

HAERSES ROAD QUARRY BIODIVERSITY AND REHABILITATION MANAGEMENT PLAN

Dixon Sands (No. 1) Pty Ltd

May 2019



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Prepared by
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on behalf of
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	Name	Date	Name	Date
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1.0 Introduction

1.1 Background

Dixon Sand (No. 1) Pty Limited (Dixon Sand) operates the Haerses Road Quarry (the Quarry), a sand extraction and processing operation located on Haerses Road in Maroota, NSW (refer to **Figure 1.1**). The Quarry has been in operation since 2006. The site is approximately 71 hectares (ha) and includes Lot 170 DP 664766, Lot 170 DP 664767, Lots A and B DP 407341, Lots 176 and 177 DP 752039 and Lot 216 DP 752039 (refer to **Figure 1.2**). The Quarry is located in the small rural community of Maroota which supports a number of other sand extraction operations, including the Old Northern Road Quarry which is also operated by Dixon Sand. The Quarry supplies concrete sand and specialty sands to the Sydney metropolitan market.

The Quarry operates in accordance with Development Consent (DA 165-7-2005) issued by the Minister for Planning on 14 February 2006. The Development Consent was modified under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 22 January 2018 (Modification 1). The Development Consent was subsequently modified under Section 4.55(1) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 29 January 2019 (Modification 2).

The Development Consent permits the extraction and processing of 250,000 tonnes per annum (tpa). Transport of up to 190,000 tpa of quarry product to the Old Northern Road Quarry for processing, located approximately 2 kilometres (km) to the north, is also permitted.

The Development Consent permits quarrying operations to be carried out on site until 14 February 2046.

1.2 Purpose and Scope

The purpose of this Biodiversity and Rehabilitation Management Plan (BRMP) is to describe the biodiversity and rehabilitation management strategies, procedures, controls and monitoring programs to be implemented for the management of approved biodiversity and rehabilitation impacts from the operation of the Quarry.

This BRMP addresses the relevant requirements of the Development Consent. The Development Consent conditions and Environmental Assessment (EA) Commitments relevant to this plan are provided in **Section 2.0**, including a checklist of where each condition has been addressed within this document.

The Development Consent requires the retirement of biodiversity credits (as per Condition 30, 31 and 32 of Schedule 3 of the Development Consent), this is being carried out under BioBanking agreements for Haerses Road and Porters Road BioBank Sites (referred to in greater detail in **Section 4.2** and **Section 4.3**) which are currently in the process of being implemented. As such, this document covers the management of the following areas (see **Figure 1.3**):

- Haerses Road Quarry Site
- Haerses Road BioBank Site (established as part of the Haerses Road Quarry Extraction Area Modification approval to meet biodiversity credit requirements)
- Porters Road BioBank Site (established as part of the Haerses Road Quarry Extraction Area Modification approval to meet biodiversity credit requirements).

The management of the Biodiversity Offset Area for Old Northern Road Quarry (required for a separate Dixon Sand held project approval for the Old Northern Road Quarry (DA 250-09-01) is not undertaken as part of this document and has its own management plan, however has been referred to on **Figure 1.3** for the purposes of provided context and so it can be integrated into overall landscape designs.

This BRMP has also been developed in accordance with the requirements of the Draft Department of Planning and Environment's (DPE) *Environment Management Plan Guidelines* (the guidelines). A checklist of where the guidelines have been addressed within this document is shown in **Appendix 1**.

1.2.1 Objectives of the BRMP

The objective of this BRMP is to provide direction for the short to long term management and enhancement of the biodiversity values of the Haerses Road Quarry site and its offsets, as well as provide a detailed description of the measures to be implemented to achieve this over the next 3 year period (2018-2020).

The objectives of the BRMP are to:

- identify and describe the areas of land that will be required to be managed in accordance with this BRMP
- provide clear and concise instructions for the management measures to be implemented in accordance with the Project Approval Conditions in order to achieve the conservation management objectives and minimise the impacts of key threats
- provide a working schedule for the implementation of activities required from the BRMP
- describe monitoring, performance evaluation and reporting procedures that are informative, practical and achievable.

[2x click to insert picture]

Figure 1.1 Locality Map

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[2x click to insert picture]

Figure 1.2 Haerses Road Quarry

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[2x click to insert picture]

Figure 1.3 Haerses Road and Porters Road BioBank Sites and Old Northern Road Biodiversity Offset Area

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2.0 Regulatory Requirements

2.1 Development Consent

Table 2.1 below outlines the relevant Development Consent conditions under DA 165-7-2005 and where they have been addressed within the BRMP.

