ehrharta longiflora* and **Ehrharta calycina* mid grassland over **Moraea flaccida* and **Lotus subbiflorus* open low herbland
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name

Casuarina obesa
**Ehrharta calycina*
**Ehrharta longiflora*
Eucalyptus rudis subsp. *rudis*
**Lolium rigidum*
**Lotus subbiflorus*
Melaleuca sp.
**Moraea flaccida*

Site: SVB084
Described: BL **Date**: 15/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 403929mE; 6506566mN
Habitat: Creek/ floodplain, very gentle slope, southerly aspect
Soil: Brown loamy sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis*, *Melaleuca rhaphiophylla* and *Melaleuca concreta* open low forest over **Moraea flaccida* sparse mid herbland over **Lolium rigidum*, **Ehrharta longiflora* and **Cynodon dactylon* mid grassland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.2
**Bromus diandrus*	+	0.2
**Casuarina ?equisetifolia*	+	1
**Cotula coronopifolia*	+	0.2
Crassula decumbens var. *decumbens*	+	0.1
**Cynodon dactylon*	7	0.3
**Cyperus tenellus*	+	0.1
Drosera glanduligera	+	0.1
**Ehrharta longiflora*	20	0.5
Eucalyptus rudis subsp. *rudis*	50	9
**Hypochaeris glabra*	+	0.1
Isolepis cernua var. *setiformis*	+	0.1
Lobelia anceps	+	0.3
**Lolium rigidum*	70	0.5
**Lotus subbiflorus*	1	0.2
Melaleuca concreta	6	7
Melaleuca rhaphiophylla	+	4
**Moraea flaccida*	10	0.5
Oxalis sp.	+	0.2
**Romulea rosea* var. *communis*	+	0.2
**Zantedeschia aethiopica*	+	0.9

Site: SVB085
Described: CvdB **Date**: 15/09/2014 **Type:** Quadrat 10x10m
MGA Zone: 50 404720mE; 6506854mN
Habitat: Dampland, low
Soil: Moist dark brown/ black clay
Rock Type: None
Vegetation: *Melaleuca preissiana* open low forest over *Juncus kraussii* subsp. *australiensis* sparse mid sedgeland over **Cynodon dactylon* open low grassland
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: <5%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Cynodon dactylon*	25	0.2
Isolepis cernua var. *setiformis*	+	0.1
Juncus kraussii subsp. *australiensis*	15	0.6
Lobelia anceps	+	0.2
Melaleuca preissiana	60	4.5
**Moraea flaccida*	+	0.3
**Romulea rosea*	+	0.1
**Sonchus oleraceus*	+	0.1

Site: SVB086
Described: CvdB **Date**: 15/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 404584mE; 6506806mN
Habitat: Wetland, palurplain/ dampland, Low
Soil: Moist black dark brown clay with surface water
Rock Type: None

Vegetation: *Casuarina obesa* isolated low trees (outside) over *Melaleuca concreta* open tall shrubland over *Lepidosperma longitudinale*, *Juncus pallidus*, *Schoenus caespititius*, *Isolepis cyperoides* and *Isolepis cernua* var. *setiformis* open mid sedgeland over **Ehrharta longiflora* sparse low grassland over **Cotula coronopifolia* sparse low herbland
Condition: Good
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)
**Arctotheca calendula*	+
Casuarina obesa	+
**Cotula coronopifolia*	10
**Ehrharta longiflora*	12
**Hypochaeris glabra*	+
Isolepis cernua var. *setiformis*	+
Isolepis cyperoides	1
Juncus pallidus	1
Lepidosperma longitudinale	12
**Lotus subbiflorus*	+
Melaleuca concreta	+
Melaleuca concreta	35
**Moraea flaccida*	+
Schoenus caespititius	+
**Sonchus oleraceus*	+

Site: SVB087
Described: CvdB **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 403548mE; 6507017mN
Habitat: Floodplain on the banks of Ellen Brook, low
Soil: Moist brown black sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca rhaphiophylla* isolated low trees over **Ehrharta longiflora* open low grassland over **Moraea flaccida* sparse low herbland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia saligna	+	3.4
**Cynodon dactylon*	10	0.3
**Ehrharta longiflora*	20	0.3
Eucalyptus rudis subsp. *rudis*	25	15
**Lolium rigidum*	10	0.3
Melaleuca rhaphiophylla	2	9
**Moraea flaccida*	1	0.35

Site: SVB088
Described: BL **Date**: 15/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 404743mE; 6508902mN
Habitat: Lowerslope of low hill, gentle slope, aspect SW
Soil: Yellow - brown sand
Rock Type: None
Vegetation: *Eucalyptus marginata* subsp. *thalassica* sparse mid woodland over *Banksia menziesii* low woodland over *Xanthorrhoea preissii* sparse tall shrubland over *Hibbertia hypericoides* sparse low shrubland over *Mesomelaena pseudostygia* sparse mid sedgeland over *Alexgeorgea nitens* isolated low rushes
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 50%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	0.5
Alexgeorgea nitens	1	0.1
**Arctotheca calendula*	+	0.1
**Asparagus asparagoides*	+	0.1
Banksia attenuata	out	
Banksia dallanneyi var. *dallanneyi*	+	0.3
Banksia menziesii	35	7
Bossiaea eriocarpa	+	0.3
Brachyscome bellidioides	out	
**Briza maxima*	+	0.3
Burchardia congesta	+	0.6
Caesia micrantha	+	0.3
Caladenia flava subsp. *flava*	+	0.2
Calytrix sylvana	out	
Centrolepis drummondiana	+	0.1
Chamaescilla versicolor	+	0.2
Conostephium pendulum	out	
Conostylis aculeata subsp. *aculeata*	+	0.4
Conostylis teretifolia subsp. *teretifolia*	+	0.1
Corymbia calophylla	out	
Corynotheca micrantha	1	0.6
Daviesia divaricata subsp. *divaricata*	out	
Daviesia triflora	+	0.6
Desmocladus fasciculatus	+	0.2
Drosera erythrorhiza	+	0.1
Drosera pallida	+	cr
**Ehrharta calycina*	+	0.8
**Ehrharta longiflora*	+	0.4
Eucalyptus marginata subsp. *thalassica*	3	6
**Gladiolus caryophyllaceus*	+	1
Gompholobium knightianum	+	0.2
Gompholobium tomentosum	+	0.4
Hibbertia hypericoides	4	0.6
Hybanthus calycinus	out	
**Hypochaeris glabra*	2	0.1
Isotropis cuneifolia subsp. *cuneifolia*	+	0.3
Kennedia prostrata	+	0.1

Lepidosperma pubisquameum (flat form)	+	0.4
Levenhookia stipitata	+	0.1
Lomandra caespitosa	+	0.1
Lomandra hermaphrodita	out	
Lomandra preissii	+	0.4
Lomandra sericea	+	0.3
Mesomelaena pseudostygia	3	0.7
Petrophile linearis	+	0.4
Podotheca gnaphalioides	+	0.1
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
***Romulea rosea var. australis*	+	0.2
**Sonchus oleraceus*	+	0.2
Sowerbaea laxiflora	+	0.4
Stylidium striatum	+	0.3
Tetraria octandra	+	0.5
Thysanotus manglesianus	+	cr
Trachymene pilosa	1	0.1
**Ursinia anthemoides*	1	0.2
**Wahlenbergia capensis*	+	0.1
Xanthorrhoea brunonis	+	1.1
Xanthorrhoea preissii	15	2

Site: SVB089
Described: CvdB **Date**: 15/09/2014 **Type**: Relevés
MGA Zone: 50 403486mE; 6507118mN
Habitat: Flood plain on the banks of Ellen Brook, Low
Soil: Dark brown moist organic sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* sparse mid woodland over *Melaleuca rhaphiophylla* isolated low trees over **Lolium rigidum* and **Ehrharta longiflora* low grassland over **Moraea flaccida* isolated low herbs
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Arctotheca calendula*	+	0.2
**Ehrharta longiflora*	10	0.3
Eucalyptus rudis subsp. *rudis*	25	13
**Lolium rigidum*	50	0.3
**Lotus subbiflorus*	+	0.3
**Lupinus cosentinii*	+	0.3
Melaleuca rhaphiophylla	1	7
**Moraea flaccida*	1	0.4
**Rumex crispus*	+	0.3

Site: SVB090
Described: CvdB **Date**: 15/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 402598mE; 6506832mN

