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Memorandum

To	Patrick Atkinson	From	Corey Roderick / Chris Schell
Copy	Adam Yem, Morag Elliott	Reference	247103-008
Date	24 February 2017	Pages (including this page)	7
Subject	Assessment of proposed amendments to the Ellendale Rehabilitation and Revegetation Plan		

Patrick,

This memorandum details the findings of Aurecon's assessment of the amendments to the Ellendale Rehabilitation and Revegetation Plan (for the development previously known as the Cedar Woods Development) made by on behalf of the proponent (Cedar Woods Properties Limited) on the 8th February 2017. This assessment was undertaken with the view to determine if the intent of Condition 8 of the Ministerial approval has been achieved.

Specifically within Condition 8 (Rehabilitation Plan), point (v) states:

"Bushland restoration works to target areas that are currently deficient of an existing vegetation structure and floristic composition and will ultimately aim to achieve vegetation structure and floristic composition that is commensurate with the regional ecosystem identified on the site. Alternative regional ecosystems may be appropriate for areas with landforms influenced by unnatural levels or soil moisture or altered landform."

It is understood that amendments to the previous Ellendale Rehabilitation and Revegetation Plan were made on behalf of the proponent in order to alleviate issues associated with potential bushfire hazard ratings associated with the proposed vegetation communities, with the updated Rehabilitation Plan significantly reducing these risks.

1 Methodology followed

In order to determine if the intent of Condition 8 of the Ministerial decision has been achieved, Aurecon undertook an assessment of the original *Rehabilitation and Revegetation Plan* prepared by 28 South Environmental for Cedar Woods Properties Limited (dated Monday 21 September 2015 and referred to in the development approval dated 15th January 2016), and compared this to the updated Rehabilitation and Revegetation Plan titled *Cedar Woods Regional Ecosystem* prepared by Land Partners (plan number: WC006686.000-015) on the 8th February 2017 for Cedar Woods Properties Limited.

Specifically, the following comparisons were undertaken in relation to the Category 3 Corridors as identified in the Infrastructure Agreement for the development:

- a. Comparisons of the Regional Ecosystem (RE) codes used for rehabilitation purposes detailed in the Rehabilitation and Revegetation Plans
- b. Comparisons of the habitat differences between the RE codes detailed in the Rehabilitation and Revegetation Plans
- c. Determination of whether any changes are "commensurate" of the RE codes for the development
- d. Assessment of whether any changes will fulfil an ecosystem function role for the development.

In addition to the consideration of ecological matters relating to the proposed updated Rehabilitation and Revegetation Plan, an assessment has also been undertaken to confirm whether proposed changes to vegetation types for the development will materially impact on the stormwater function of the Category 3 corridors, and therefore compliance with the conditions of the Ministerial decision.

2 Findings

Ecology assessment

Assessment of the original Rehabilitation and Revegetation Plan indicates that within Category 3 Corridors three (3) REs were proposed (ie RE 12.3.2, RE 12.3.7 and RE 12.11.3). By comparison, these areas have now, as part of the updated Rehabilitation and Revegetation Plan, been amended to reflect five (5) REs (ie RE 12.3.7, RE 12.3.7b, RE 12.3.16, RE 12.11.3a and RE 12.11.25). In addition to these REs, several additional “non-remnant” treatments are proposed (ie. Low grass or tree Cover in rural areas, Low grass or tree Cover in built-up areas and Low grass or tree Cover in built up areas – Fig treatment).

A summary of the original RE code proposed for revegetation and the updated RE codes/treatments is provided in **Table 1** attached with this memorandum.

Comparison of the two Rehabilitation and Revegetation Plans indicates that reduction in the fire risk/frequency of burns has occurred as a result of the modified RE codes (refer to “fire management guidelines” within Table 1). In addition it is also noted that the updated RE codes, with the addition of “Fig treatments”, provide increased habitat opportunities for fauna when areas are fully restored (eg Wetland REs, increased availability of food and structurally diverse ecosystems). Furthermore, the additional REs contained within the updated Rehabilitation and Revegetation Plan are known to support conservation significant species (ie Coxen's Fig Parrot (*Cyclopsitta diophthalma coxeni*), Native Jute (*Corchorus cunninghamii*), *Macadamia* spp. and Native Milk-vine (*Marsdenia* spp.). The greater diversity of habitats and vegetation structure is likely to result in an increased ecosystem role for the development.