Table 2.1 Biodiversity and Rehabilitation Related Development Consent Conditions

Condition	Description	Section/s Addressed																								
Biodiversity Offset Strategy																										
30	<p>The Applicant must retire the biodiversity credits specified in Table 4 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing within the Mod 1 extraction area, except the minimum clearing required to comply with condition 16 of this Schedule.</p> <p><i>Table 4: Biodiversity credits to be retired prior to the commencement of vegetation clearing</i></p> <table border="1"> <thead> <tr> <th>Credit type</th> <th>Number of Credits</th> </tr> </thead> <tbody> <tr> <td colspan="2"><i>Ecosystem Credits</i></td> </tr> <tr> <td>HN560 Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion</td> <td>3</td> </tr> <tr> <td>HN566 Red Bloodwood – Scribbly Gum Healthy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion</td> <td>377</td> </tr> <tr> <td>HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Healthy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion</td> <td>181</td> </tr> <tr> <td>HN586 Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Healthy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion</td> <td>44</td> </tr> <tr> <td colspan="2"><i>Species Credits</i></td> </tr> <tr> <td><i>Darwinia biflora</i></td> <td>360</td> </tr> <tr> <td>Dural Land Snail (<i>Pommerhelix duralensis</i>)</td> <td>98</td> </tr> <tr> <td>Eastern Pygmy Possum (<i>Cercartetus nanus</i>)</td> <td>148</td> </tr> <tr> <td><i>Grevillea parviflora</i> subsp. <i>supplicans</i></td> <td>338</td> </tr> <tr> <td><i>Tetratheca glandulosa</i></td> <td>288</td> </tr> </tbody> </table>	Credit type	Number of Credits	<i>Ecosystem Credits</i>		HN560 Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion	3	HN566 Red Bloodwood – Scribbly Gum Healthy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion	377	HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Healthy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion	181	HN586 Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Healthy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion	44	<i>Species Credits</i>		<i>Darwinia biflora</i>	360	Dural Land Snail (<i>Pommerhelix duralensis</i>)	98	Eastern Pygmy Possum (<i>Cercartetus nanus</i>)	148	<i>Grevillea parviflora</i> subsp. <i>supplicans</i>	338	<i>Tetratheca glandulosa</i>	288	Section 3.0
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31	<p>The Applicant must retire the biodiversity credits specified in Table 5 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing within in extraction cells 1B, 2B or 3B (As shown in Figure 2, Appendix 1), except the minimum clearing required to comply with condition 16 of this Schedule.</p> <p><i>Table 5: Biodiversity credits to be retired prior to vegetation clearing in extraction cells 1B, 2B or 3B</i></p> <table border="1"> <thead> <tr> <th>Credit type</th> <th>Number of Credits</th> </tr> </thead> <tbody> <tr> <td colspan="2"><i>Species Credits</i></td> </tr> <tr> <td>Dural Land Snail (<i>Pommerhelix duralensis</i>)</td> <td>132</td> </tr> </tbody> </table>	Credit type	Number of Credits	<i>Species Credits</i>		Dural Land Snail (<i>Pommerhelix duralensis</i>)	132	Section 3.0																		
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Condition	Description	Section/s Addressed										
32	<p>The Applicant must retire the biodiversity credits specified in Table 6 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing within in extraction cells 1B, 2B or 3B; 4A, 4B and 5B (As shown in Figure 2, Appendix 1), except the minimum clearing required to comply with condition 16 of this Schedule.</p> <p>Prior to commencing vegetation clearing in any of extraction cells 1B, 2B or 3B; 4A, 4B and 5B, the Applicant must demonstrate that the credits required in respect to that cell have been retired, to the satisfaction of the Secretary.</p> <p><i>Table 6: Biodiversity credits to be retired progressively</i></p> <table border="1" data-bbox="352 607 1134 837"> <thead> <tr> <th data-bbox="352 607 935 645">Credit type</th> <th data-bbox="935 607 1134 645">Number of Credits</th> </tr> </thead> <tbody> <tr> <td colspan="2" data-bbox="352 645 1134 678">Ecosystem Credits</td> </tr> <tr> <td data-bbox="352 678 935 757">HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion</td> <td data-bbox="935 678 1134 757">357</td> </tr> <tr> <td colspan="2" data-bbox="352 757 1134 790">Species Credits</td> </tr> <tr> <td data-bbox="352 790 935 837">Eastern Pygmy Possum (<i>Cercartetus nanus</i>)</td> <td data-bbox="935 790 1134 837">75</td> </tr> </tbody> </table>	Credit type	Number of Credits	Ecosystem Credits		HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion	357	Species Credits		Eastern Pygmy Possum (<i>Cercartetus nanus</i>)	75	Section 3.0
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Species Credits												
Eastern Pygmy Possum (<i>Cercartetus nanus</i>)	75											
33	<p>In retiring the ecosystem and species credits set out in conditions 30 to 32 above, the Applicant may apply the Biodiversity Offset Strategy (see Appendix 4 of the Development Consent) or, with the agreement of the Secretary, may use other land or alternate mechanisms permitted under the <i>Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects</i>.</p>	Section 3.2										
Rehabilitation Objectives												
34	<p>The Applicant must rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the final landform in Appendix 6 and must comply with the objectives in Table 6.</p> <p><i>Table 6: Rehabilitation Objectives</i></p> <table border="1" data-bbox="328 1256 1134 1559"> <thead> <tr> <th data-bbox="328 1256 520 1290">Feature</th> <th data-bbox="520 1256 1134 1290">Objective</th> </tr> </thead> <tbody> <tr> <td data-bbox="328 1290 520 1429"><i>All areas of the site affected by the development</i></td> <td data-bbox="520 1290 1134 1429"> <ul style="list-style-type: none"> • Safe • Hydraulically and geotechnically stable • Non-polluting • Fit for the intended final land use(s) • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land </td> </tr> <tr> <td data-bbox="328 1429 520 1462"><i>Surface infrastructure</i></td> <td data-bbox="520 1429 1134 1462"> <ul style="list-style-type: none"> • Decommissioned and removed, unless otherwise agreed by the Secretary </td> </tr> <tr> <td data-bbox="328 1462 520 1507"><i>Quarry benches and pit floor</i></td> <td data-bbox="520 1462 1134 1507"> <ul style="list-style-type: none"> • Landscaped and vegetated using native tree and understorey species </td> </tr> <tr> <td data-bbox="328 1507 520 1559"><i>Final void</i></td> <td data-bbox="520 1507 1134 1559"> <ul style="list-style-type: none"> • Minimise the size, depth and slope of the batters of the final void • Minimise the drainage catchment of the final void </td> </tr> </tbody> </table>	Feature	Objective	<i>All areas of the site affected by the development</i>	<ul style="list-style-type: none"> • Safe • Hydraulically and geotechnically stable • Non-polluting • Fit for the intended final land use(s) • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land 	<i>Surface infrastructure</i>	<ul style="list-style-type: none"> • Decommissioned and removed, unless otherwise agreed by the Secretary 	<i>Quarry benches and pit floor</i>	<ul style="list-style-type: none"> • Landscaped and vegetated using native tree and understorey species 	<i>Final void</i>	<ul style="list-style-type: none"> • Minimise the size, depth and slope of the batters of the final void • Minimise the drainage catchment of the final void 	Section 6.0
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Progressive Rehabilitation												
35	<p>The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable measures must be taken to minimise the total area exposed for dust generation at any time. Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.</p> <p><i>Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to future re-disturbance.</i></p>	Section 6.2										

