MAIN ROADS WA – OFFSET PROPOSAL

Condition 16(b), CPS 818/5

Project:	Bussell Highway, Carbunup - SLK 67.50 - 70.76 Realign existing highway and improve intersections
Date:	22/03/2012
Manager:	Bruce Walker (Project Manager)
Clearing location:	Various locations on both sides of Bussell Highway between SLK 67.50 and 70.76.. The clearing extents occur approximately 7 km southwest of Busselton from the Carbunup Reserve south to Chambers Road. Approximately 0.83 ha of native vegetation is proposed to be cleared from 4 main patches of remnant vegetation and some smaller stands, all of which will be on land managed by Main Roads prior to clearing. Refer to Appendix 3 for site location and other maps showing remnant vegetation condition; remnant area numbers and ID numbers, proposed alignment, and proposed clearing and offset areas.
Offset location:	The environmental offsets are located adjacent to the proposed clearing, within the Bussell Highway easement and also on land proposed to be acquired. The offset sites can be seen in Appendix 3: Figure 3 and consist of: • SLK 68.0 – 68.45: Retaining the existing vegetated Bussell Highway road reserve (western side) (Remnant 3: ID 15) (0.75 ha). The retained vegetation is a Threatened Ecological Community (TEC) "Southern Eucalyptus (*Corymbia calophylla* woodlands on heavy soils (SCP 1b)" in very good condition and contains a population of Declared Rare Flora (DRF) (*Daviesia elongata* subsp. *elongata*) which is also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). • SLK 68.20-68.50: Revegetating acquired land (ID 13) (0.4 ha) to buffer part of the area above. • SLK 69.06 – 69.44: Retaining the existing vegetated Bussell Highway road reserve (western side) (Remnant 4: ID 16) (0.69 ha). The existing vegetation to be retained is a TEC as described above in good condition and contains a population of Priority 3 species, *Loxocarya magna* (Ekologica, 2011). • SLK 69.06 – 69.44: Rehabilitating and revegetating the existing road and road reserve (ID 14) (0.6 ha) that will become redundant due to the realignment which will act as a buffer to the retained area above.

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Offset description:	**Contributing Offsets:** • Retention, buffering and long term management of two identified TEC patches (totalling 1.44 ha) of good to very good condition and containing Priority and DRF species. • the installation and maintenance of fencing around the offset site at Remnant 4 and ongoing weed management as part of the MRWA maintenance program. • Transplanting and ongoing maintenance of approximately 0.005ha of the Priority 3 species *Loxocarya magna from Remnant 5 to Remnant 4. S*ome plants to be potted and housed in a nursery for 12 months specialised care prior to planting. **Direct Offset** The direct offset proposed includes the total revegetation of 1 ha of redundant road reserve and cleared paddock land, plus the retention of 1.44 ha of road verge vegetation in good to very good condition for conservation purposes. The revegetation includes as per the proposed Offset Revegetation Implementation Plan (Appendix 2): • 0.6 ha of road reserve between SLK 69.06 - 69.44, and • 0.4 ha of cleared paddock between SLK 68.20 - 68.52. Revegetation would involve the preparation of the land and planting of available local provenance species of similar species to those in the adjacent TECs. It is anticipated that seed would be sourced from the Carbunup Reserve (Shire of Busselton) located just over one kilometre north of the offset site. In addition, as standard Main Roads practice, some roadside verges of the new alignment will also be revegetated. These areas however are not included specifically in this proposal.

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Reason for offset & description of impacts:	The proposal is at variance to Principles (a), (d) and (e), and may be at variance to Principle (b). Principle (a) - *Native vegetation should not be cleared if it comprises a high level of biological diversity*. A population of the DEC Priority 3 species *Loxocarya magna*, which is not listed under the EPBC Act, was identified in an area proposed to be cleared in Remnant 5 covering approximately 0.005 ha (Ekologica 2011). Three Western Ringtail Possums (WRP) were also identified in Remnant 2. Principle (b) - *Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.* Remnant 2 contains known WRP habitat. The proposed clearing (0.14 ha) of the patch (0.67ha) may reduce the viability of the population in the long term. Principle (d) - *Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community*. Ekologica (2011) identified the TEC "Southern Eucalyptus (*Corymbia calophylla*) woodlands on heavy soils (SCP 1b)" within Remnants 1, 3 and 5. Clearing of approximately 0.54ha of vegetation within these Remnants is required. Principle (e) - *Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared*. The proposal would require the clearing of Jarrah Forest (Mattiske and Havel, 2002) which is considered to be an over cleared vegetation type, with less than 30% remaining in State-wide, Bioregional (IBRA Region) and LGA contexts.	
Offset Principles addressed: *Insert description of how each offset principle has been or will be addressed by the offset proposal.*	**Direct offsets:**	The direct offsets will counterbalance the loss of native vegetation.
	Contributing offsets:	The contributing offsets will assist in maintaining the ecological values of the TECs, (which contain DRF and Priority listed flora), by providing a buffer between Bussell Hwy and the TEC patches, retaining the TEC for conservation purposes and applying ongoing management to improve long term viability of those patches (fencing and weed control).
	Hierarchy of avoidance, minimisation, rectification, mitigation:	All opportunities to avoid, minimise, rectify and reduce impacts have been realised as shown in Appendix 1.