Habitat: Bank of a tributary to Ellen Brook, low floodplain
Soil: Brown white sandy clay
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* isolated mid trees (outside) over *Melaleuca rhaphiophylla* low woodland over **Ehrharta longiflora* and **Bromus diandrus* closed low grassland
Condition: Degraded
Fire Age: > 10 years
Notes: Leaf Litter: <2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Bromus diandrus*	1	0.3
**Ehrharta longiflora*	85	0.4
**Hordeum leporinum*	+	0.3
Melaleuca rhaphiophylla	30	5
**Rumex crispus*	+	0.36

Site: SVB091
Described: CvdB **Date**: 23/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 400076mE; 6484225mN
Habitat: Dampland (RE wetland)
Soil: Dark brown sandy clay
Rock Type: None
Vegetation: **Pinus pinaster* and *Eucalyptus rudis* subsp. *rudis* isolated mid trees over *Melaleuca preissiana* and *Melaleuca rhaphiophylla* isolated low trees over *Astartea scoparia* sparse mid shrubland over *Schoenus caespititius* isolated mid sedges over **Vulpia bromoides* and **Aira praecox* sparse low grassland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 15%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
**Aira praecox*	1	0.2
**Arctotheca calendula*	+	0.3
Astartea scoparia	8	1.6
Avena barbata	+	1.4
**Briza maxima*	+	0.2
Briza minor	+	0.1
Drosera glanduligera	+	0.1
Eucalyptus rudis subsp. *rudis*	4	9
Eutaxia virgata	+	0.1
**Gladiolus caryophyllaceus*	+	0.5
**Hypochaeris glabra*	+	0.1
**Lotus subbiflorus*	1	0.1
Melaleuca preissiana	out	10
Melaleuca rhaphiophylla	out	10
**Pinus pinaster*	out	17
Schoenus caespititius	+	0.4
**Vulpia bromoides*	3	0.1

Site: SVB092
Described: CvdB **Date**: 25/09/2014 **Type:** Quadrat 10x10 m
MGA Zone: 50 401606mE; 6485575mN
Habitat: Mid, south facing slope
Soil: Grey brown medium grained sand
Rock Type: None

Vegetation: *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Macrozamia fraseri* and *Beaufortia elegans* sparse mid shrubland over *Eremaea pauciflora* var. *pauciflora*, *Astroloma xerophyllum* and *Scholtzia* aff. involucrata sparse low shrubland over *Patersonia occidentalis* subsp. *occidentalis* isolated low herbs

Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 12%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia huegelii	+	0.2
Adenanthos cygnorum subsp. *cygnorum*	+	0.2
Allocasuarina humilis	1	0.5
Astroloma xerophyllum	+	0.6
Austrostipa compressa	+	0.2
Banksia attenuata	12	7
Banksia menziesii	out	7
Beaufortia elegans	4	1.7
Boronia ramosa subsp. *anethifolia*	+	0.3
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Burchardia congesta	+	0.2
Caladenia flava subsp. *flava*	+	0.2
Calytrix flavescens	+	0.4
Calytrix fraseri	1	0.3
Centrolepis drummondiana	+	0.1
Conostephium preissii	+	0.3
Conostylis aculeata subsp. *cygnorum*	+	0.3
Drosera macrantha	+	cr
Eremaea pauciflora var. *pauciflora*	2	0.6
Eriochilus dilatatus subsp. *undulatus*	+	0.5
**Gladiolus caryophyllaceus*	+	0.2
Gompholobium tomentosum	+	0.2
Hibbertia aurea	1	0.3
Hibbertia hypericoides	+	0.3
Hibbertia sericosepala	+	0.3
Hibbertia subvaginata	+	0.4
**Isolepis marginata*	+	0.1
Lomandra integra	+	0.3
Lyginia barbata	+	0.4
Macrozamia fraseri	+	2
Nuytsia floribunda	+	0.5
Patersonia occidentalis var. *occidentalis*	1	0.5
Petrophile linearis	+	0.3
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podotheca chrysantha	+	0.1
Podotheca gnaphalioides	+	0.2
Poranthera moorokatta	+	0.2

Schoenus curvifolius	+	0.3
Scholtzia aff. involucrata EAG 5500	1	0.3
Stylidium rigidulum	+	0.2
Stylidium saxifragoides	+	0.2
Trachymene pilosa	+	0.1
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1
Wahlenbergia preissii	+	0.2

Site: SVB093
Described: BL **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 401777mE; 6485589mN
Habitat: Upperslope of dune, steep south slope
Soil: Grey sand
Rock Type: None

Vegetation: *Banksia ilicifolia*, *Banksia attenuata* and *Banksia menziesii* sparse low woodland over *Eucalyptus todtiana* isolated mid mallee trees over *Adenanthos cygnorum* subsp. *cygnorum* isolated tall shrubs over *Beaufortia elegans* isolated mid shrubs over *Eremaea pauciflora* var. *pauciflora*, *Hibbertia hypericoides* and *Scholtzia* aff. involucrata open low shrubland over *Patersonia occidentalis* var. *occidentalis* isolated low herbs

Condition: Excellent
Fire Age: >10 years
Notes: Leaf Litter: 40%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia pulchella var. *pulchella*	+	1.3
Adenanthos cygnorum subsp. *cygnorum*	1	4.5
**Aira cupaniana*	+	0.1
Austrostipa compressa	+	0.2
Banksia attenuata	25	5
Banksia ilicifolia	5	8
Banksia menziesii	2	5
Beaufortia elegans	2	1.2
Boronia ramosa subsp. *anethifolia*	+	0.3
Bossiaea eriocarpa	+	0.3
**Briza maxima*	+	0.2
Burchardia congesta	+	0.5
Caladenia flava subsp. *flava*	+	0.1
Calytrix angulata	+	0.5
Calytrix flavescens	+	0.3
Centrolepis drummondiana	+	0.1
Conospermum stoechadis subsp. *stoechadis*	out	
Conostephium minus	+	0.3
Conostephium preissii	+	0.3
Conostylis aculeata subsp. *cygnorum*	+	0.3
Desmocladus flexuosus	+	0.1
Drosera erythrorhiza	+	0.1
Drosera macrantha	+	cr
Elythranthera brunonis	+	0.3
Eremaea pauciflora var. *pauciflora*	25	0.9
Eriochilus dilatatus subsp. *dilatatus*	+	0.1
Eucalyptus todtiana	2	5
Gastrolobium linearifolium	+	0.6
**Gladiolus caryophyllaceus*	+	0.3
Gompholobium confertum	out	
Hibbertia hypericoides	10	0.7
Hibbertia subvaginata	+	0.2
**Hypochaeris glabra*	+	0.1
**Isolepis marginata*	+	0.1
Jacksonia sternbergiana	out	
Lagenophora huegelii	+	0.1
Lomandra caespitosa	+	0.1

Lomandra hermaphrodita	+	0.2
Lyginia barbata	+	0.3
Macrozamia fraseri	out	
Paracaleana nigrita	+	0.1
Patersonia occidentalis var. *occidentalis*	1	0.4
Petrophile linearis	+	0.4
Philotheca spicata	+	0.4
Phyllangium paradoxum	+	0.1
Podolepis lessonii	+	0.1
Podotheca chrysantha	+	0.1
Podotheca gnaphalioides	+	0.1
Poranthera moorokatta	+	0.1
Pterostylis sanguinea	+	0.2
Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)	+	0.1
Quinetia urvillei	+	0.1
Rytidosperma acerosum	+	0.2
Scholtzia aff. involucrata EAG 5500	15	0.5
Stylidium androsaceum	+	0.1
Thysanotus manglesianus	+	cr
Trachymene pilosa	+	0.1
**Ursinia anthemoides*	+	0.1

Site: SVB094
Described: BL **Date**: 19/09/2014 **Type**: Quadrat 10x10 m
MGA Zone: 50 401927mE; 6485746mN
Habitat: Marginal dampland, very gentle East slope, low
Soil: Grey-black sand
Rock Type: None
Vegetation: *Banksia littoralis* sparse low woodland over *Hypocalymma angustifolium* and *Pericalymma crassipes* closed mid shrubland over *Meeboldina scariosa* sparse tall rushland
Condition: Pristine
Fire Age: >10 years
Notes: Leaf Litter: 30%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Aira cupaniana*	+	0.1
Allocasuarina campestris	+	2.5
Astartea scoparia	+	1
Austrostipa compressa	+	0.1
Banksia ilicifolia	+	
Banksia littoralis	20	6
Caladenia flava subsp. *flava*	+	0.2
Centrolepis aristata	+	0.1
Dasypogon bromeliifolius	+	0.2
Drosera glanduligera	+	0.1
Drosera miniata	+	0.1
**Gladiolus caryophyllaceus*	+	0.6
Hyalosperma cotula	+	0.1
Hypocalymma angustifolium	80	1.9
**Hypochaeris glabra*	+	0.1
Melaleuca preissiana	+	
Paracaleana nigrita	+	0.2
Pericalymma crassipes	21	0.8
Phyllangium paradoxum	+	0.1
Podotheca gnaphalioides	+	0.1
Poranthera moorokatta	+	0.1
Pultenaea reticulata	+	1.6
Quinetia urvillei	+	0.1
Schoenus caespititius	6	1.2
Schoenus nanus	+	0.1
Siloxerus humifusus	+	0.1
Stylidium araeophyllum	+	0.2
Stylidium repens	+	0.1
Stylidium sp.	+	0.1
Thelymitra crinita	+	
Trachymene pilosa	+	0.1