Condition	Description	Section/s Addressed
Biodiversity and Rehabilitation Management Plan		
36	<p>The Applicant must prepare a Biodiversity and Rehabilitation Management Plan for the development to the satisfaction of the Secretary. This plan must:</p> <ul style="list-style-type: none"> (a) Be prepared by a suitably qualified expert (b) Be prepared in consultation with OEH and Council (c) Be submitted to the Secretary for approval within 6 months of the approval of Modification 1, unless otherwise agreed by the Secretary (d) Provide details of the conceptual final landform and associated final land use(s) for the site (e) Describe how the implementation of the Biodiversity Offset Strategy will be integrated with the overall rehabilitation of the site (f) Describe the short, medium and long term measures to be implemented to: <ul style="list-style-type: none"> • Manage remnant vegetation and habitat on site, including within the Biodiversity Offset Strategy area; and • Ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations in this consent (g) Include a detailed description of the measures described in paragraph (f) to be implemented over the next 3 years (to be updated for each 3 year period following initial approval of the plan) including the procedures to be implemented for: <ul style="list-style-type: none"> • Maximising the salvage of environmental resources within the approved disturbance area, including tree hollows, vegetation and soil resources, for beneficial reuse in the enhancement of the offset area or site rehabilitation. • Restoring and enhancing the quality of native vegetation and fauna habitat in the biodiversity offset and rehabilitation areas through assisted natural regeneration, targeted vegetation establishment and the introduction of fauna habitat features • Protecting vegetation and fauna habitat outside the approved disturbance area on-site, paying particular attention to any occurrences of <i>Hibbertia superans</i> adjacent to the approved extraction areas • Minimising the impacts on native fauna, including undertaking pre-clearance surveys and avoiding clearing activities during sensitive hibernation and breeding periods • Establishing vegetation screening to minimise the visual impacts of the site on surrounding receivers • Ensuring minimal environmental consequences for threatened species, populations and habitats • Collection and propagating seed • Controlling weeds and feral pests • Controlling erosion; and • Managing bushfire risk (h) Include a program to monitor the effects of the development on flora and fauna 	<p>Whole Document</p> <p>TBA</p> <p>TBA</p> <p>Section 6.0</p> <p>Section 3.3</p> <p>Section 7</p> <p>Section 6.2</p> <p>Section 5.6</p> <p>Section 5.1.1.1</p> <p>Section 5.1.1</p> <p>Section 5.3.3</p> <p>Section 5.2, Section 5.3 and Section 5.4</p> <p>Section 5.1.3</p> <p>Section 5.2.2, and Section 5.2.3</p> <p>Section 5.2.4</p> <p>Section 5.2.5</p> <p>Section 7.0</p>

Condition	Description	Section/s Addressed
	<p>(i) Include detailed performance and completion criteria for evaluating the performance of the Biodiversity Offset Strategy and the rehabilitation of the site (including progressive rehabilitation), including triggers for any necessary remedial action</p> <p>(j) Include a program to monitor and report on the effectiveness of the measures described in paragraphs (f) and (g), and progress against the performance and completion criteria</p> <p>(k) Identify the potential risks to the successful implementation of the plan, and include a description of the contingency measures to be implemented to mitigate against or address these risks, including specific measures to be implemented in the event that the performance and completion criteria are not satisfied</p> <p>(l) Include details of who is responsible for monitoring, reviewing, and implementing the plan.</p> <p>The Applicant must implement the Biodiversity and Rehabilitation Management Plan as approved by the Secretary.</p>	<p>Section 7</p> <p>Section 7.0</p> <p>Section 10.0</p> <p>Section 11.0</p>
Biodiversity and Rehabilitation Bond		
37	<p>Within 6 months of the approval the Biodiversity and Rehabilitation Management Plan, the Applicant must lodge a Biodiversity and Rehabilitation Bond with the Department to ensure that the Biodiversity Offset Strategy and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the Biodiversity and Rehabilitation Management Plan and the relevant conditions of this consent. The sum of the bond must be determined by:</p> <p>(a) Calculating the full cost of implementing the Biodiversity Offset Strategy</p> <p>(b) Calculating the cost of rehabilitating all disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations; and</p> <p>(c) Employing a suitably qualified surveyor or other expert to verify the calculated costs, to the satisfaction of the Secretary.</p> <p><i>Notes:</i></p> <ul style="list-style-type: none"> • <i>Alternative funding arrangements for long term management of the Biodiversity Offset Strategy, such as provisions of capital and management funding as agreed by OEH as part of a BioBanking Agreement, or transfer to conservation reserve estate can be under to reduce the liability of the Biodiversity and Rehabilitation Bond</i> • <i>If capital or other expenditure required by the Biodiversity and Rehabilitation Management Plan is largely complete, the Secretary may waive the requirement for lodgement of a bond in respect of the remaining expenditure</i> 	Section 3.4

Condition	Description	Section/s Addressed
	<ul style="list-style-type: none"> If the Biodiversity Offset Strategy and/or rehabilitation of the site area are completed (or partially completed) to the satisfaction of the Secretary, then the Secretary will release the bond (or relevant part of the bond). If the Biodiversity Offset Strategy and Rehabilitation of the site are not completed to the satisfaction of the Secretary, then the Secretary will call in all or part of the bond, and arrange for the completion of the relevant works Any redundant rehabilitation or biodiversity bonds currently held by the Department in relation to the development may be released following acceptance of the Biodiversity and Rehabilitation bond required under this condition 	
38	<p>The Biodiversity and Rehabilitation Bond must be reviewed and (if required), an updated bond must be lodged with the DPE within 3 months following:</p> <ol style="list-style-type: none"> An updated or revision to the Biodiversity and Rehabilitation Management Plan The completion of an Independent Environmental Audit in which recommendations relating to the implementation of the Biodiversity Offset Strategy and/or rehabilitation of the site have been made; or In response to a request by the Secretary. 	Section 3.4

2.2 Rehabilitation and Biodiversity Related EIS Management Commitments

In accordance with Condition 2 Schedule 2 of the Development Consent, the Quarry must be developed and operated generally in accordance with the environmental impact assessment reports prepared for the development and subsequent modifications. **Table 2.2** summarises the safeguards and management controls relating to biodiversity and rehabilitation management that have been identified in the Environmental Assessment reports prepared for DA 165-7-2005.