It is considered from this assessment that although some of the amendments in the updated Rehabilitation and Revegetation Plan are not analogous to the original Plan or REs present on site, the proposed RE changes are likely to result in the following benefits:

- An increased ecosystem function role for the development
- Reduction in potential bushfire hazard ratings
- Vegetation that is structurally similar to the REs proposed by the original Rehabilitation and Revegetation Plan
- Provision of a diversity of habitats capable of supporting conservation significant species
- Provision of continuous rehabilitation zones that will facilitate fauna movement through the development

It is therefore considered that, from this assessment of the updated Rehabilitation and Revegetation Plan, the proposed REs generally correspond to the REs identified on the site in relation to vegetation structure and general species diversity. In addition, alternative REs have been proposed where landforms/landzones dictate a more appropriate RE.

Stormwater Assessment

Vegetation has the potential to impact upon flooding, as denser vegetation has the ability to slow down flood waters and therefore increase flood levels. Aurecon have reviewed the proposed change in vegetation densities at elevations which are potentially impacted by flooding. This review shows that no changes are proposed to the vegetation types in the immediate vicinity of the flow paths.

There are some changes in vegetation density proposed in areas not directly connected to the flow paths, which may increase flood levels a small (presently unquantified) amount. Calibre undertook a sensitivity analysis as part of their original assessment, which showed that if vegetation densities were significantly increased, the minimum development levels would still maintain adequate freeboard. For this reason it is expected that a small increase in flood levels would not impact upon the flood immunity or freeboard of the development and it is not considered necessary to quantify any increase in flood levels.

Overall, Calibre's assessment that "there will be no material change to the outcomes of the flood investigation as a result of the updated vegetation rehabilitation plan" is consistent with the outcomes Aurecon's review.

3 Conclusion

Aurecon's assessment of the updated Ellendale Rehabilitation and Revegetation Plan has found that the proposed changes to vegetation types and densities within the Category 3 corridors will maintain the intent of the original rehabilitation strategy and will not materially impact on the stormwater function of the corridors. Accordingly, it is considered that the updated Ellendale Rehabilitation and Revegetation Plan is consistent with the conditions of the Ministerial decision, and specifically with the intent of Condition 8 (Rehabilitation Plan).

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Memorandum

Table 1. Summary of differences between the Original and the New Rehabilitation and Revegetation Plan for the Ellendale Development

Original Rehabilitation Units				Amended Rehabilitation Units				Differences between proposed REs	Summary of benefits/detractions as a result of the proposed changes
RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)	RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)		
Category 3 Corridors									
12.3.7	Narrow fringing woodland of <i>Eucalyptus tereticornis</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> +/- <i>Melaleuca viminalis</i> , <i>Waterhousea floribunda</i> . Other species associated with this RE include <i>Melaleuca bracteata</i> , <i>M. trichostachya</i> , <i>M. linariifolia</i> and <i>M. fluviatilis</i> in north of bioregion. <i>Lomandra hystrix</i> often present in stream beds. Occurs on fringing levees and banks of rivers and drainage lines of alluvial plains throughout the region.	Provides habitat for Koala (Koala food trees present) Acts as a fauna conduit along riparian corridors	STRATEGY: Avoid intentionally burning this fringe vegetation. Burn surrounding ecosystems in conditions that would minimise fire incursion.	12.3.7	Narrow fringing woodland of <i>Eucalyptus tereticornis</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> +/- <i>Melaleuca viminalis</i> , <i>Waterhousea floribunda</i> . Other species associated with this RE include <i>Melaleuca bracteata</i> , <i>M. trichostachya</i> , <i>M. linariifolia</i> and <i>M. fluviatilis</i> in north of bioregion. <i>Lomandra hystrix</i> often present in stream beds. Occurs on fringing levees and banks of rivers and drainage lines of alluvial plains throughout the region.	Provides habitat for Koala (Koala food trees present) Acts as a fauna conduit along riparian corridors	STRATEGY: Avoid intentionally burning this fringe vegetation. Burn surrounding ecosystems in conditions that would minimise fire incursion.	No difference – Same RE	Overall the amendment to the RE provides additional habitat in the form of wetland communities and maintains the intent of the original rehabilitation strategy. The change is considered to be commensurate in relation to vegetation communities on site. No change in fire management
				12.3.7b	Riverine wetland or fringing riverine wetland. Naturally occurring waterholes and lagoons, both permanent and intermittent. Includes exposed stream bed and bars. Occurs in the bed of active (may be intermittent) river channels	Provides habitat for wetland species		Wetland associated community	
12.3.2	<i>Eucalyptus grandis</i> +/- <i>E. microcorys</i> , <i>Lophoslemon confertus</i> tall open forest with vine forest understorey (wet sclerophyll). Patches of <i>Eucalyptus pilularis</i> sometimes present especially in vicinity of sedimentary rocks	Acts as a fauna conduit along riparian corridors Habitat for threatened flora species including <i>Marsdenia longiloba</i> and near	SEASON: Late summer to autumn INTENSITY: Moderate to high INTERVAL: Minimum 20 years, maximum unknown,	12.11.3a	<i>Lophoslemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E. carnea</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E. siderophloia</i> woodland. Occurs in gullies and exposed ridges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics	Acts as a fauna conduit along riparian corridors Habitat for threatened flora species including <i>Marsdenia longiloba</i> and near threatened species including <i>Liparis simmondsii</i> .	SEASON: Late summer to autumn. INTENSITY: Moderate to high. INTERVAL: Minimum 20 years, maximum unknown, requiring further research.	Different landzones Absence of <i>Eucalyptus grandis</i> (Flooded Gum) RE 12.113a represents onsite vegetation	When compared to the original RE, the proposed REs vary significantly in relation to landzone, canopy cover (ie Vine forest, Tall open forest, open forest and woodland) and habitat that they would provide to flora and fauna. However, the proposed REs do reflect vegetation and landscape features that are currently present on site (ie wetland areas,