Site: SVB098
Described: BL **Date**: 16/09/2014 **Type**: Quadrat 10x0 m
MGA Zone: 50 403006mE; 6498934mN
Habitat: Wetland forest, flat, low
Soil: Black clayey sand
Rock Type: None
Vegetation: *Eucalyptus rudis* subsp. *rudis* mid woodland over *Astartea scoparia*, *Kunzea glabrescens* and *Aotus gracillima* open tall shrubland over *Dielsia stenostachya* sparse low rushland
Condition: Very good
Fire Age: >10 years
Notes: Leaf Litter: 25%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Aotus gracillima	2	1.5
Aphelia cyperoides	+	0.1
Astartea scoparia	30	2.5
**Bromus diandrus*	+	0.2
Corymbia calophylla	out	
**Cotula coronopifolia*	+	0.1
Dielsia stenostachya	8	0.3
Eucalyptus rudis subsp. *rudis*	40	17
**Holcus lanatus*	+	0.6
**Hypochaeris glabra*	+	0.1
Isolepis cernua var. *setiformis*	+	0.1
Kunzea glabrescens	3	2
Lepidosperma longitudinale	out	
Lobelia anceps	+	0.2
**Lolium rigidum*	+	0.2
**Lotus subbiflorus*	+	0.1
**Medicago sp.*	+	0.1
**Poa annua*	+	0.2
Poaceae sp.	+	0.1
Schoenus sp.	+	0.1
**Sonchus oleraceus*	+	0.2
**Trifolium repens* var. *repens*	+	0.1
**Zantedeschia aethiopica*	+	1

Site: SVB100
Described: CvdB **Date**: 16/09/2014 **Type:** Relevés
MGA Zone: 50 403972mE; 6502300mN
Habitat: Plain, flat
Soil: White Grey Coarse grained sand
Rock Type: None
Vegetation: *Xanthorrhoea preissii* tall open shrubland over **Ehrharta calycina* sparse mid grassland
Condition: Degraded
Fire Age: >10 years
Notes: Leaf Litter: 2%
Rock size: N/A
Exposed rock: 0%
Rock Cover: 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
**Asparagus asparagoides*	+	cr
**Briza maxima*	+	0.4
Dampiera linearis	+	0.2
**Ehrharta calycina*	15	0.6
**Gladiolus caryophyllaceus*	+	0.5
Hibbertia hypericoides	+	0.6
Isotropis cuneifolia subsp. *cuneifolia*	+	0.2
**Monoculus monstrosus*	+	0.4
**Schinus terebinthifolius*	+	0.2
**Ursinia anthemoides*	+	0.3
Xanthorrhoea preissii	32	3

APPENDIX C

Monitoring Sites

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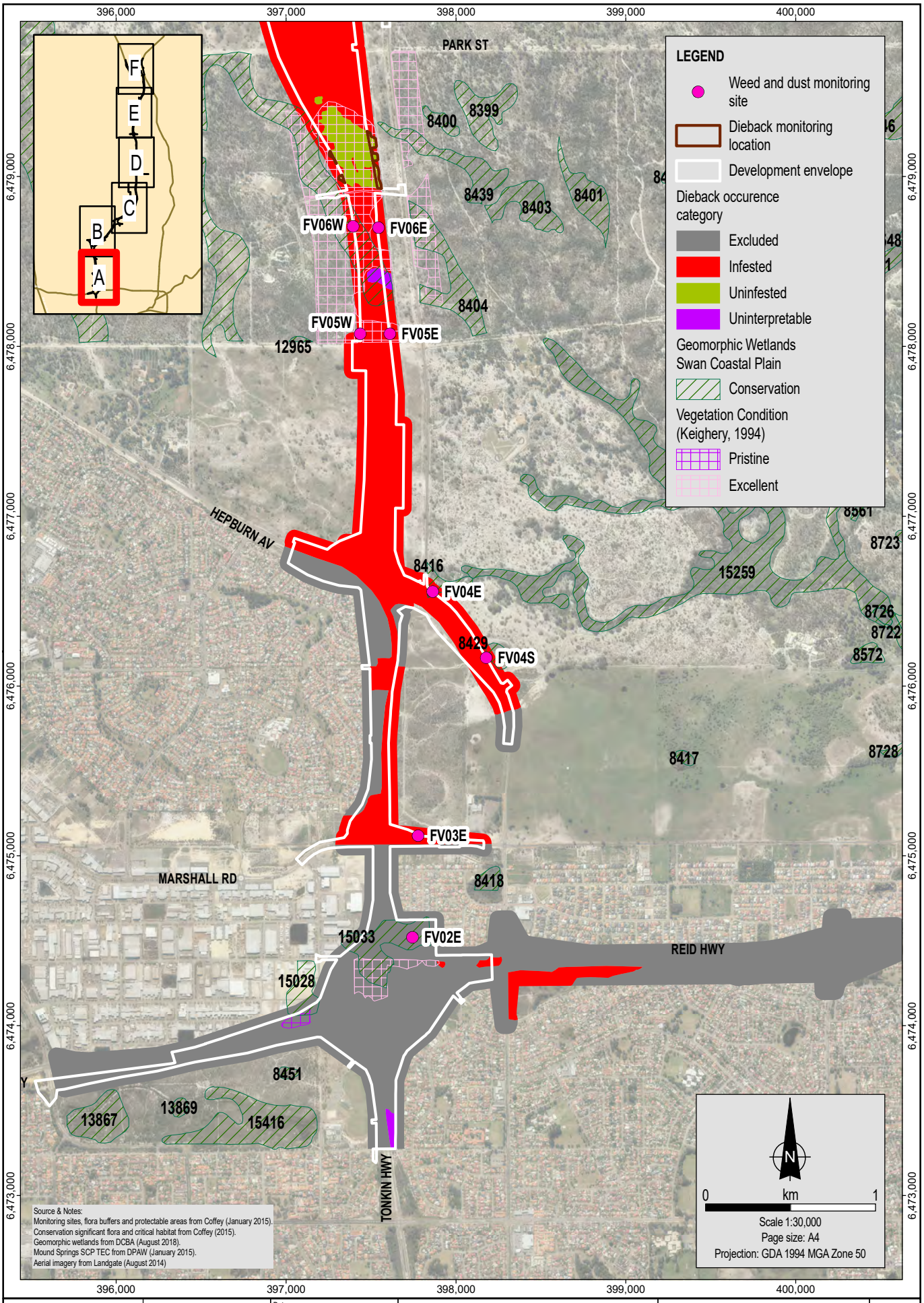