Table 2.2 Relevant EIS Biodiversity and Rehabilitation Commitments

Reference	Description	Section/s Addressed
Haerses Road Quarry Extraction Area Modification Environmental Assessment (Umwelt 2016a)	<p>Section 7.1.5 Ecology</p> <p>Dixon Sand will implement the following measures to minimise the potential impacts on the biodiversity of the Modification Area and the locality:</p> <ul style="list-style-type: none"> ongoing weed management ongoing sediment and erosion controls a tree felling procedure to minimise the potential for impacts on native fauna species (focusing on threatened species) as a result of the clearing of hollow-bearing trees employee education and training including inductions for staff, contractors and visitors to the site, to inform personnel of the biodiversity issues present at the site and their role and responsibilities in relation to the protection and/or minimisation of impacts to biodiversity 	Section 5.2

Reference	Description	Section/s Addressed
	<ul style="list-style-type: none"> ○ demarcation of areas of biodiversity value outside the proposed extraction area, where appropriate, to prevent the unnecessary disturbance ○ traffic control measures/speed limits/signage will be utilised on haul roads and access roads to minimise fauna injury/road kills. <p>Dixon Sands will retire biodiversity credits as outlined in Haerses Road Quarry Extraction Area Modification Project Biodiversity Assessment Report (Umwelt 2016b) prior to the disturbance of native vegetation in the Modification area. The credits may be retired progressively based on the staging of native vegetation disturbance in line with the progressive development of the Quarry. The area of progressive disturbance and associated credits retired will be reported annually, along with an indication of when the next stage of disturbance requiring further credits will occur. Credit retirement will be undertaken in accordance with the Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects (OEH September 2014).</p>	Section 3.0
	<p>Section 7.1.9 Rehabilitation</p> <p>The Rehabilitation and Landscape Management Plan will be updated for the Modification to incorporate the rehabilitation of the proposed extraction area.</p> <p>As part of the detailed quarry planning process, a detailed Quarry Closure Plan will be developed approximately three years prior to cessation of quarrying activities. The Quarry Closure Plan will describe in detail the proposed operational and progressive rehabilitation procedures for the remainder of the Quarry life and subsequent to the Quarry closure.</p> <p>Rehabilitation monitoring and maintenance will be undertaken as outlined in Section 6.14.5 of the Haerses Road Quarry Extraction Area Modification Environmental Assessment (Umwelt, 2016a).</p>	<p>Section 6.0</p> <p>Section 7.1.3</p> <p>Section 7.1 and Section 7.3</p>

2.3 Guidelines and Policies

Guidelines relevant to the BRMP include:

- Bush Fire Environmental Assessment Code for New South Wales (NSW Rural Fire Service, 2006a)
- Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code (NSW Rural Fire Service, 2006b)
- Guidelines for Ecologically Sustainable Fire Management (NPWS, 2004).

2.4 Stakeholder Consultation

In accordance with Condition 36 Schedule 3 of the Development Consent, this BRMP has been prepared in consultation with the Office of Environment and Heritage (OEH) and The Hills Shire Council. A copy of correspondence provided by these agencies is provided and a summary of how these issues have been addressed is provided in **Appendix 2**.

2.5 Further Studies and Approvals

No further studies or approvals relevant to this BRMP are specified under the Development Consent for the Quarry. Baseline studies relevant to this BRMP were undertaken as part of the initial EIS (ERM 2005) and subsequent Haerses Road Quarry Extraction Area Modification Environmental Assessment (Umwelt 2016).

2.6 Hold Points

Condition 30, 31 and 32 of Schedule 3 of the Development Consent requires the following hold point relating to the BioBank Sites (Haerses Road and Porters Creek):

- The Applicant must retire the biodiversity credits specified in Table 4 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing within the Mod 1 extraction area, except the minimum clearing required to comply with condition 16 of this Schedule.
- The Applicant must retire the biodiversity credits specified in Table 5 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing in extraction cells 1B, 2B or 3B (as shown in **Figure 2, Appendix 1**), except the minimum clearing required to comply with condition 16 of this Schedule.
- The Applicant must retire the biodiversity credits specified in Table 6 to the satisfaction of the Secretary and OEH. The Applicant must retire the credits prior to commencing any vegetation clearing in extraction cells 1B, 2B, 3A, 3B, 4A, 4B and 5B (as shown in **Figure 2, Appendix 1**), except the minimum clearing required to comply with condition 16 of this Schedule.

Prior to commencing vegetation clearing in any of extraction cells 1B, 2B, 3A, 3B, 4A, 4B and 5B, the Applicant must demonstrate that the credits required in respect of that cell have been retired, to the satisfaction of the Secretary.

These credits will be retired once the BioBanking Agreements are finalised for the offset areas. The reports for these documents were submitted to OEH for review in February 2018. The Biobanking Agreement for the Porters Road Biobank site has been registered in February 2019. The Biobanking Agreement for the Haerses Road Biobank site is currently being processed by the Land and Registry Services.

3.0 Biodiversity Offset Strategy

The existing Quarry operates in accordance with Development Consent (DA) 165-7-2005 issued in 2006 and modified during 2016. Condition 30 of DA 165-7-2005 requires the implementation of a Biodiversity Offset Strategy (BOS) which is outlined in Tables 4, 5 and 6 of the Development Consent.

Table 3.1 below outlines the biodiversity offset credits which must be retired to the satisfaction of the Secretary and OEH prior to commencement of any vegetation clearing within the Mod 1 extraction area, except for the minimum clearing required to comply with Schedule 3 Condition 16 of the Development Consent, which relates to the installation of groundwater monitoring bores for the baseline monitoring program.

The disturbance area in which vegetation clearing can occur, subject to the Development Consent requirements, comprises both Extraction Area A and Extraction Area B approved as part of Mod 1.