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Condition 16(b), CPS 818/5

Like for like or better:	The proposed offsets are designed to result in a net environmental benefit by revegetating cleared pasture land, improving the size and viability of existing conservation significant patches by implementing management regimes to reduce access, weeds and other edge effects, and introducing a physical and vegetative buffer to the TECs.
Ratio greater than 1:1:	The ratio between clearing and revegetation of the offset offered is 1:1.2. This ratio increases with the inclusion of 1.44 ha of retained vegetated land plus the contributing offsets. Areas are shown in Appendix 1.
Robust, consistent assessment:	The assessment process has followed Main Roads' Environmental Assessment and Approval Process (EMS certified to ISO 14001) and requirements of Main Roads Clearing Permit CPS 818/6. In accordance with Part II of CPS 818/6, clearing has been minimised as far as possible as outlined in Appendix 1. An assessment of the clearing impacts has been undertaken, including specialist surveys (flora and fauna), an environmental management plan has been prepared and stakeholders have been invited to make submissions regarding the proposed project. Suitably qualified and experienced practitioners carried out the assessments in accordance with best practice for undertaking environmental investigations. In addition local DEC staff were consulted in regard to the proposed works and the results of the flora and fauna surveys.
Appropriateness:	The proposed offset revegetation work is located immediately adjacent to areas proposed to be cleared. The offsets aim to retain and improve the conservation values at the site (in particular those relating to the TEC patches and conservation significant flora) and revegetate cleared areas with local provenance species. The revegetation would have the added advantage of buffering the TEC patches and flora locations, and together with the ongoing management proposed, this proposal is considered appropriate as a means of mitigating the impact of the proposed clearing. This proposal is also consistent with the recommendations of the EPA (2008b).

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No net loss / net gain:	The offsets will lead to a net gain in overall vegetation (approximately 1:1.2). An additional 1.83 ha of land between the redundant road reserve area and the new alignment is being acquired for future offset requirements which, when revegetated, will further enhance the sustainability of the retained TEC at Remnant 4.
Statutory requirements met:	The proposed offset complies with the statutory requirements of CPS 818/6.
Defined, documented, audited:	The proposed offset is clearly defined and provides the opportunity for monitoring and auditing. Funds have been allocated for the implementation and management of the offset package over a five year term.
Long-term benefit:	The offset will ensure a long term benefit to the conservation of the TECs on site and revegetate lands currently being utilised as pasture by private landowners. Due to the difficulties in ceding the TECs to DEC or implementing a conservation covenant over the land due to the relatively small patch sizes (Andrew Webb pers comm), MRWA would manage the land internally as a Main Roads' registered Special Environmental Area for the purposes of conservation and to meet long term offset commitments.
Environmental specialist advice:	Assessments of the vegetation values within the proposed clearing and offset sites have been undertaken for Main Roads through the engagement of **ngh**environmental (consultants) using the services of botanist Russell Smith of Ekologica (2011). WRP fauna surveys of Remnant 2 and an adjacent section of Carbunup Reserve, were carried out by **ngh**environmental (2012). Kim Williams (DEC) has also been liaising with Main Roads regarding relocation requirements. Supplementary advice has been received from Andrew Webb and Peter Hanly of DEC. The transplanting of the Priority Flora and revegetation works will be conducted by an experienced revegetation practitioner. Site vegetation monitoring will be conducted by an appropriately experienced flora person to determine compliance with the Completion Criteria.

Offset comparison:	Proposed clearing	Proposed offset
Area:	• Clearing 0.83 ha of under-represented native vegetation, including 0.54 ha of the TEC "Southern Eucalyptus (*Corymbia calophylla*) woodlands on heavy soils (SCP 1b)" • Clearing 0.14ha of degraded WRP habitat • Relocation of 0.005 ha of Priority 3 species *Loxocarya magna.*	Buffering and management of 1.44 ha of good to very good condition TEC patches, containing Priority and DRF species. Revegetation of 1.0 ha of redundant road, road reserve and cleared paddock with native local provenance species (refer Appendix 3).
Species:	Refer list of species in Appendix 6.	Seeds and cuttings will be collected from the City of Busselton Carbunup Reserve (approximately one kilometre away) to ensure revegetation is of local provenance. In addition, *Loxocarya magna* individuals would be transplanted from Remnant 5 (SLK 70.10).
Community Type:	Broadly the vegetation would consist of Jarrah Forest (Mattiske and Havel, 2002) and more specifically TEC "Southern Eucalyptus (*Corymbia calophylla*) woodlands on heavy soils (SCP 1b)".	Revegetation would where possible attempt to foster similar species compositions to those in adjacent TECs however it is recognised that not all species will be available for revegetation, and that diversity will increase over the long term from natural seed dispersal from the adjacent TEC.
Condition:	Vegetation condition ranges from very good to completely degraded.	The objective of the revegetation is to maintain and improve the condition of the existing vegetation and promote the re-establishment of local provenance species.
Ecological function:	Clearing would occur through the removal of narrow edges of vegetation along existing narrow roadside verges or isolated paddock trees. The disjunct nature of existing vegetation patches means that ecological function as a corridor is currently low. The small patch sizes of the TECs mean they are also under pressure from edge effects and their long term viability is probably low.	The ecological function of the TECs (and the DRF and Priority flora) would be improved by the implementation of a buffer and ongoing management. Likely benefits would include: • Reduced edge effects • Weed management / fencing • Distance and vegetation buffer • Improved ecological function and habitat values Revegetation will also improve the condition of the site and encourage establishment of wider species diversity.