RTI REVIEW

Original Rehabilitation Units				Amended Rehabilitation Units				Differences between proposed REs	Summary of benefits/detractions as a result of the proposed changes
RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)	RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)		
	Fringing streams and in narrow gullies in high rainfall areas	Threatened species including <i>Liparis simmondsii</i> Provides habitat for Koala (Koala food trees present)	requiring further research			Provides food resources for Koalas			presence of <i>Corymbia henryi</i> and existing landzones (ie Land zone 11).
				12.3.16	Complex notophyll to microphyll vine forest on alluvial plains	Habitat for threatened flora species including <i>Xanthostemon oppositifolius</i> , <i>Fountainia rostrata</i> , <i>Macadamia integrifolia</i> and <i>M. ternifolia</i> . Habitat for threatened fauna species including Coxon's Fig Parrot (<i>Cyclopsitta diophthalma coxeni</i>) and the Richmond Birdwing Butterfly (<i>Ornithoptera richmondia</i>) Important for fruit-eating birds, many of which migrate seasonally from upland to lowland rainforest	STRATEGY: Avoid intentionally burning this community	Community generally lacks Myrtaceous species (Eg. <i>Eucalyptus</i> , <i>Lophostemon</i> , <i>Corymbia</i> and <i>Melaleuca</i>)	In relation for flora and fauna habitat values, the proposed REs are likely to provide a greater diversity of fauna habitat values and an increase in food availability to frugivorous (ie fruit-eating) species (ie Flying foxes, possums, parrots and native pigeons) as a result of incorporating native Fig species into the rehabilitation area. In relation to fire management strategies, the proposed amendments to the rehabilitation REs would result in a reduced fire risk overall.
				12.11.25	<i>Corymbia henryi</i> and/or <i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i> +/- <i>E. crebra</i> , <i>E. carnea</i> , <i>E. lindalae</i> woodland on mesomorphics +/- interbedded volcanics	Habitat for threatened flora species including <i>Sophora fraseri</i> Provides food resources for Koala	SEASON: Summer to winter INTENSITY: Low to moderate INTERVAL: 4-25 years	Landzone, community dominated by Eucalypts species other than <i>E. grandis</i>	
				12.3.7b	<i>Melaleuca bracteata</i> open forest +/- emergent <i>Eucalypts tereticornis</i> . Occurs in drainage depressions on	Provides habitat for small insectivorous birds such	STRATEGY: Avoid intentionally burning this community	Absence of <i>E. grandis</i> and vine forest understorey and presence of	