Table 3.1 Biodiversity Offset Strategy - Schedule 3, Conditions 30, 31 and 32 of DA 165-7-2005

Credit Type	Number of Credits
Biodiversity Credits that must be retired prior to commencing vegetation clearing within the MOD1 Extraction Area (comprising western Approved Extraction Stages of Lot 177 DP 752039 and Approved Extraction Stages within Lot 216 DP 752039)	
Ecosystem Credits	
HN560 Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion	3
HN566 Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion	377
HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion	181
HN586 Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion	44
Species Credits	
<i>Darwinia biflora</i>	360
Dural Land Snail (<i>Pommerhelix duralensis</i>)	98
Eastern Pygmy Possum (<i>Cercartetus nanus</i>)	148
<i>Grevillea parviflora</i> subsp. <i>Supplicans</i>	338
<i>Tetratheca glandulosa</i>	288
Biodiversity Credits that must be retired prior to commencing vegetation clearing within extraction cells 1B, 2B or 3B	
Species Credits	
Dural Woodland Snail (<i>Pommerhelix duralensis</i>)	132
Biodiversity Credits that must be retired prior to commencing vegetation clearing within extraction cells 1B, 2B, 3A, 3B, 4A and 5B	
Ecosystem Credits	
HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion	357
Species Credits	
Eastern Pygmy Possum (<i>Cercartetus nanus</i>)	75

3.1 Security of Biodiversity Offset Strategy

Condition 30 Schedule 3 of the Development Consent requires Dixon Sand to retire credits prior to undertaking vegetation activities (with the exception of the minimum amount required to comply with Condition 16). Dixon Sand is in the process of implementing this Biodiversity Offset Strategy; however is awaiting comment on the following documentation provided to OEH:

- Haerses Road BioBank Site Biodiversity Assessment Report (Umwelt 2018a)
- Porters Road BioBank Site Biodiversity Assessment Report (Umwelt 2018b).

The Biobanking Agreement for the Porters Road Biobank site has been approved and registered in February 2019. The Biobanking Agreement for the Haerses Road Biobank site is currently being processed by the Land and Registry Services. The credits will be retired once both Biobanking agreement has been approved and registered.

Biodiversity management, maintenance and monitoring activities within the two BioBank sites will be implemented by Dixon Sand in accordance with the approved BioBanking Agreements. **Section 3.3** outlines how the implementation of the Biodiversity Offset Strategy will be integrated with the overall rehabilitation of the site.

3.2 Integration of Biodiversity Offset Strategy with Quarry Rehabilitation

Quarry rehabilitation aims to improve the environmental quality of the site by protecting and enhancing habitat for threatened species. A key component of the BOS is revegetation of rehabilitated land to reinstate, to the greatest extent practicable, the vegetation communities, threatened species and fauna habitats which were present prior to disturbance. The rehabilitation once established, also aims to improve connectivity between vegetated areas and BioBanking sites established as part of the Project to the east and west.

These aims will be achieved through the implementation of a range of operational management controls which will be implemented consistently across the operational and rehabilitation areas more broadly (refer to **Section 6.3**), as well as specific management controls relating to regeneration and targeted revegetation (refer to **Section 6.4**). The final landform which demonstrates the integration of the quarry rehabilitation and BioBanking sites is described in **Section 6.3**.

3.3 Biodiversity and Rehabilitation Bond

In accordance with Schedule 3 Condition 37 of the Development Consent, within 6 months of the approval of the BRMP, Dixon Sand will lodge a Biodiversity and Rehabilitation Bond with the Department to ensure that the BOS and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the BRMP and the relevant conditions of this consent.

The sum of the bond will be determined by:

- a) calculating the full cost of implementing the BOS;
- b) calculating the cost of rehabilitating all disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations; and
- c) employing a suitably qualified quantity surveyor or other expert to verify the calculated costs.

to the satisfaction of the Secretary.

The Biodiversity and Rehabilitation Bond will be reviewed and (if required), an updated bond will be lodged with the Department within 3 months following:

- a) an update or revision to the BRMP;
- b) the completion of an Independent Environmental Audit in which recommendations relating to the implementation of the BOS and/or rehabilitation of the site have been made; or
- c) in response to a request by the Secretary.

4.0 Existing Biodiversity Values

The key biodiversity values that will be managed under this BRMP are described in **Section 4.1** to **Section 4.3** below. Further detail regarding the biodiversity features and values of the Quarry and associated offset site can be found in Section 6.7 of the Environmental Assessment (Umwelt, 2016a), Framework for Biodiversity Assessment (Umwelt, 2016b), the Biodiversity Offset Strategy (Umwelt, 2017) and the Haerses Road EIS (ERM, 2005).

4.1 Haerses Road Quarry Site

The Quarry site is located within the Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) bioregion and the Yengo IBRA subregion. Two BioBank sites (Haerses Road and Porters Road) are managed as part of this Quarry. The location of these sites relative to each other is provided in **Figure 1.3**. The Modification Area contains four biometric vegetation types as identified in Umwelt (2016b). These vegetation types are shown in **Figure 4.1** and include:

- HN560 – Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion (consistent with *Coastal Upland Swamp in the Sydney Basin Bioregion* endangered ecological community (EEC) (listed under the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act))
- HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion
- HN582 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion and
- HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion.

The following threatened flora and fauna species have also been identified in the vicinity of the Approved Extraction Area as part of ERM (2005) and Umwelt (2016b) (see **Figure 4.1** and **Figure 4.2**):

- Koala (*Phascolarctos cinereus*) (listed as vulnerable under the BC Act and the EPBC Act)
- Little bentwing-bat (*Miniopterus australis*) (listed as vulnerable under the BC Act)
- *Tetratheca glandulosa* (listed as vulnerable under the BC Act)
- *Darwinia biflora* (listed as vulnerable under the BC Act and the EPBC Act)
- *Hibbertia superans* (listed as endangered under the BC Act)
- *Grevillea parviflora* subsp. *supplicans* (listed as endangered under the BC Act).

Existing operations are located within the west of Lot B DP 407341 and central Lot 177 DP752039 (see **Figure 1.2**).

Exotic flora species within the site occur predominately within agricultural areas and surrounding dams, including species such as Crofton weed (*Ageratina adenophora*) (a declared weed under the NSW *Biosecurity Act 2015*) as well as exotic grasses.

Remnant vegetation areas tended to comprise low levels of introduced species and where present were dominant by relatively innocuous species such as catsear (*Hypochaeris radicata*), *Centaureum* sp. and paspalum (*Paspalum dilatatum*).

Feral animal species identified include:

- Domestic dog (*Canis lupus familiaris*)
- Red fox (*Vulpes vulpes*)
- Brown hare (*Lepus capensis*)
- Sheep (*Ovis aeries*) and
- Black rats (*Rattus rattus*).