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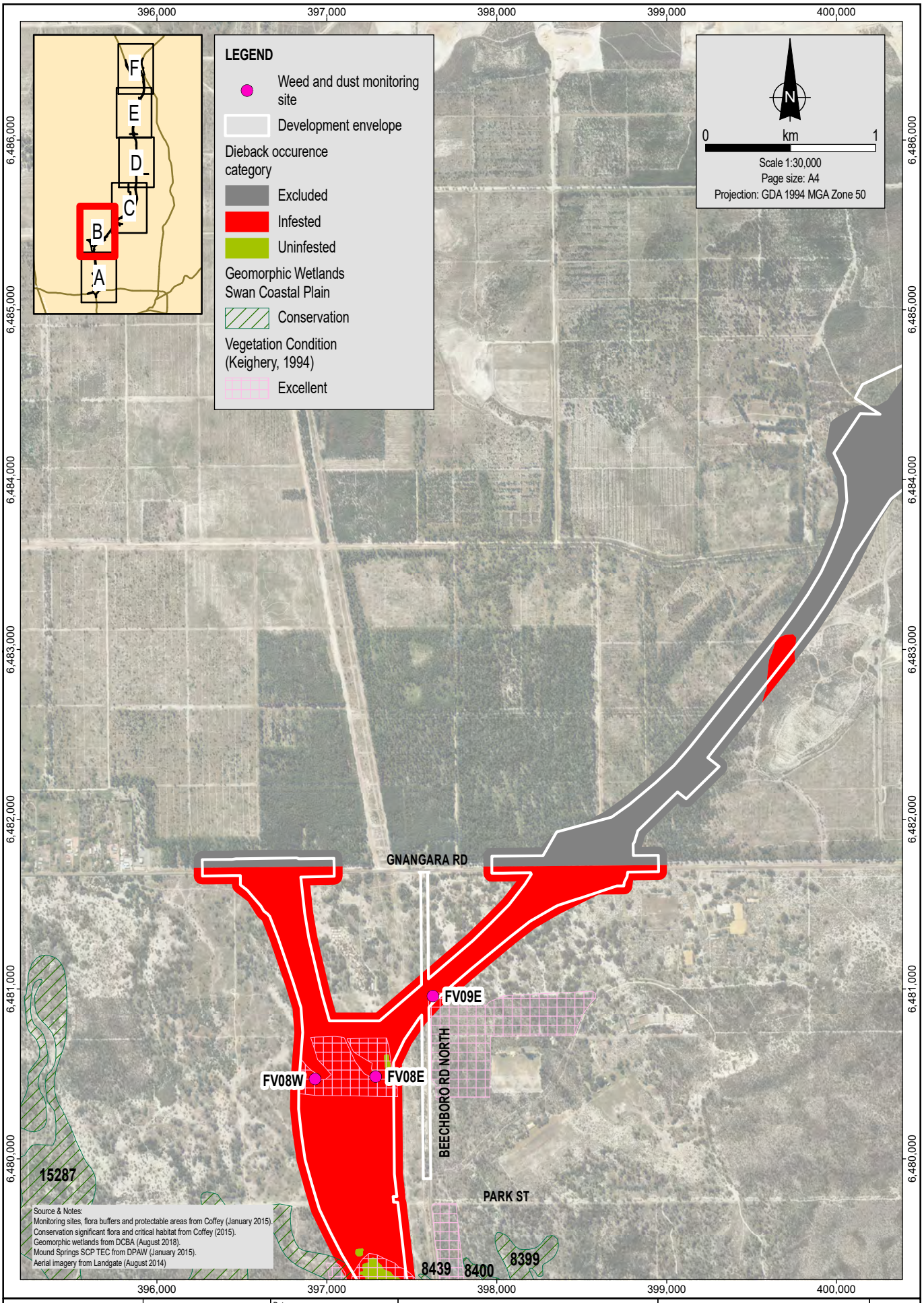
coffey
A TETRA TECH COMPANY

Date: 20.08.2018
MXD: 4483AA_58_GIS003_11
File Name: 4483AA_58_AppC_F001_GIS

Perth–Darwin National Highway
Flora and Vegetation
Construction Condition EMP

Locations of monitoring sites
Map 1 of 6

Figure No:
1



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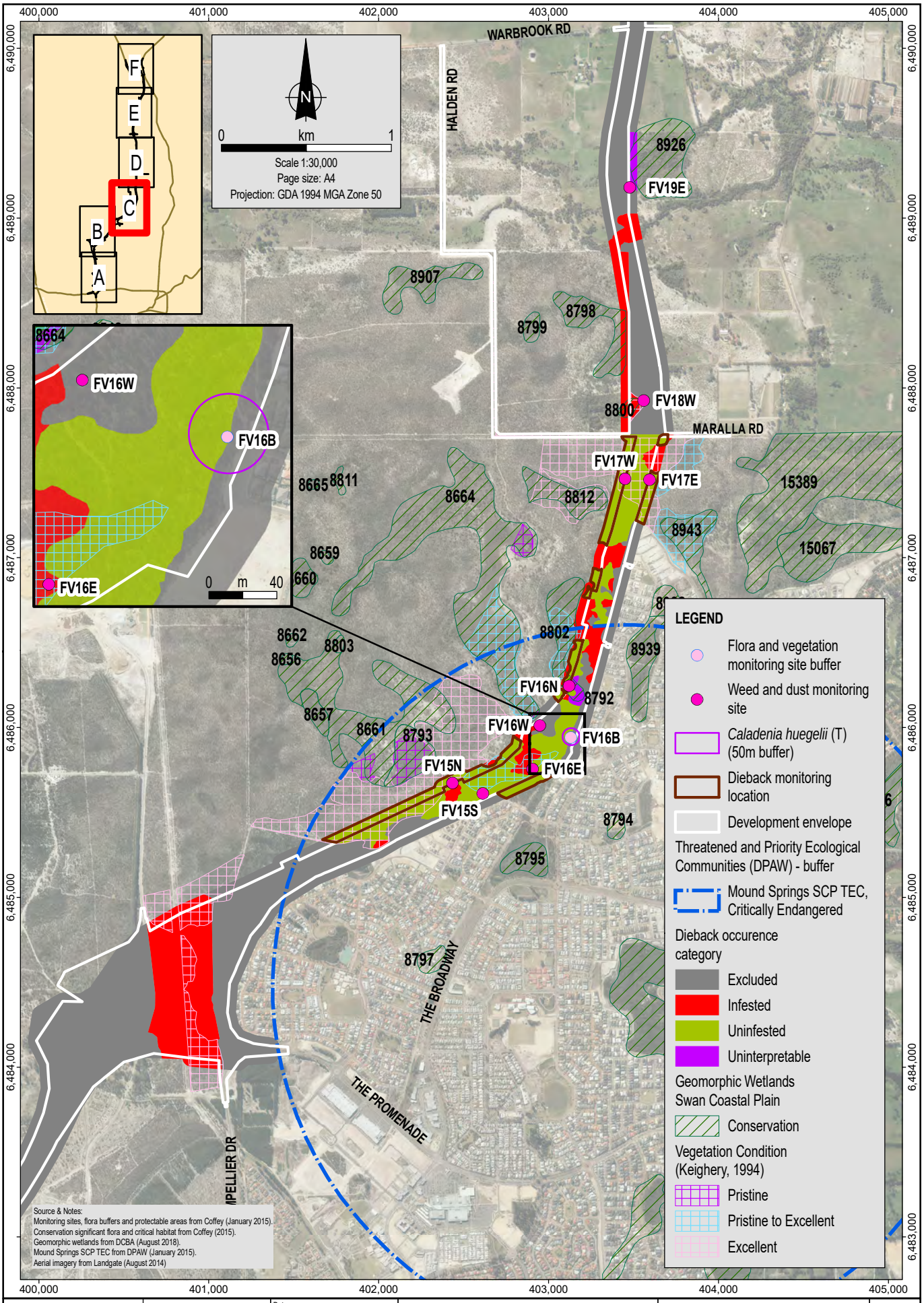

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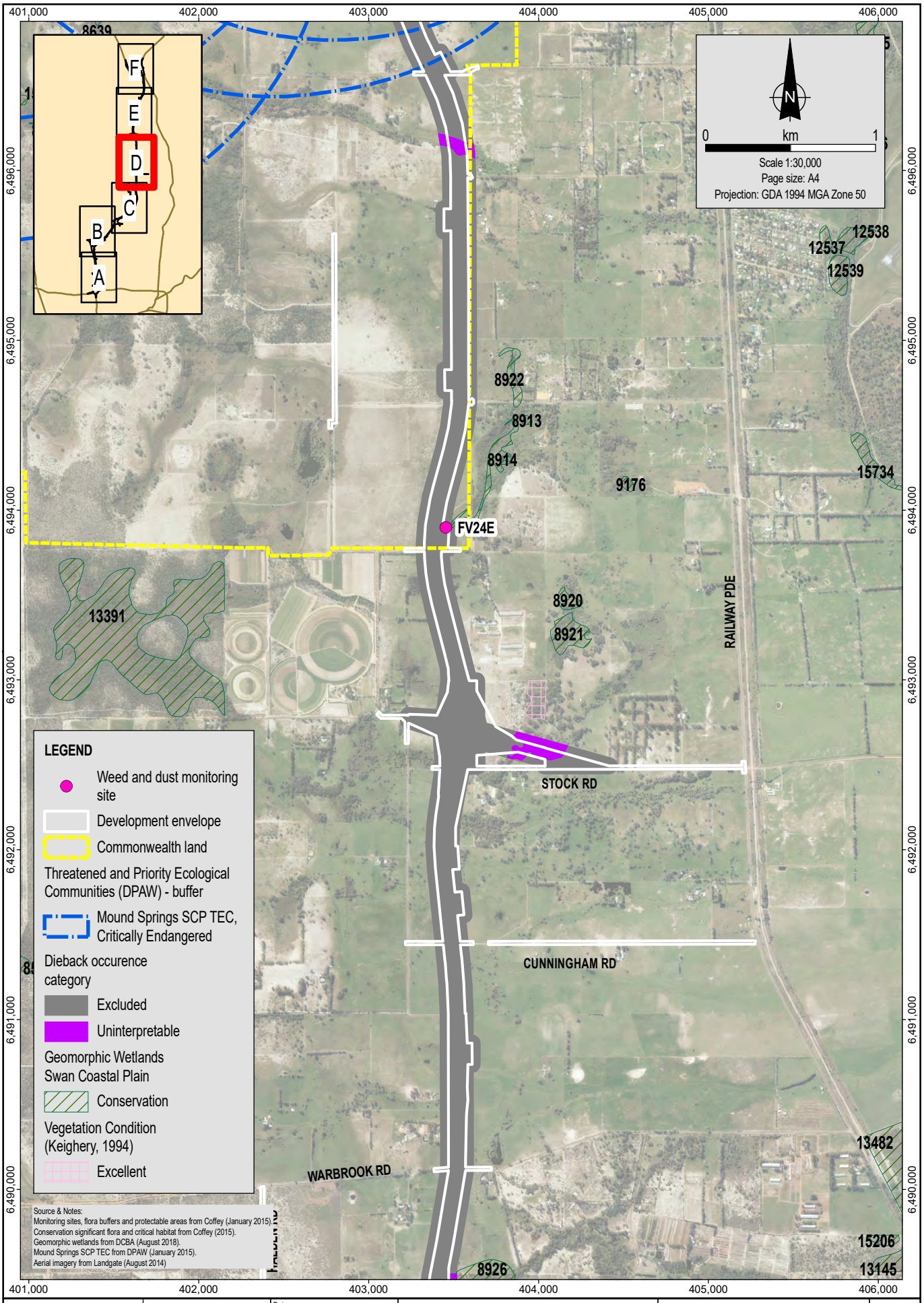