Other values:	Loss of WRP habitat from Remnant 2 may decrease long term viability of the population at that location.	WRP located at Remnant 2 would be translocated to the Carbunup Reserve.
Monitoring commitments:	Parameters will be monitored twice annually by a visual Rapid Assessment technique and assessed if management actions are required (see Appendix 2)	
Management commitments:	Contingency actions shall be enacted if monitoring indicates that conditions are detrimental for the revegetated area to achieve the completion criteria (see Appendix 2). Fencing would be installed around the TEC and revegetation site at Remnant 4, as well as ongoing weed control at both offset sites.	

Agencies consulted & submissions received:	Submissions for the two projects on Bussell Highway between Carbunup and Roy Road (SLK 67.50-72.6) were invited from the stakeholders listed below in March 2011 : 1. Department of Environment and Conservation Native Vegetation Protection Branch 2. Department of Water Bunbury Regional Office 3. Office of the Commissioner for Soil and Land Conservation 4. Conservation Council of Western Australia 5. Shire of Busselton Responses were received from: 1. Department of Environment and Conservation Native Vegetation Protection Branch 2. Department of Water Bunbury Regional Office 3. Office of the Commissioner for Soil and Land Conservation Copies of the invitation letter and the responses are in Appendix C of the Environmental Impact Assessment. The proposed offset package was discussed with DEC officers from Bunbury (Andrew Webb and Peter Hanley) at a meeting with Main Roads and **ngh**environmental on 13 March, 2012. The following was discussed and agreed to in principle: • General details of this offset proposal, including the location of clearing and offsets. • Proposed transplanting of Priority flora (from Remnant 5) to the offset site at Remnant 4. • Proposed sourcing of seed from the adjacent Carbunup Reserve. • Proposal to utilise the additional land as an offset 'bank' in future (subject to future DEC correspondence)., General management proposals such as fencing and weed control. • Protection of the retained TEC vegetation areas (SLK 68.0 – 68.45 and SLK 69.06 and 69.44) as an informal MRWA reserve rather than formal vesting through conservation covenants or similar. Kim Williams (DEC) has also been consulted regarding the relocation of WRP from Remnant 2 to the Carbunup Reserve and offered his advice(refer to Appendix 4).

Appendix 1
Summary of Impact Mitigation Measures and Residual Impacts

	Environmental Asset	Legislative Protection	Impact Mitigation				Residual Impact Requiring Offset	Proposed Offset	
			Avoid	Minimise	Rectify	Reduce		Direct	Contributing (Enhancing)
1	Transplanting of up to 0.005ha of Priority 3 species *Loxocarya magna* from Remnant 5 to Remnant 4.	Clearing principle (a)	The realignment has been chosen to avoid vegetation where possible. Land resumption and transfer has been required to achieve this. The variable lineal and patchy nature of local vegetation means that some clearing is unavoidable. The relocation of the Lennox Rd intersection has also been chosen to avoid clearing vegetation where possible.	Clearing will be the minimum necessary for the safe construction and operation of the highway. Only the essential vegetation to allow construction will be removed. Other vegetation will be demarcated so as to avoid impact. Mitigation measures will be implemented to ensure that construction activity does not encroach beyond the cleared area. Individual *L. magna* would be avoided where possible.	Revegetation of offset areas with suitable local provenance species. Transplanting of *L. magna* from the clearing zone to the offset sites.	No other options to further reduce the residual impact.	Yes	Yes	Yes

	Environmental Asset	Legislative Protection	Impact Mitigation				Residual Impact Requiring Offset	Proposed Offset	
			Avoid	Minimise	Rectify	Reduce		Direct	Contributing (Enhancing)
2	Clearing of WRP habitat in Remnant 2.	Clearing principle (b)	WRP habitat (primarily *Agonis flexuosa,* and *Corymbia callophyla* and hollow bearing trees) would be avoided where possible. DEC have indicated that the loss of the habitat proposed may still affect the viability of the population in the long term, therefore relocations should still be carried out.	Minimising impacts would be achieved by avoiding the clearing of habitat where possible.	WRP would be trapped and released offsite (in adjacent Carbunup Reserve) prior to clearing.	No other options to further reduce the residual impact	Unlikely	No	No
3	Clearing of 0.54ha of the TEC "Southern Eucalyptus (*Corymbia calophylla*) woodlands on heavy soils (SCP 1b)" from Remnants 3 and 5.	Clearing principle (d)	As per Clearing Principle (a) above.	As above. The usual clearing offset of 1.0m from the edge of earthworks will be reduced to zero offset in areas of conservation significant vegetation (Remnants 3 and 5).	Revegetation of 2.23 ha plus retention of 0.69 ha of vegetation containing TEC, along with management measures (weed control and fencing).	No other options to further reduce the residual impact	Yes	Yes	Yes
4	Clearing a vegetation type (Jarrah Forest) (Mattiske and Havel, 2002), with less than 30% remaining in State-wide, Bioregional (IBRA Region) and LGA contexts.	Clearing principle (e)	As per the general notes described for Clearing Principle (a) above.	As above	As above	As above	Yes	Yes	Yes

Appendix 2
Offset Revegetation Implementation Plan

Offset Revegetation Implementation Plan

This Revegetation Plan is proposed to mitigate the clearing of 0.83 ha of under-represented native vegetation, including 0.54 ha of the TEC "Southern Eucalyptus (*Corymbia calophylla*) woodlands on heavy soils (SCP 1b)" and the transplanting of up to 0.005 ha of Priority 3 species *Loxocarya magna*.

Main Roads believes that the proposed environmental offsets for the project are congruent and compliant with the relevant Offset principles embedded in CPS 818/6.