4.2 Haerses Road BioBank Site

The Haerses Road BioBank Site is comprised of part of Lot 216/DP752039, Lot 170/DP664767, Lot 177/DP752039, Lot 176/DP752039 and Lot B/DP407341; and is 28.18 ha in size (see **Figure 4.1**). It occurs in the Hawkesbury/Nepean catchment within The Hills LGA. Although zoned as RU1 – Primary Production, there is no evidence of recent grazing or fire in this site. Only 0.65 ha of this site comprises cleared vegetation, with the remainder comprising intact vegetation with disturbance limited to fire trails and access trails.

The site is underlain by soils derived from Hawkesbury Sandstone and rocky outcrops, a prominent ridgeline and several gullies. This site is connected to expansive areas of remnant vegetation. Four vegetation communities were identified in this site being:

- PCT978/HN560 – Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion (consistent with *Coastal Upland Swamp in the Sydney Basin Bioregion* EEC (BC Act and EPBC Act)) – 0.95 ha
- PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion – 10.53 ha
- PCT 1134/HN852 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion – 12.32 ha and
- PCT 1181/HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion – 2.98 ha.

The following threatened flora and fauna species have been recorded within the Haerses Road BioBank site:

- Dural land snail (*Pommerhelix duralensis*) (listed as endangered under the BC Act and the EPBC Act)
- Eastern pygmy possum (*Cercartetus nanus*) (listed as vulnerable under the BC Act)
- *Darwinia biflora* (listed as vulnerable under the BC Act and the EPBC Act)
- *Tetratheca glandulosa* (listed as vulnerable under the BC Act) and
- *Grevillea parviflora* subsp. *supplicans* (listed as endangered under the BC Act).

Several weed species are known to occur within the wider Haerses Road BioBank Site in low densities, including introduced grasses such as whisky grass (*Andropogon virginicus*). No weeds listed under the *Biosecurity Act 2015* were identified.

Two feral fauna species have been identified at this site being the:

- Pig (*Sus scrofa*) and
- Fox (*Vulpes vulpes*).

4.3 Porters Road BioBank Site

The Porters Road BioBank Site is approximately 54.7 ha and comprises Lot 1 DP565423 (see **Figure 4.3**). Although zoned as RU2 rural landscape there is no evidence of recent grazing or fire. This site comprises intact vegetation with disturbance limited to fire trails and access tracks.

The site is underlain by soils derived from Hawkesbury Sandstone with rocky outcrops, a prominent ridgeline and a gully. This site is connected to expansive areas of remnant native vegetation to the north. Four vegetation communities were identified in this site being:

- PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion – 29.65 ha
- PCT 1134/HN852 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion – 7.04 ha
- PCT 1181/HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion – 15.68 ha
- PCT 1237/HN596 – Sydney Blue Gum – Blackbutt – Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion (consistent with *Blue Gum High Forest of the Sydney Basin Bioregion* CEEC under the BC Act and the EPBC Act) – 1.52 ha.

The following threatened flora and fauna species have been recorded within the Porters Road BioBank site:

- Dural land snail (*Pommerhelix duralensis*) (listed as endangered under the BC Act and the EPBC Act)
- Eastern pygmy possum (*Cercartetus nanus*) (listed as vulnerable under the BC Act)
- *Darwinia biflora* (listed as vulnerable under the BC Act and the EPBC Act)
- *Tetratheca glandulosa* (listed as vulnerable under the BC Act).

Several weed species are known to occur within the wider Porters Road BioBank Site in low densities, including lantana (*Lantana camara*) which is listed under the *Biosecurity Act 2015* in low numbers. Exotic grasses narrow-leaved carpet grass (*Axonopus fissifolius*) and *Setaria parviflora* were also identified in low numbers, however are both relatively innocuous.

Two feral fauna species were identified as requiring control at this site being the:

- Pig (*Sus scrofa*)
- Fox (*Vulpes vulpes*).

[2x click to insert picture]

Figure 4.1 Biometric Vegetation Types and Threatened Species of Haerses Road Quarry Modification Area and Haerses Road Biobank Site

© Umwelt, 2018

[2x click to insert picture]

Figure 4.2 Vegetation Communities and Threatened Species in the Approved Extraction Area

© Umwelt, 2017

[2x click to insert picture]

Figure 4.3 Biometric Vegetation Types and Threatened Species of the Porters Road Biobank Site

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5.0 Biodiversity Management Measures

As noted in **Section 1.2**, this BRMP identifies the biodiversity and rehabilitation management and monitoring measures that will be implemented for the Quarry. A range of controls and strategies have also been formulated to minimise and mitigate direct impacts associated with the Quarry, particularly in relation to land clearing and ground-disturbance and minimising impacts on the range of threatened species that are known to occur on the site. These management controls are aimed at ensuring that the purpose of the BRMP described in **Section 1.2.1** is met.

These impact mitigation measures will be implemented for the next 3 years (2018 – 2020) and for the life of the Quarry. Potential for continuous improvements in the type and way mitigation measures are implemented will be regularly reviewed. These improvements will be taken into consideration in future revisions of this BRMP.

5.1 Extraction Area Biodiversity Management Controls

During the next 3 years (2018 – 2020), the primary activities within the Quarry will involve ongoing development of quarrying areas and control of weed and feral species. The objective will be to undertake pre-disturbance activities that aim to minimise the ecological impacts of the quarrying operation as well as commence rehabilitation as soon as practical behind the quarrying activities so as to minimise the extent of disturbance on site. As such, the key biodiversity management controls to be adopted during this time include:

- Definition of clearing limits and install fencing to mark the extent of extraction (**Section 5.1.1.1**)
- Pre-clearance surveys ahead of vegetation clearing in accordance with **Section 5.1.1.2**. Based on the outcomes of these inspections, undertake the following where required:
 - specific tree felling procedures as outlined in **Section 5.1.1.4**, in order to minimise the impacts to flora and fauna from clearing
 - collect seed and regenerative material for use in rehabilitation, as per **Section 5.1.2**
 - salvage of habitat features as outlined in **Section 5.1.3**
 - salvage soil resources for use in rehabilitation as outlined in **Section 5.1.4**
- undertake feral animal and weed monitoring works as required (see **Section 5.2.2** and **Section 5.2.3**)
- undertake rehabilitation activities in accordance with the requirements of **Section 6.0**
- undertake rehabilitation and ecological monitoring activities as per the monitoring program outlined in **Section 7.0**.