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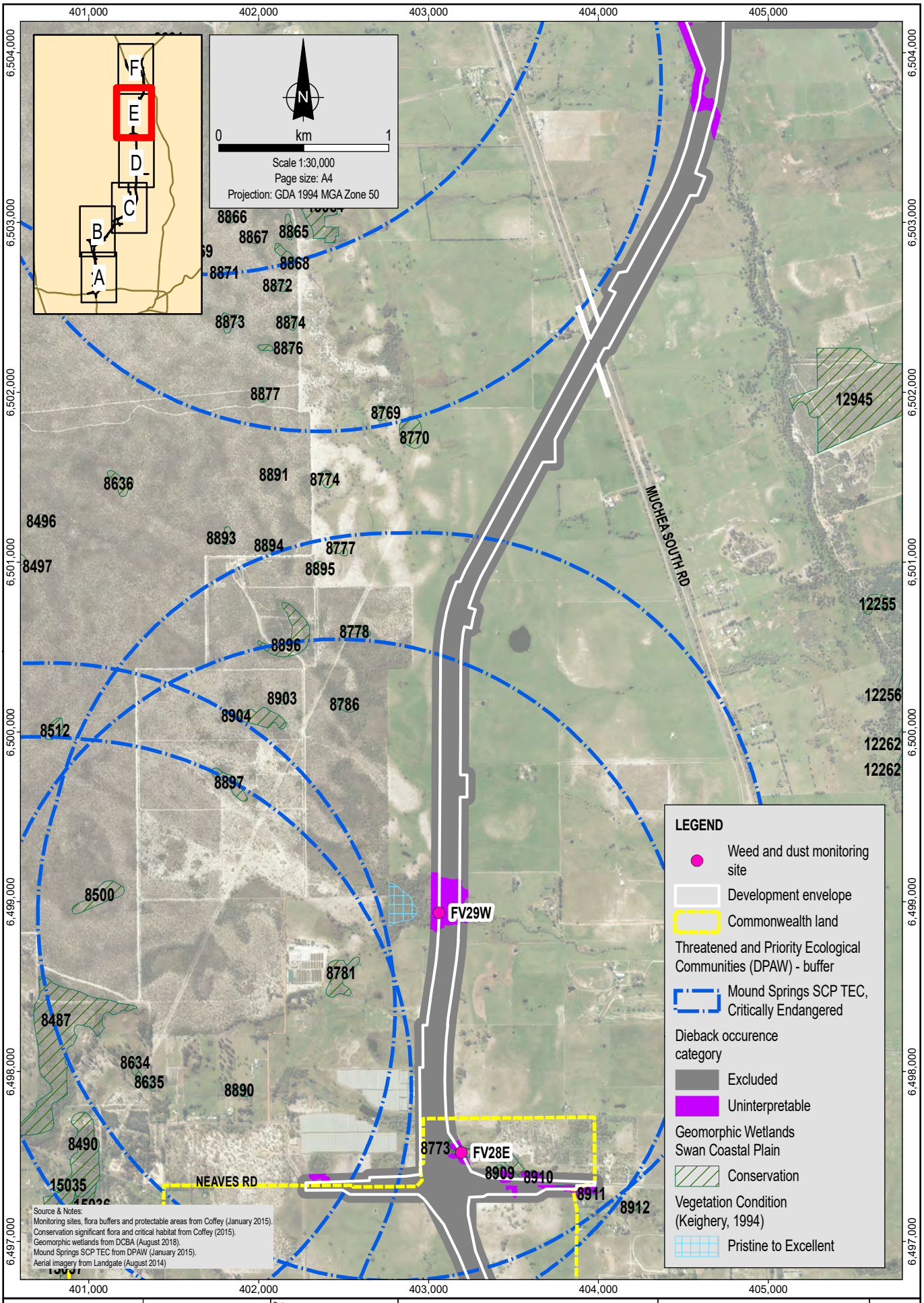

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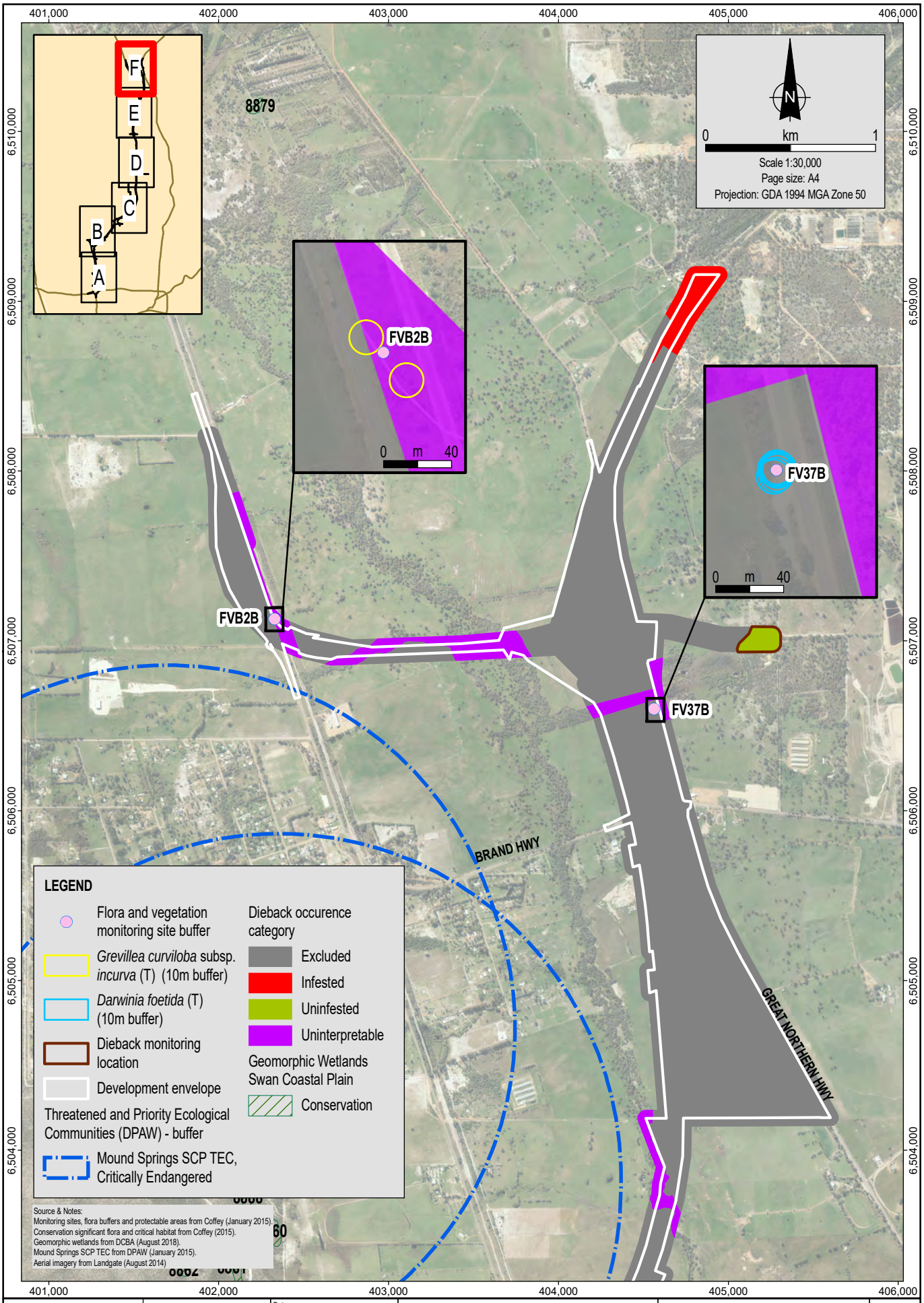
Date: 20.08.2018
MXD: 4483AA_58_GIS003_11
File Name: 4483AA_58_AppC_F005_GIS