Main Roads has prepared this Offset Revegetation Implementation Plan to define proposed management and rehabilitation measures for the offset sites. The objectives of the revegetation plan are:

- To revegetate the offset sites with local plant species, in particular species corresponding with the existing TEC, and to transplant any Priority 3 *Loxocarya magna* individuals from clearing areas to the offset site.
- To improve the condition of the vegetation at the sites and to promote the re-establishment of local provenance species. It is expected that, in the longer term, this will encourage the sustainable establishment of increased species diversity within the road reserve.

The proposed rehabilitation methodology, species, monitoring, management and contingency measures, completion criteria and reporting are detailed below with consideration of the project commencing in October 2012.

1. Methodology

Topic	Action	Timing
Transplant (and pot) *Loxocarya magna* from Remnant 5.	Select and prepare sites (weed control, soil preparation, etc.) in Remnant 4 for installation of specimens.	June 2012
	Using qualified staff (and in consultation with DEC) arrange for collection of *Loxocarya magna* individuals from Remnant 5. Some plants will be potted and maintained by a local nursery and used to propagate and produce more.	July 2012
Weed control	Determine appropriate method and timing of weed control.	September 2012
	Conduct weed spraying and/or removal prior to initial earthworks. Scalping will be an appropriate option on pasture grass areas proposed for revegetation.	September 2012
	Implement ongoing weed control works as required to achieve completion criteria. Follow up weed control will occur if the weed load is determined to be detrimental to maintaining species density and diversity in the future.	Ongoing
Topsoil improvement	Increase the volume of usable topsoil available by adding mulched native vegetation from the wider project area at a rate of 1 part mulch to 2 parts topsoil.	October – November 2012
	Import additional compost to add at a rate of 1 part compost to 6 parts topsoil. The stockpile will be mixed to provide a homogenous material.	
Seed and cutting Collection & Propagation	Arrange access to the adjacent City of Busselton's Carbunup Reserve for the collection of seed and cuttings.	November - December 2012
	Order additional appropriate seeds from specialist seed vendors.	November 2012
	Arrange for cuttings to be propagated for species that are difficult to grow from seed.	Oct 2012 – May 2013
	Arrange for selected seeds to be stored for future propagation and infill planting.	
Prepare redundant road in Remnant 4: ID 14	Rip and rotary hoe existing sealed road.	March 2013
Prepare pasture grass areas (ID 13 & 17)	RMP: Rip / Mound & Plant. Rip and rotary hoe. Install raised mounds three metres apart and meandering through the sites.	
Topsoil spread	The available blended topsoil will be spread uniformly on the rehabilitation areas.	
Revegetation of the redundant road reserve (Remnant 4: ID 14) – seeding and seedlings	• Undertake seed treatment to address dormancy of the seed collected prior to use. • Undertake seeding as per the MRWA Revegetation Planning and Techniques 6707/031. • Nursery grown tube stock will be randomly planted throughout.	May / June 2013
Revegetation of pasture grass areas (ID 13 & 17)	Nursery grown tube stock will be planted with two metre spacings on prepared mounds	May / June 2013

Topic	Action	Timing
Installation of monitoring plots	Define and peg a 10X100m monitoring plot in each of the three revegetation areas	July 2013
Revegetation – infill planting	Undertake infill seedling planting as per the MRWA Revegetation Planning and Techniques 6707/031 if required.	June 2014
	Install potted *Loxocarya magna* individuals from Remnant 5 into Remnant 4.	
Pest and other fauna control	Implement pest control program to minimise damage from rabbits, grasshoppers and other insects if required.	As required
	Install tree guards around seedlings if required.	As required
Monitoring and contingencies	Monitor progress of rehabilitation outcomes and implement contingency actions as required.	Twice annually from spring 2013

2. Species

The selection of species to be used in the revegetation of the offset sites is based on the list provided in the flora survey report (Ekologica 2011). Most will be sourced from the Carbunup Reserve and adjacent TEC remnants as well as from specialist vendors. Arrangements will be made for cuttings and seeds to be germinated in suitable nurseries for the initial planting and also for infill tube stock plantings in the future.

Recommended revegetation species list (from Ekologica P/L, 2011)

	SPECIES	**PROPOSED PROPAGATION METHOD**			
P	Seedlings - Proposed to be provided from local nurserys				
P	Cuttings - Proposed to be provided from local nurserys				
S	Seed 1 - Known to be commercially available				
S	Seed 2 - Dependant on availability for collection				
	LATIN NAME	**SEEDLING**	**CUTTING**	**SEED 1**	**SEED 2**
SP	*Acacia extensa*	X		X	
SP	*Acacia myrtifolia*	X		X	
S	*Acacia pulchella*			X	
S	*Acacia vari*			X	
P	*Adenanthos barbiger*		X		
P	*Adenanthos obovarus*		X		
SP	*Agonis flexuosa*	X		X	
SP	*Allocasuarina fraseriana*	X		X	
P	*Anigozanthos flavidus*	X			
SP	*Astartea aff. fascicularis*	X		X	
S	*Billardiera variifolia*				X
S	*Bossiaea ornata*				X
S	*Conostylis aculeata*			X	
P	*Corymbia calophylla*	X			
S	*Dampiera alata*				X
S	*Dampiera linearis*				X
S	*Daviesia elongata subsp. Elongata*				X
S	*Daviesia rhombifolia*				X
SP	*Eucalyptus marginata*	X		X	
S	*Gastrolobium praemorsum*			X	
S	*Grevillea trifida*				X
SP	*Hakea amplexicaulis*	X		X	
S	*Hakea ruscifolia*			X	
SP	*Hakea varia*	X		X	
SP	*Hovea chorizemifolia*	X		X	