The key rehabilitation and ecological management and mitigation measures to be adopted over this time are detailed in **Table 5.1**.

Table 5.1 Key Biodiversity Management Controls

Management or Mitigation Measure	Actions	Section/s Addressed
Short Term – over the next 3 years		
Protecting vegetation and fauna habitat outside the approved disturbance area on-site	<ul style="list-style-type: none"> Demarcation of clearing limits to be maintained throughout the 3 year period Demarcation of revegetation areas to be installed and maintained throughout the 3 year period 	<p>Section 5.1.1.1</p> <p>Section 6.2</p>
Minimising the impacts of clearing on native fauna, including undertaking pre-clearance surveys and avoiding clearing activities during sensitive hibernation and breeding periods	<ul style="list-style-type: none"> Implementation of pre-clearance surveys and tree felling procedure prior to clearing Where possible, timing clearing works outside sensitive periods for local threatened fauna 	<p>Section 5.1.1.2 and Section 5.1.1.4</p> <p>Section 5.1.1.3</p>
Ensuring minimal environmental consequences for threatened flora species, populations and habitats	<ul style="list-style-type: none"> Defining clearing limits Pre-clearance surveys and tree felling procedures Seed collection and propagation of local flora species Assisted regeneration and targeted vegetation establishment within buffers and rehabilitation areas 	<p>Section 5.1.1.1</p> <p>Section 5.1.1.2 and Section 5.1.1.4</p> <p>Section 5.1.2</p> <p>Section 5.3</p>
Maximising the salvage of environmental resources within the approved disturbance area, including tree hollows, vegetative and soil resources, for beneficial reuse in the enhancement of site rehabilitation	<ul style="list-style-type: none"> Salvage of habitat features and placement within rehabilitation areas Direct transfer of topsoil and associated seedbank from quarried areas 	<p>Section 5.1.3</p> <p>Section 5.1.4</p>
Restoring native vegetation and fauna habitat in the rehabilitation areas through targeted vegetation establishment and the introduction of fauna habitat features	<ul style="list-style-type: none"> Rehabilitation of former quarried areas Salvage and placement of habitat features in rehabilitated areas 	<p>Section 6.0</p> <p>Section 6.7.4</p>
Collecting and propagating seed	<ul style="list-style-type: none"> Direct transfer of topsoil and brushmatting Seed collection and propagation of local native and threatened species 	<p>Section 6.7.1</p> <p>Section 5.1.2</p>
Controlling weeds and feral pests	<ul style="list-style-type: none"> Annual inspections with implementation of control programs as required Monthly targeted weed control activities within buffers and rehabilitation areas 	Section 5.2.2, 5.2.3
Controlling erosion	<ul style="list-style-type: none"> Continued erosion and sediment control in accordance with the Haerses Road Soil and Water Management Plan 	Section 5.2.4
Managing bushfire risk	<ul style="list-style-type: none"> Continued implementation of bushfire control measures in accordance with the Haerses Road Bushfire Management Plan 	Section 5.2.5

Management or Mitigation Measure	Actions	Section/s Addressed
Medium Term Measures (3-8 years)		
Protecting vegetation and fauna habitat outside the approved disturbance area on-site (where required)	<ul style="list-style-type: none"> Demarcation of clearing limits to be maintained for the life of the Quarry Fencing of revegetation areas to be installed and maintained for the life of the Quarry 	Section 5.1.1.1 Section 5.1.1.1
Controlling weeds and feral pests	<ul style="list-style-type: none"> Annual inspections with implementation of control programs as required Targeted weed control activities within rehabilitation areas Weed and feral pest control (if necessary) 	Section 5.2.2, 5.2.3
Controlling erosion	<ul style="list-style-type: none"> Inspection and maintenance of erosion and sediment controls in accordance with the Haerses Road Soil and Water Management Plan 	Section 5.2.4
Reporting	<ul style="list-style-type: none"> Annual reporting of any significant environmental impacts or disturbance within the rehabilitations areas or the Biodiversity Offset Area 	Section 8
Long Term Measures (8 + Years)		
Protecting vegetation and fauna habitat outside the approved disturbance area on-site (where required)	<ul style="list-style-type: none"> Demarcation of clearing limits to be maintained for the life of the Quarry Fencing of revegetation areas to be installed and maintained for the life of the Quarry 	Section 5.1.1.1 Section 5.1.1.1
Controlling weeds and feral pests	<ul style="list-style-type: none"> Annual inspections with implementation of control programs as required Targeted weed control activities within rehabilitation areas Weed and feral pest control (if necessary) 	Section 5.2.2, 5.2.3
Controlling erosion	<ul style="list-style-type: none"> Inspection and maintenance of erosion and sediment controls in accordance with the Haerses Road Soil and Water Management Plan 	Section 5.2.4
Reporting	<ul style="list-style-type: none"> Annual reporting of any significant environmental impacts or disturbance within the rehabilitations areas or the Biodiversity Offset Area 	Section 8

5.1.1 Land Disturbance Management Controls

The following measures apply to works associated with land clearing and ground-disturbance within the Quarry extraction area.

5.1.1.1 Defining Limits of Clearing

The limits of clearing for each stage of clearing works will be clearly delineated prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal, disturbance must be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

Particular attention will be paid to demarcation of records of *Hibbertia superans* records located adjacent to the approved extraction areas.

The person/s responsible for the clearing activities will be responsible for ensuring that the boundary markers, barriers and signs are installed to enable the suitable environmental and technical inspections of the proposed disturbance to be undertaken. Site inductions are to be given to ensure all site workers and visitors are aware of any sensitive vegetation. Prior to clearing the Quarry Manager (or their delegate) will check the marked clearing limits and provide approval of the disturbance boundary. Approval must be granted before clearing commences.