Perth–Darwin National Highway
Flora and Vegetation
Construction Condition EMP

Locations of monitoring sites
Map 5 of 6

Figure No:
5



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Date: 20.08.2018
MXD: 4483AA_58_GIS003_11
File Name: 4483AA_58_AppC_F006_GIS

Perth–Darwin National Highway
Flora and Vegetation Construction Condition EMP

Locations of monitoring sites
Map 6 of 6

Figure No: 6

APPENDIX D

Transect Monitoring Method

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FLORA AND VEGETATION MONITORING METHOD

The following monitoring method has considered the following standard and guidelines in the preparation of this documents:

- Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004).
- Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and DPAW, 2015).
- Standard Operating Procedure Establishing Vegetation Transects SOP No. 6.2 (DEC, 2009).

Transect Monitoring Method

Transect monitoring sites will be located in remnant vegetation along the development envelope and close to environmentally sensitive areas and weed free native flora and vegetation. Transects will not be placed within Completed Degraded areas. All monitoring will be undertaken by an experienced botanist.

Transects with plots will be established to monitor dust and weeds as a result of construction activities, such that:

- Monitoring sites will be spaced at approximately 1 km intervals to represent the entire length of the alignment.
- Transects will start from the new vegetation edge (outside the road reserve) and the location will be recorded by GPS. A permanent marker will be used to mark the transect start point.
- At each monitoring site a transect line will be run perpendicular to the development envelope for 30 m.
- 2 x 2 m plots will be placed at 5 m intervals along the transect with the first plot at 0 m and the last at 30 m (Figure 2).
- The first plot will be established between 0 and 2 m along the transect. Each plot will placed alternately left and right of the transect line.

The transect monitoring method will be used to measure a gradient of dust and weed impacts perpendicular to the new vegetation edge.

The impact quadrats (located within the initial 10 m of the transect) will be compared against the control quadrats (located beyond the 10 m mark of the transect) along each transect (Figure 2). The results of monitoring will be graphically represented to show variation along the length of each transect over time. If any indirect impacts are occurring, they would be expected to be observed as a change over time in one or more parameters in the impact quadrats without a corresponding change being recorded in control quadrats. Over time, the comparison will also allow determination of whether indirect impacts, if any are occurring, are extending beyond the predicted 10 m from the new vegetation edge and into the control quadrats. Each transect will be tested independently from the remaining transects as the prevailing environment (i.e. vegetation structure, condition, environmental receptor) at each location will be different.

Within each plot the following parameters will be recorded:

- Introduced vegetation cover (%).
- Introduced species diversity (richness and abundance).

- Level of dust (0-4 scale) (refer to Table 1).
- Plant deaths.
- Vegetation condition (Keighery, 1994).
- Level of plant stress (0-4 scale) (refer to Table 1).

Along each transect the following measures will be recorded:

- Evidence of unauthorised access (from the road reserve).
- Vegetation condition.

A photo will be taken at the start and end point of each transect, facing towards the middle of the transect.

Dust Deposition/Plant Stress Indicator

Plant stress can be caused by a range of anthropogenic and natural factors including drought. The assessment of plant stress caused by dust deposition will consider other factors prevailing at the time. It will be assessed by observation of evidence of wilting of foliage and the extent of wilting, and/or leaf colour for species where wilting and curling of leaves is not typically exhibited.

A scale comprising five increments will be used to indicate the extent of deposition and level of stress a plant is potentially under. Table 1 lists the indicators to be used in assessing dust deposition and plant stress. The most suitable score will be assigned based on the criteria available and their applicability to the vegetation being assessed, e.g. for species where leaf colour is the appropriate indicator, the percentage of plants or foliage cover affected will be used to determine the plant stress score.

Table 1 Level of dust scale

Rating	Dust deposition	Plant stress
0	No evidence of dust deposition.	No evidence of wilting of foliage. Foliage intact and healthy. Plants not stressed.
1	Evidence of dust deposition (minor discolouration indicating fine dust particles on surface of leaves).	Plant leaves show signs of wilting at periphery. Less than 10% of plants or foliage cover affected. Plants potentially stressed.
2	Evidence of dust deposition (minor dust build up visible on surface of leaves).	Plant leaves wilting with noticeable curling of leaf periphery. 10% to 20% of plants or foliage cover affected. Plants exhibiting symptoms of stress.
3	Evidence of dust deposition (moderate dust build up visible on surface of leaves).	Plant leaves wilting with noticeable curling of leaf. 20% to 30% of plants or foliage cover affected. Plants exhibiting signs of stress.
4	Evidence of dust deposition (heavy dust build up visible on surface of leaves).	Plant leaves wilting with noticeable curling of leaf (approaching closure). More than 30% of plants or foliage cover affected. Plants clearly stressed.

The dust deposition/plant stress indicator is the aggregate of the observed deposition of dust and the indicator of plant stress. Plants from various species will respond in different ways to dust deposition. Stress may be induced in some plants by minor build-up of dust, whereas other plants may tolerate heavier build-up with no adverse effects. An aggregate score of 7 will be used as an early warning indicator.

Buffer Monitoring Method

The buffers for the known locations of Threatened flora for the individual of *Caladenia huegelii* and individuals of *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida* will be monitored using the same transect monitoring parameters to monitor dust and weeds as a result of construction activities.

The transect monitoring method will be used for the *Caladenia huegelii* 50 m buffer.

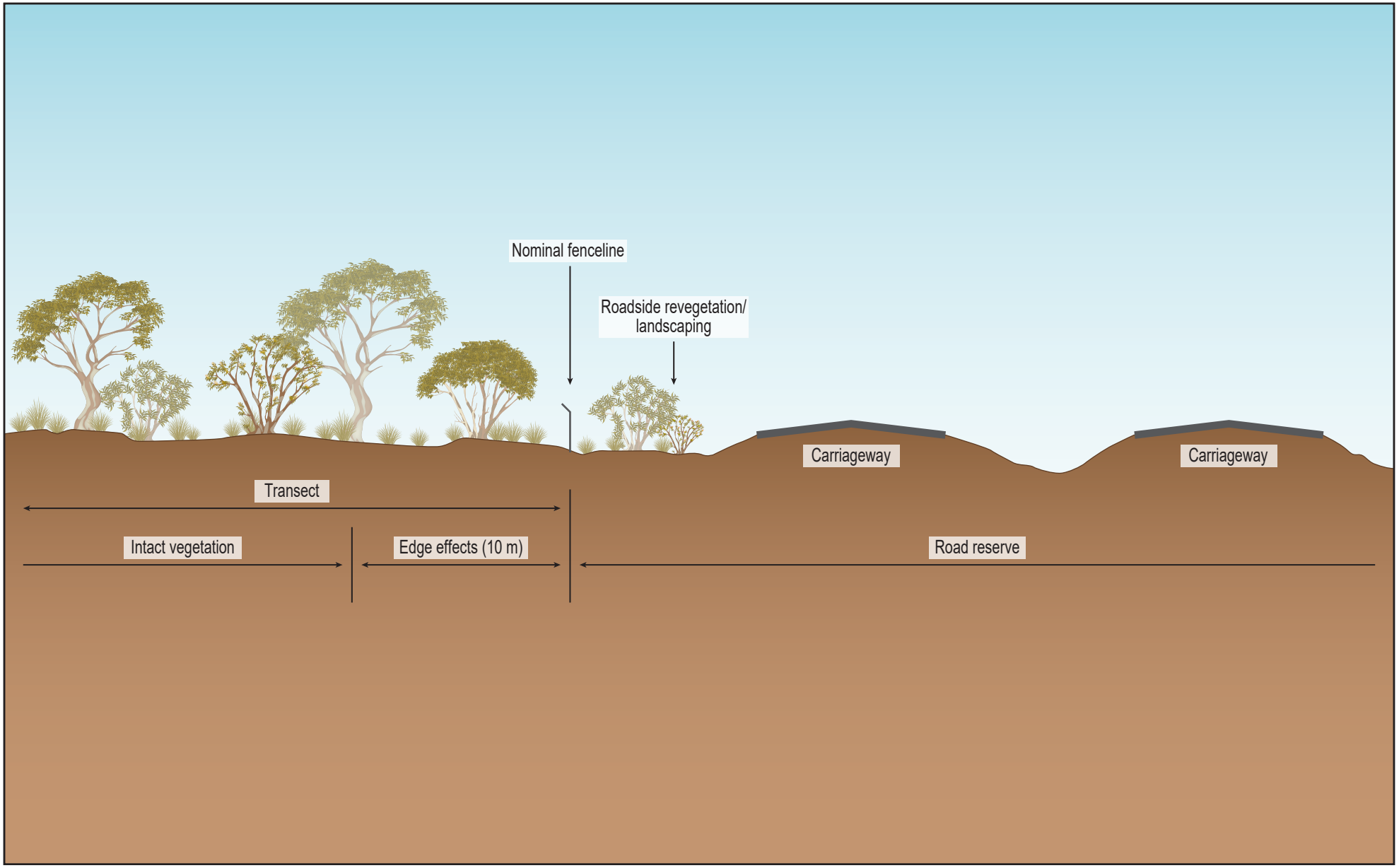
The monitoring method for *Grevillea curviloba* subsp. *incurva* and *Darwinia foetida* buffers will not include individual quadrats given the limited size of the 10 m buffer. A photo-monitoring point will be established on the edge of the 10 m buffers with photos taken looking towards the known populations.