S	*Hovea trisperma*				X
S	*Hypochaeris glabra*				X
	Hypolaena exsulca				
S	*Kennedia prostrata*			X	
S	*Kingia australis*			X	
S	*Labichea punctata*				X
S	*Lepidosperma squamatum*				X
S	*Lomandra preissii*				X
SP	*Melaleuca incana*	X		X	
SP	*Melaleuca thymoides*	X		X	
SP	*Melaleuca viminea*	X		X	
S	*Mesomelaena tetragona*				X
S	*Patersonia occidentalis*			X	
S	*Patersonia umbrosa* var. *umbrosa*				X
S	*Patersonia umbrosa* var. *xanthina*				X
P	*Scaevola calliptera*		X		
S	*Synaphea gracillima*				X
SP	*Taxandria linearifolia*	X		X	
S	*Tetraria capillaris*				X
S	*Tetraria octandra*				X
S	*Tricoryne elatior*				X
S	*Xanthorrhoea gracilis*			X	
S	*Xanthorrhoea preissii*			X	
SP	*Xylomelum occidentale*	X		X	

3. Monitoring

Three 100 m x 10 m RA plots will be defined in the three revegetation areas (Remnant 4: ID 14 & 17 and Remnant 3: ID 13). The plots will be set out using 50 mm square section white timber survey pegs driven into the ground and marked with the RA number from 1 to 3 and NW, NE, SW or SE to indicate which corner the peg represents. GPS locations of the corner pegs will be recorded in a shape file, which will be used to mark the RA locations on the Project as-constructed landscaping drawings.

Parameters will be monitored by a visual Rapid Assessment technique and assessed if management actions are required. See example of a monitoring sheet in Section 7. The parameters will include:

- native plant foliage cover (high/medium/low/none)
- weed cover (high/medium/low/none)
- presence of bare soil areas greater than 4m in diameter

- vegetation health and survival (including signs of disease and pests)
- native species diversity (number of species)
- native species density (average number of plants per m2)

Photo stations will also be established so that photo comparison techniques can be used to determine growth rates between monitoring events. Monitoring will be undertaken twice annually (Spring & Autumn) for three years after the initial planting with completion planned for June 2015. Monitoring and maintenance will continue until completion criteria are met or as otherwise agreed by DEC.

4. Completion Criteria

Main Roads will provide DEC a report assessing the revegetation works against the completion criteria at the end of the proposed "Establishment Period" planned for June 2015.

Acceptance of the works at the end of the "Establishment Period" shall be subject to:

- Revegetation works meeting the completion criteria for final completion based on the two randomly selected representative quadrants (2.5m x 2.5m) within the larger 100m x 10m plots.
- Satisfactory completion of all additional maintenance and remedial works by Main Roads.
- Satisfactory preparation and submission of annual monitoring reports to DEC.

Acceptance criteria for plants shall be:

- Plants are well formed and exhibit signs of sufficiently healthy growth.
- Plants are generally free of disease symptoms (eg yellowing, wilting, etc.).
- Plants are generally free from signs of insect pests.

Revegetation Completion Criteria will be based on three aspects: Vegetation Cover, and Species Diversity for the seeded site; and Plant Numbers for the seedling sites (RMP).

Vegetation Cover - a minimum of 50 % projected foliage cover (excluding any weeds) over any treated area of 1000m2, with no bare soil areas with a diameter >4m2

Species Diversity - At least 30% of the species used in the seeding mix and no less than ten species of shrubs or groundcovers occurring within any 1000m2 area. Where tree species are used representatives of all species must also be present.

Plant Numbers – At least 60% survival of the original number of planted seedlings over any treated area (RMP) of 1000m2.

5. Management / Contingency Actions

Contingency actions shall be enacted if monitoring indicates that conditions are detrimental for the rehabilitation area to achieve the completion criteria.

Contingency actions for the rehabilitation sites

Trigger	***Action***
Insufficient provenance seed volumes or plants collected and propagated from current seed collection areas.	1. Discuss with DEC the potential to extend seed collection areas or obtain additional seed and plants from other seed collectors and native nurseries. 2. Prioritise areas for planting and/or direct seeding, potentially postponing some of the planned works.
Inadequate native flora species richness and/or cover to achieve targets.	1. Identify cause. 2. Implement approach to remedy cause, which could include: • collecting additional seed for direct seeding or plant propagation to compensate for the insufficient native plant species richness and/or cover • undertaking of infill seedling planting or additional direct seeding • application of fertilisers or wetting agents etc to improve soil. 3. Monitor success of remedy.
Significant changes to native flora species diversity, richness and/or cover between monitoring years.	1. Identify cause, which could include: • favoured species is potentially invasive or a pioneer species • spatial and seasonal variation is attributing to succession within plant communities • limiting factors restricting the development of species (e.g. infiltration rates, groundwater level, soil surface features, diseases). 2. Implement approach to remedy cause, which could include: • application of fertilisers and wetting agents • removing potentially invasive species • dieback treatment. 3. Monitor success of remedy.
Unacceptable weed infestations as per completion criteria.	1. Identify cause. 2. Identify the weeds, their location and coverage and obtain quotations from contractors to control them. 3. Employ a contractor to control the weeds. 4. Monitor success of control.
Erosion occurring.	1. Identify cause. 2. Implement remedy (may involve consulting an expert to determine the appropriate remedy). 3. Monitor success of remedy.