Original Rehabilitation Units				Amended Rehabilitation Units				Differences between proposed REs	Summary of benefits/detractions as a result of the proposed changes
RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)	RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)		
					Quaternary alluvial plains. Riverine wetland or fringing riverine wetland.			emergent <i>E. tereticornis</i> and <i>M. bracteata</i>	
				Low grass or tree Cover in built up areas - Fig treatment	Non-remnant, N/A	Figs will provide a valuable food source for vagile frugivorous species such as Flying Fox (<i>Pteropus</i> spp).	N/A	Non-remnant area	
				Low grass or tree Cover in built up areas	Non-remnant, N/A	Open areas will provide habitat for grassland species, the inclusion of trees will provide cover for insectivorous birds.	N/A	Non-remnant area	
12.11.3	<i>Eucalyptus siderophloia</i> and <i>E. propinqua</i> open forest +/- <i>E. microcorys</i> , <i>Lophostemon confertus</i> , <i>Corymbia intermedia</i> , <i>E. biturbinata</i> , <i>E. acmenoides</i> , <i>E. tereticornis</i> , <i>E. moluccana</i> , <i>Angophora leiocarpa</i> , <i>Syncarpia verecunda</i> with vine forest species and <i>E. grandis</i> or <i>E. saligna</i> in gullies. <i>Eucalyptus pilularis</i> and <i>E. tindaliae</i> sometimes present. Occurs predominantly on hills and ranges of Palaeozoic and older moderately to	Habitat for threatened flora species including <i>Corchoris cunninghamii</i> , <i>Marsdenia coronata</i> , and <i>Sophora fraseri</i> and near threatened species including <i>Acomis acoma</i> Provides habitat for Koala (Koala food trees present)	SEASON: Summer to winter INTENSITY: Plan for low to moderate Unplanned occasional high intensity wildfire will occur. INTERVAL: 4-8 years maintains a healthy grassy system. 8-20 years for shrubby elements of understorey	12.11.25	<i>Corymbia henryi</i> and/or <i>Eucalyptus fibrosa</i> subsp. <i>nicrosa</i> +/- <i>E. crebra</i> , <i>E. carneae</i> , <i>E. tindaliae</i> woodland on metamorphics +/- interbedded volcanics	Habitat for threatened flora species including <i>Sophora fraseri</i> Provides food resources for Koala	SEASON: Summer to winter INTENSITY: Low to moderate INTERVAL: 4-25 years	<i>Corymbia henryi</i> is the dominant species - Reflect identified on site. Presence of <i>E. fibrosa</i> in RE12.11.25. Absence of vine forest understorey	When compared to original RE, the proposed REs have a reduced fire risk (ie burn intervals are greater). Although RE 12.11.3a is considered analogous to RE 12.11.3 in relation to vegetation management status, dominant species within these two communities differ, with RE 12.11.3a being typical of gullies and areas of higher moisture. The proposed REs are characterised as "Woodland", and the original RE is categorised as "Open Forest" therefore planting densities would be slightly reduced as a result of the proposed changes.
				12.11.3a	<i>Lophostemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E. carneae</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E. siderophloia</i> woodland. Occurs in gullies and exposed ridges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics	Acts as a fauna conduit along riparian corridors Habitat for threatened flora species including <i>Marsdenia longifolia</i> and near threatened species including <i>Liparis simmondsii</i>	SEASON: Late summer to autumn INTENSITY: Moderate to high INTERVAL: Minimum 20 years, maximum unknown, requiring further research	Dominated by <i>L. confertus</i> , with lesser quantities of <i>Eucalyptus</i> species. Community typical of gullies.	



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Original Rehabilitation Units				Amended Rehabilitation Units				Differences between proposed REs	Summary of benefits/detractions as a result of the proposed changes
RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)	RE proposed	Description (REDD)	Habitat features	Fire Management Guidelines (REDD)		
	strongly deformed and metamorphosed sediments and interbedded volcanics.			Low grass or tree Cover in rural areas	Non-remnant, N/A	Open areas will provide habitat for grassland species, the inclusion of trees will provide cover for insectivorous birds.	N/A	Non-remnant area	
				Low grass or tree Cover in built up areas	Non-remnant, N/A	Open areas will provide habitat for grassland species, the inclusion of trees will provide cover for insectivorous birds.	N/A	Non-remnant area	

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