Additional monitoring parameters that will be recorded for the buffer monitoring methods include:

- Evidence of unauthorised access.
- Presence of laydown or stockpiles.

References

- DEC. 2009. Standard Operating Procedure: establishing Vegetation Transects. SOP No. 6.2. June. Department of Environment and Conservation, Kensington, Western Australia.
- EPA. 2004. Guidance for the Assessment of Environmental Factors – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51. June. Environmental Protection Authority, Western Australia.
- EPA and DPAW. 2015. Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment. December. Environmental Protection Authority and Department of Parks and Wildlife, Perth, Western Australia.
- Keighery, B. 1994. Bushland Plant Survey: A guide to plant community survey for the community. Wildflower Society of Western Australia, Nedlands, Western Australia.



Note:
Minimum length of transect ~30 m
Drawing is not to scale and is for illustrative purposes only.

NorthLinkWA

coffey
A TETRA TECH COMPANY

Date:
05.08.2016

File Name:
4483AA_59_F001_GRA

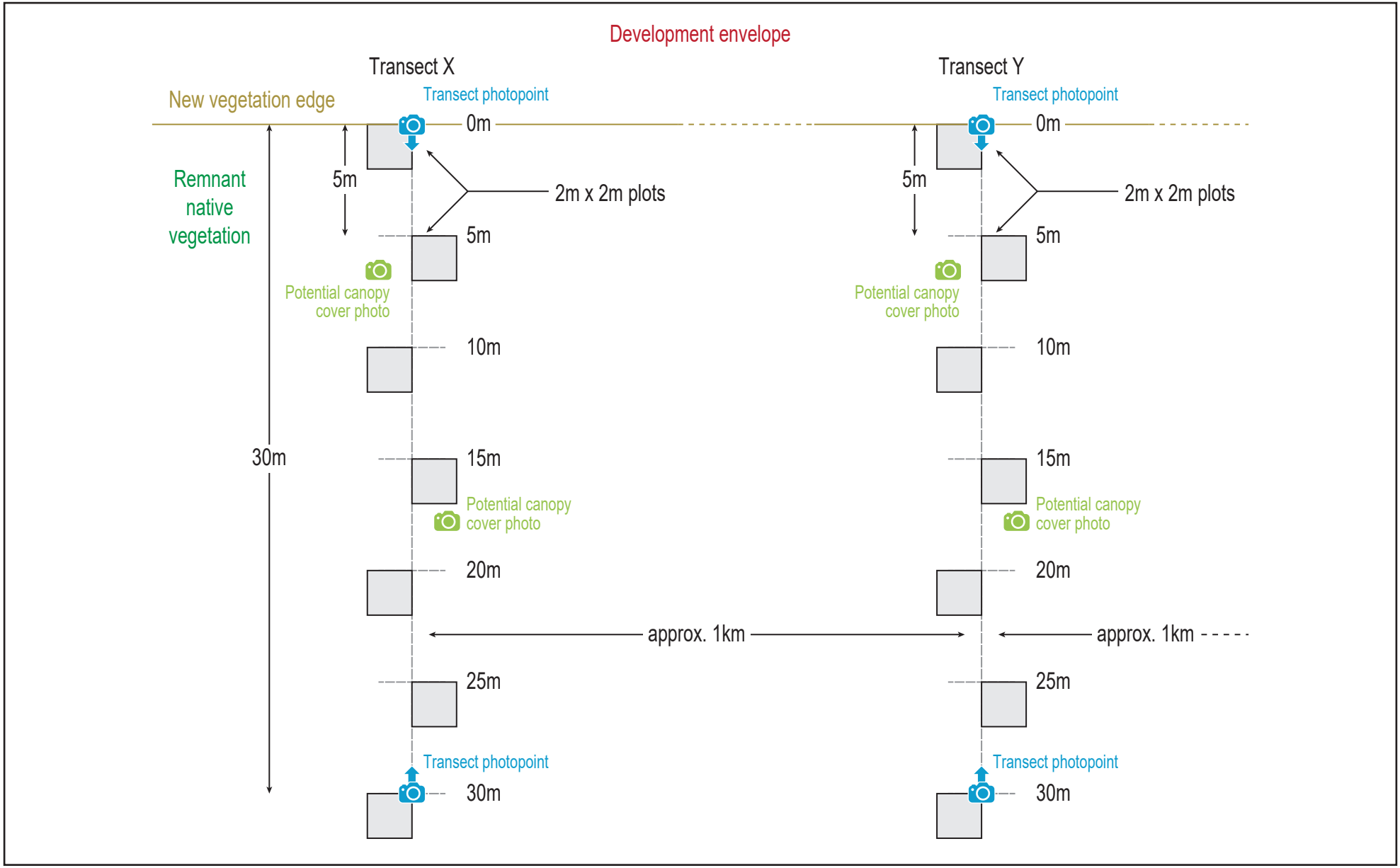
Perth–Darwin National Highway

Flora and Vegetation Construction Condition EMP

Monitoring Concept Illustration (proposed arrangement of transect)

Figure No:
1

AI Reference: 4483AA_59_GRA001_v2ai



Note: Drawing is not to scale and is for illustrative purposes only.	NorthLinkWA	coffey A TETRA TECH COMPANY	Date: 17.01.2017 File Name: 4483AA_59_F003_GRA	Perth–Darwin National Highway Flora and Vegetation Construction Condition EMP	Typical transect line	Figure No: 2

AI Reference: 4483AA_59_GRA003_v2.ai_5

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Australian Government

mainroads WESTERN AUSTRALIA

NorthLinkWA

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Mr John Braid
Principle Environmental Officer
Main Roads Western Australia
PO Box 6202
EAST PERTH WA 6892

Our Ref: *DWERA-001936*
Your Ref: *13/1616-02*
Enquiries: *Pip Marshall; 6364 7329*
Email: pip.marshall@dwer.wa.gov.au

VIA EMAIL: john.braid@mainroads.wa.gov.au

Dear Mr Braid

Perth-Darwin National Highway (Swan Valley section) – Ministerial Statement 1036 – Flora and Vegetation – Construction Condition Environmental Management Plan – Addendum – Approved

Thank you for your letter on 27 May 2019, submitting the Addendum to *"Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"* to the Department of Water and Environmental Regulation (DWER) for review.

I note that the addendum (Addenda 1) updates Table 6 of the *"Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"* to include post-construction monitoring frequency. Condition 9-6 of Ministerial Statement 1036 requires that post construction monitoring be undertaken for three years.

I am satisfied with the changes to Table 6 as set out in the Addenda 1 to *"Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"*, and consider that the outcome of condition 9-6 can be met with the continued implementation of the *"Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"*.

Please note any changes to the *"Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"* and the addendum would require the approval of the DWER.