6. Reporting

Main Roads will report in writing to the DEC on or before June 30 each year regarding the compliance of this Offset Proposal stating activities conducted between January 1 and December 31 the preceding year. This reporting will be conducted as part of Main Roads corporate annual reporting requirements under the conditions of Part VI of CPS 818/5.

Annual reports will include information on: 1) monitoring methods, 2) general observations of vegetation development, 3) maintenance activities, 4) recommendations, 5) photos and 6) comparisons of the current year's findings with those of previous years. The first annual report will also describe the as-planted implementation efforts.

At the completion of the revegetation establishment period (September 2015) Main Roads will report to DEC on compliance with the revegetation completion criteria as detailed in the Revegetation Implementation Plan.

7. Example of monitoring sheet

HRL999-01 **Date** May 11	**Response**	**Comments**
1. Vegetation Cover		
Native plant cover of 100 m x 10 m H/M/L/N (seeded)	L	
Bare soil areas >4m dia in 100 m x 10 m Y/N? (seeded)	NA	
2. Species Diversity		
Min 30% of spp used found Y/N? (seeded)	Y	
Min 5 spp of shrub/groundcover found Y/N? (seeded)	NA	
All tree spp used present Y/N? (seeded / RMP)	N	
3. Plant Numbers		
No of seedlings planted from physical count (RMP)	109	
No of surviving planted seedlings (RMP)	80	
% of planted seedlings surviving (RMP)	73	
4. Vegetation Condition		
Vegetation well formed & signs of healthy growth Y/N?	Y	
Any signs of disease Y/N?	Y	Typical E rudis damage, not of concern
Any signs of insect pests Y/N?	Y	Typical E rudis damage, not of concern
5. Weeds		
Weed cover of 100 m x 10 m H/M/L/N	M	
Declared weeds observed Y/N ? and species	N	
Nuisance weeds observed (eg Lovegrass) Y/N ? and spp	N	
Other weeds observed in significant numbers	Y	
Weeds manageable with min future maintenance Y/N?	Y	
6. Recommended Action code 1-5	3	
7. General Comments		
No Banksias found. Said to have been planted in Sep 10 There was evidence of cattle on the plot, and several trees seemed to have been damaged by them (photo)		

Species seeded	**Species planted**	**Tree species**
	Agonis flexuosa	Agonis flexuosa
	Allocasuarina fraseriana	Allocasuarina fraseriana
	Banksia attenuata	Banksia attenuata
	Banksia grandis	Banksia grandis
	Banksia ilicifolia	Banksia ilicifolia
	Corymbia calophylla	Corymbia calophylla
	Eucalyptus marginata	Eucalyptus marginata
	Eucalyptus rudis	Eucalyptus rudis
	Melaleuca incana	Melaleuca preissiana
	Melaleuca lateritia	Melaleuca rhaphiophylla
	Melaleuca preissiana	Viminaria juncea
	Melaleuca rhaphiophylla	
	Melaleuca teretifolia	
	Melaleuca uncinata	
	Taxandria linearifolia	
	Viminaria juncea	
	Not planted	
	Some sedges	

Key: H/M/L/N = high, medium, low, none
Recommended action codes: 1 - none, 2 - investigate problem (erosion control, more planting/seeding/mulch)
3 - weed control only, 4 - as per 2 + weed control
5 - weed control required + planting, seeding and/or mulch

Place photos here

Appendix 3

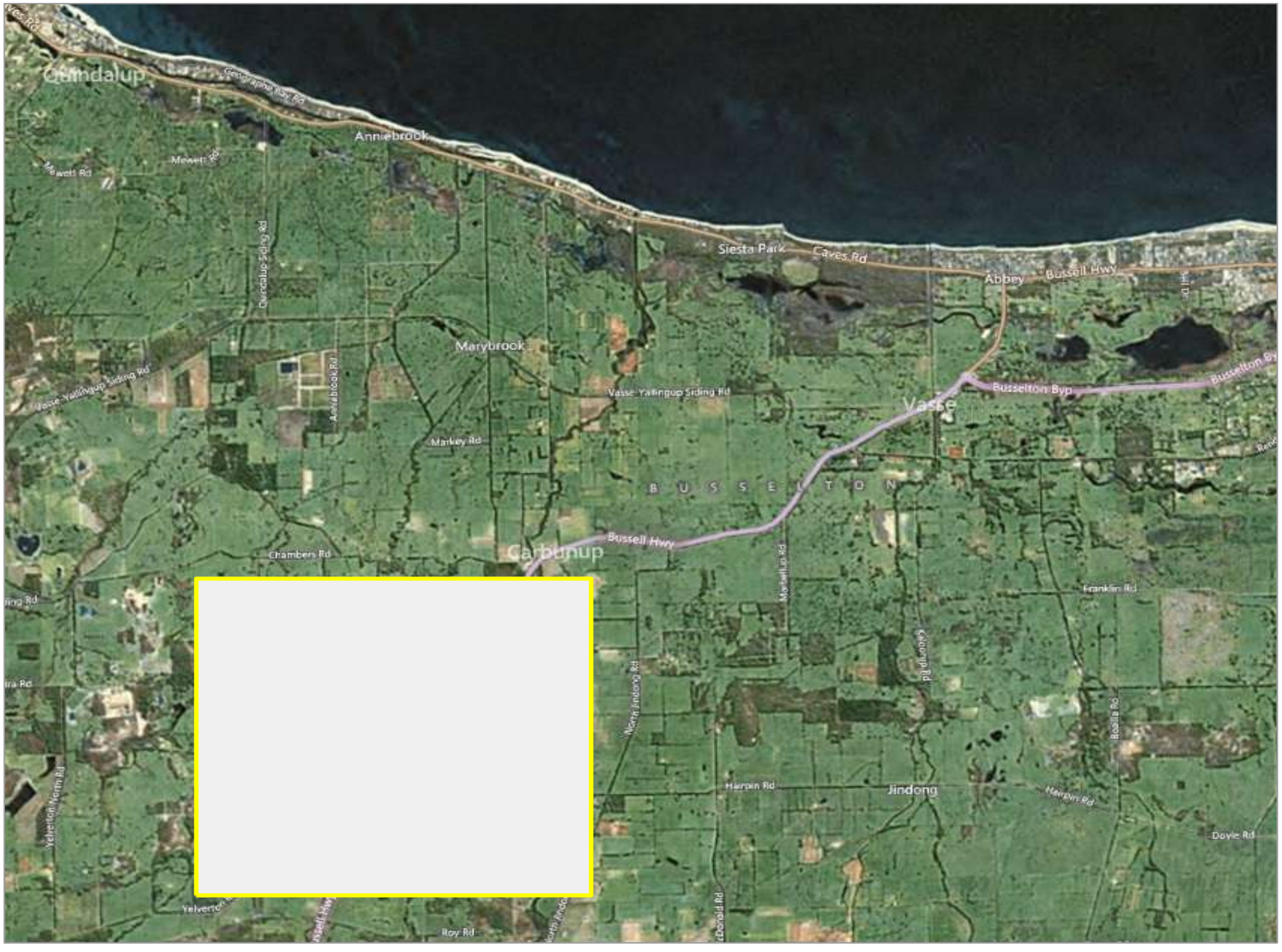
Maps:

Figure 1: **Site location**

Figure 2: **Proposed realignment, vegetation condition and remnant area number**

Figure 3: **Proposed clearing and revegetation areas**

Site Location



OFFSET PROPOSAL
Bussell Highway, Carbunup
SLK 67.50 - 70.76

Proposed works

Notes:
- Satellite image from ESRI Online:
'Bing maps' © Microsoft (2012)
- Proposed works courtesy of the client (2012)

0 0.5 1 2 Kilometres

Prepared by:

www.nghenvironmental.com.au

Figure 1: Site Location

Proposed realignment, vegetation condition and remnant number

OFFSET PROPOSAL
Bussell Highway, Carbunup
SLK 67.50 - 70.76

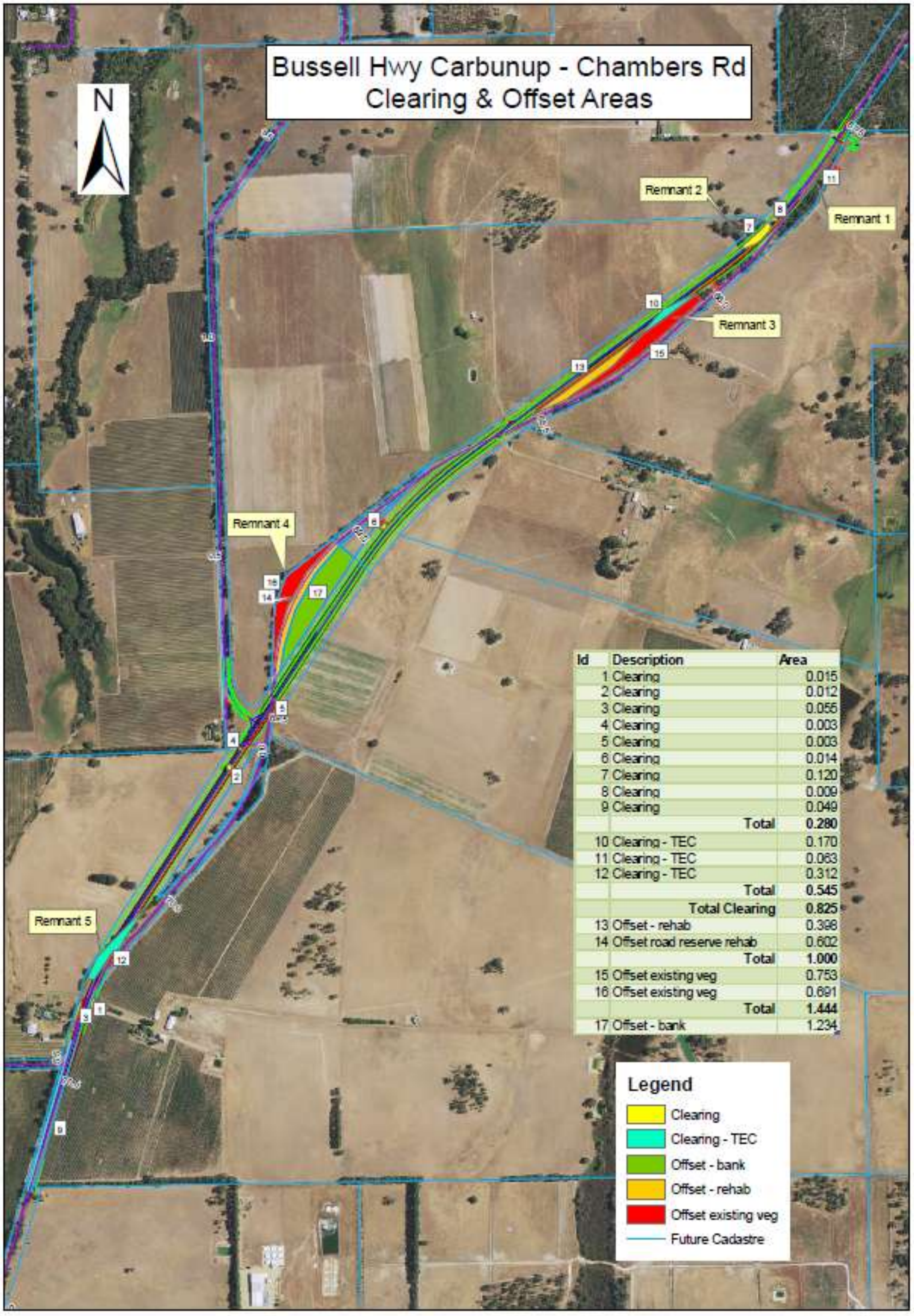
Proposed realignment footprint
Road
Vegetation condition
Very Good
Good
Degraded
Completely Degraded