Yours sincerely

Anthony Sutton
Executive Director
EPA Services
For the Chief Executive Officer under Notice of Delegation dated 3 July 2017

2 July 2019

Prime House, 8 Davidson Terrace Joondalup Western Australia 6027
Locked Bag 10 Joondalup DC WA 6919
Telephone: 08 6364 7000 Facsimile: 08 6364 7001
www.dwer.wa.gov.au

Enquiries: John Braid ph: 9323 6183
Our Ref: 13/1616-02
Your Ref: MS1036

27 May 2019

Mr Mike Rowe
Chief Executive Officer
Department of Water and Environmental Regulation
Environmental Protection Authority Locked Bag 33
Cloister Square Perth WA 6850

Dear Mr Rowe

Ministerial Statement 1036 – Addendum to Flora and Vegetation – Construction – Condition Environmental Management Plan

Main Roads Western Australia is currently implementing the Ministerial Statement 1036 (MS 1036) through the construction of the Northlink WA project. In implementing the proposal, Main Roads has been implementing the "Flora and Vegetation – Condition – Environmental Management Plan Rev 5" as required under condition 9 of MS 1036 and approved on 13 March 2019.

In accordance with condition 7-5 of MS 1036 Main Roads has reviewed the "Flora and Vegetation – Condition – Environmental Management Plan Rev 5" and is proposing a revision through an addendum to the existing plan (see attached Addenda 1).

The proposed addendum clearly states the post-construction monitoring frequency required under the "Flora and Vegetation – Condition – Environmental Management Plan Rev 5". Currently the CEMP does not have any specified post-construction monitoring frequency. The addenda addresses this by modifying the existing Table 6 of the CEMP.

Please contact John Braid on ph: 9323 6183 or john.braid@mainroads.wa.gov.au for further information

Yours sincerely

John Braid
Principal Environment Officer

Enc: Addenda 1 to "Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5"

Addenda 1 to “Flora and Vegetation – Construction – Condition Environmental Management Plan Rev 5”

Table 6 Monitoring to measure the efficacy of management actions against the management target (edits from original plan are highlighted in yellow).

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 1: No introduction of *Phytophthora cinnamomi* into disease-free areas by construction activities.					
Phytophthora cinnamomi infestation.	Dieback occurrence mapping will be conducted by an accredited person using methods consistent with Terratree (2014) and in accordance with DPAW’s Manual for detecting *Phytophthora* dieback disease (Procedures for DPAW managed lands) (2013) including: • Identifying visible symptoms of disease in species susceptible to *P. cinnamomi* . • Confirming disease presence through laboratory analysis of soil and plant tissues. • Dieback management plan.	Boundary of, and up to 10 m within, all disease-free areas adjacent to the development envelope (as shown in Figures 1, 3 and 6 in Appendix C).	Location of disease front. Signs of significant erosion and surface water leaving the development envelope into disease-free areas.	• Pre-construction (after significant spring rainfall and increasing soil temperatures). • Construction – annually (after significant spring rainfall and increasing soil temperatures). • Post-construction – annually (after significant spring rainfall and increasing soil temperatures).	Non-conformance with the dieback management plan.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 2: No loss of flora or vegetation from dust generated by construction activities within the development envelope and adjacent environmentally sensitive areas.					
Loss of flora and vegetation due to dust smothering.	Visual observations by a experienced botanist for presence of dust on flora and vegetation and signs of plant stress at 5 m intervals, along a 30 m long transect at each monitoring site. Record observations within a plot at each 5 m interval. Photographic record of transect. Refer to Appendix D for detailed method including transect and plot design and placement.	At monitoring sites (transects) as shown in Appendix C, specifically: **Environmentally sensitive areas:** • *Caladenia huegelii* 50 m buffer – FV16B. • *Grevillea curviloba* subsp. *incurva* 10 m buffer – FVB2B. • *Darwinia foetida* 10 m buffer – FV37B. • CCWs – FV02E, FV04S, FV04E, FV06W, FV16W, FV16N, FV18W, FV19E, FV24E, FV28E. • Communities of Tumulus Springs – FV29W. **Native flora and vegetation in Excellent to Pristine condition:** • FV05W, FV05E, FV06W, FV06E, FV08W, FV08E, FV09E, FV14N, FV15N, FV15S, FV16E, FV16W, FV16N, FV17W, FV17E, FV18W.	Observations of dust covering on plant leaves and signs of stress including: • Location. • Species. • Extent of dust deposition (0-4 scale)/ plant stress (0-4 scale). Refer to Appendix D.	• Quarterly during construction. • Annually post-construction in spring	Dust / plant stress aggregate scale of 7 recorded.
	Visual observations for dust on flora and	Clearing edge within the development envelope.	Observations of dust covering on plant leaves including:	• Weekly during construction	• Dust covering on plants with a score of 2 or higher

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
	vegetation along clearing edge.		• Location • Extent of dust deposition (0-4 scale)	• Not required post-construction.	
Management target 3: No new declared weed species introduced into the development envelope or adjacent environmentally sensitive areas.					
New declared weed species.	Visual observations by an experienced botanist for spread of new declared weed species along clearing edge.	Clearing edge within the development envelope.	Location of declared weed infested areas within the development envelope including weed species, density and/or numbers from pre-construction monitoring observations.	• Pre-construction (spring) – declared weed survey mapping. • Construction – monthly visual inspections and annual declared weed survey mapping. • Post-construction annual declared weed survey mapping.	• Increase in declared weed species, density and/or numbers from pre-construction monitoring observations in the development envelope.
	Spot check of vehicle compliance with clean on entry/exit procedures.	Vehicles and clean on entry/exit points.	Clean on entry/exit records.	• Weekly and unscheduled inspections. • Not required post-construction.	• Non-conformance with weed management plan.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
Management target 4: No weeds introduced or spread by construction activities to weed-free areas in the development envelope and adjacent environmentally sensitive areas.					
Spread of weeds.	Visual observations by an experienced botanist for spread of weeds at 5 m intervals, along a 30 m long transect at each monitoring site. Record observations within a plot at each 5 m interval. Photographic record of transect. Recording of locations of weeds by GPS and photographs. Refer to Appendix D for detailed method including transect and plot design and placement.	At monitoring sites (transects) as shown in Appendix B and C, specifically: **Environmentally sensitive areas:** *Caladenia huegelii* 50 m buffer – FV16B. *Grevillea curviloba* subsp. *incurva* 10 m buffer – FVB2B. *Darwinia foetida* 10 m buffer – FV37B. CCWs – FV02E, FV04S, FV04E, FV06W, FV16W, FV16N, FV18W, FV19E, FV24E, FV28E. Communities of Tumulus Springs – FV29W. **Native flora and vegetation not infested by weeds:** Excellent to Pristine vegetation – FV05W, FV05E, FV06W, FV06E, FV08W, FV08E, FV09E, FV14N, FV15N, FV15S, FV16E, FV16W, FV16N, FV17W, FV17E, FV18W.	Number, species and location of weeds.	• Pre-construction (spring) – weed survey. • Construction – annual weed survey. • Post-construction – annual weed survey	• Increase in weed species, density and/or numbers from pre-construction monitoring observations within the development envelope and adjacent environmentally sensitive areas.

Indicator	Method	Monitoring site/location	Parameters	Frequency	Early warning indicator
	Visual observations for spread of weed species along clearing edge.	Clearing edge within the development envelope.	Number, species and location of weeds.	• Monthly during construction • Annually post-construction.	• Increase in weed species, density and/or numbers from pre-construction monitoring observations within the development envelope.
	Spot check of vehicle compliance with clean on entry/exit procedures.	Vehicles and clean on entry/exit points.	Clean on entry/exit records.	• Weekly and unscheduled inspections. • Not required post-construction.	• Non-conformance with weed management plan.
Management target 5: No disturbance of the buffers around threatened flora species *Caladenia huegelii, Grevillea curviloba* subsp. *incurva* and *Darwinia foetida*.					
Clearing, laydowns or stock piles located within buffer of threatened flora species	Visual inspection of buffers established around threatened flora species (see Figures 3 and 6 in Appendix C).	In vegetated buffers established around known Threatened flora as shown in Appendix C, specifically: • FV16B – *Caladenia huegelii* 50 m buffer. • FVB2B – *Grevillea curviloba* subsp. *incurva* 10 m buffer. • FV37B – *Darwinia foetida* 10 m buffer.	Observations of disturbance in buffers including: • Evidence of unauthorised access. • Presence of laydown areas or stockpiles.	• While construction activities are occurring within proximity of threatened flora - weekly. • At all other times during construction – quarterly. • Post-construction – annually.	• Evidence of disturbance to fences around the buffers established around Threatened flora species.