Notes:
- Layers courtesy of the client
- Condition and remnants from Ekologica (2011)

0 50 100 200 Metres

Prepared by:

Figure 2: Proposed realignment, vegetation condition and remnant area number



Id	Description	Area
1	Clearing	0.015
2	Clearing	0.012
3	Clearing	0.055
4	Clearing	0.003
5	Clearing	0.003
6	Clearing	0.014
7	Clearing	0.120
8	Clearing	0.009
9	Clearing	0.049
	Total	**0.280**
10	Clearing - TEC	0.170
11	Clearing - TEC	0.063
12	Clearing - TEC	0.312
	Total	**0.545**
	Total Clearing	**0.825**
13	Offset - rehab	0.398
14	Offset road reserve rehab	0.602
	Total	**1.000**
15	Offset existing veg	0.753
16	Offset existing veg	0.691
	Total	**1.444**
17	Offset - bank	1.234

Figure 3: Proposed Clearing and Revegetation Areas

Appendix 4
Correspondence regarding WRP from Kim Williams (DEC) (17.01.2012)

Department of
Environment and Conservation

Our environment, our future

Your ref
Our ref: Bun2009005405
Enquiries: K.Wiliams
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Fax

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Mr Peter Swanson
Environment Officer
Main Roads
Bunbury WA. 6230

RE: Western Ringtail Possum Management, Proposed Bussell Highway Roadworks Carbanup

Dear Peter

Further to our meeting of the18th November and documentation supplied. I have reviewed the ngh environmental report " Preliminary Western Ringtail Possum (WRP) assessment (site 2) and Hollow Bearing Tree (HBT) location (site 6) for proposed clearing along the Bussell Highway, Carbanup" and make the following comments and recommendations.

The methodology adopted in the report is adequate and meets the standards expected from a preliminary assessment with the exception of one key aspect, that being to provide information about the distribution and habitat use of WRP in the local context. Ie: immediately outside the proposed area. In this instance key questions such as; are there WRP in the Carbanup Reserve 200m to the NE and if so approximately how many and where are they distributed. This information would provide guidance as to the significance of the remnant habitat in site 2 and possibility of relocating animals to the larger reserve.

DEC's preferred strategy to manage the small WRP population identified in site 2 is;

1) MRD to provide a report detailing the distribution and population size of both species on possum in Carbanup Reserve.
2) within 5 days prior to the commencement of vegetation clearing at the site, repeat the day time WRP assessment to determining the location and occupancy of dreys and undertake a night time survey to ascertain the total number of possums, both WRP and brushtail possums utilising the site. DEC to be notified immediately of the survey results.
3) if occupied dreys or individuals are not observed during the surveys, then proceed with the clearing following standard possum clearing protocols, including having a possum spotter onsite during the operation.
4) if any possums (all species) are recorded on the site then depending on numbers these animals may need to be relocated to the Carbanup Reserve. DEC to advise on the process to be followed to undertake this action. It is probable this will include capturing animals at drey sites, holding and bagging in an appropriate container and releasing at sunset/early evening. Any remaining animals to be captured at night and immediately transported and released in the Carbanup Reserve.

5) If strategy 4 can not be implemented then a formal WRP Management Plan will be required including the requirement for a translocation proposal to be produced and submitted to DEC for approval.

Yours sincerely

K. Williams

Kim Williams
Regional Leader Nature Conservation
Department of Environment and Conservation
Bunbury. 17/01/2012

Appendix 5
References

Clapperton, G. NPC Consulting, 2011: *Phytophthora Dieback Interpretation Report Bussell Highway Upgrade* SLK 67.5 – SLK 72.6

Ekologica P/L, 2011: *A Rare Flora and Vegetation Survey of Seven Areas of remnant Vegetation South of Carbunup*, prepared for nghenvironmental.

Keighery, B.J., Keighery, G.J., Webb, A., Longman, V.M., and Griffin, E.A., Department of Environment and Conservation and EA Griffin & Associates, 2008: *A Floristic Survey of the Whicher Scarp.*

Mattiske Consulting and Havel. J.J. (2002). *Review of management options for poorly represented vegetation complexes*. Report to the Conservation Commission of Western Australia.

nghenvironmental, 2011: *Western Ringtail Possum (WRP) assessment (site 2) and Hollow Bearing Tree (HBT) location (site 6) for proposed clearing along the Bussell Highway, Carbunup*

nghenvironmental, 2012: *Western Ringtail and Brushtail Possum survey of Remnant 2 and section of Carbunup Reserve*