5.1.1.2 Pre-Clearance Surveys

Comprehensive pre-clearing surveys will be undertaken by a suitably experienced and licensed ecologist, no more than 2 weeks prior to felling. This will include marking of hollow-bearing trees, as well as any other notable features such as fallen timber, hollow logs or boulders suitable for salvage; active nests, dreys or dens requiring consideration, and seed-bearing trees for salvage. Surveys will include detailed searches for threatened flora and fauna species. An additional pre-clearance survey of the vegetation to be cleared will be undertaken by the Environmental Officer on the day of clearing (within 24 hours of clearing).

5.1.1.3 Timing of Clearing

As far as practicable, vegetation clearing is to be planned for periods outside of the breeding season for threatened species known to nest in the site and outside of torpor periods for hollow-roosting microbat species known to occur within the site. **Table 5.2** identifies the critical periods of use for threatened species recorded on site.

Clearing of hollow resources suitable for breeding will also be conducted outside of the winter period (June and July) and will not be cleared during the suspected breeding period for these species. This is generally between November and January.

Table 5.2 Critical Periods of use for Threatened Species known to occur within the Site

Species	Resource Utilised in Extraction Area	Critical Periods of Use
Masked owl (<i>Tyto novaehollandiae</i>)	Roosts and breeds in large tree hollows (or sometimes caves)	Capable of breeding during any time of year.
Glossy black cockatoo (<i>Calyptorhynchus lathami</i>)	Requires large hollow-bearing eucalypts as nest sites	Breeds from March to August.
Little Bentwing-bat (<i>Miniopterus australis</i>)	Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer.
Other (Non-hollow Dwelling) threatened species		
Koala (<i>Phascolarctos cinereus</i>)	Not hollow dependent, however slower moving than other local threatened species and less capable or readily evacuating trees. Inactive during the day.	Breeding season occurs from approximately August to February.

5.1.1.4 Tree Felling Procedure

A robust tree felling procedure will be implemented at the Quarry to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees. The tree felling procedure is designed to minimise impacts to hollow-dependent fauna. The procedure includes the following:

- Comprehensive pre-clearing surveys by a suitably experienced and licensed ecologist, no more than 2 weeks prior to felling. This will include marking of hollow-bearing trees, as well as any other notable features such as fallen timber, hollow logs or boulders suitable for salvage; active nests, dreys or dens requiring consideration; and seed-bearing trees for salvage. Surveys will include detailed searches for threatened flora and fauna species, including micro-bats.
- Removal of non-hollow-bearing trees/vegetation on the day or as close to the date of clearing as possible (in order to discourage fauna usage of the area). Removal of vegetation identified as not providing tree-hollows during pre-clearing surveys encourages hollow-dependent fauna to vacate clearing areas prior to the clearing of habitat trees, reducing the likelihood of mortality during clearing.
- Visual canopy inspection of all trees to be removed on the day of clearing by suitably experienced and licensed person to ensure that fauna is not injured during tree felling operations on the day of clearing.
- Detailed hollow-bearing tree felling procedures, including (but not limited to):
 - supervision of all hollow-bearing tree felling works by a suitably experienced and licensed person. Where necessary, this can be undertaken by the Environmental Officer with instruction by a suitably experienced and licensed person off site
 - visual canopy inspection on the day of the felling of hollow-bearing trees for fauna species and active nests
 - shaking of hollow-bearing tree (with heavy machinery) for at least 30 seconds to encourage resident fauna to abandon tree, prior to felling
 - lowering of hollow-bearing trees as gently as possible with heavy machinery
 - inspection of all hollows in felled trees
 - capture of any displaced/injured fauna. Any injured fauna will be taken to a wildlife carer or vet
 - release of unharmed fauna into nearby secure habitats
 - felled trees to be rolled so that the number of hollows blocked against the ground are minimised
 - all felled trees to remain in place overnight to allow any unidentified fauna to escape
 - salvage of suitable hollows (i.e. hollows of appropriate size and structural integrity and that can be salvaged safely) for treatment and installation within rehabilitation and revegetation areas as compensatory habitat.

In the event that threatened fauna are located within hollow-bearing trees during pre-clearance surveys or tree felling, no works will be undertaken within 5 m of the identified tree until the species is captured and relocated, or moves from within the clearing area of its own volition.

5.1.2 Seed Collection and Propagation

The primary seed source utilised for quarry rehabilitation will be the direct transfer of topsoil and brush-matting from cleared strips during their excavation. Propagation of locally sourced seed and plant material will also be used for windrows. To this end, Dixon Sand will implement a seed collection and propagation procedure in order to use local provenance species in rehabilitation. Seed from the site will be collected prior to or during clearing (in order to meet the requirements of Condition 36 (g)), or from within adjacent buffer zones and biodiversity offset areas (in order to facilitate that the biodiversity values of the offset areas are protected).

Locally sourced seed will be used in rehabilitation on site where possible using brush-matting techniques. When local seed cannot be sourced due to prevailing environmental conditions, other seed sources will be utilised to ensure that degraded areas are rehabilitated within one month of final landform shaping.

5.1.3 Salvage of Habitat Features

Where feasible, the salvage and relocation of hollow logs, fallen timber and boulders will be undertaken to augment habitat complexity within areas being rehabilitated. The purpose of this will be to increase habitat complexity in these areas, to make them more habitable for native species, particularly threatened fauna species.

Habitat features suitable for salvage will be identified and marked in the field as part of pre-clearance surveys. It is intended that any salvaged hollow bearing trees will either be incorporated in the final landform as ground level habitat or will have suitable hollow sections removed and attached to trees. The procedure for salvaging and reinstating habitat features is as follows:

- Hollow bearing trees will be considered for salvage based on structural integrity, number and size of hollows. Hollows to be salvaged will include a range of diameter sizes. Ideally, hollows should be in trunks or solid living branches to maximise the chance that they would survive the felling process.
- Woody ground debris will be selected based on size, structural integrity and presence of good hollows. Larger logs (in both length and girth) will be typically selected with large hollows (i.e. large diameter hollows through the length of the stem or at least a significant portion) through the stems.
- Bush rock and boulders will be selected based on size, structural integrity and provision of habitat. Larger rocks and boulders will typically be selected to provide habitat for fauna species.

Salvaged habitat features will be moved to a rehabilitation area as soon as possible after clearing to maintain habitat connectivity between cleared areas and remnant bushland. This will provide for the continuation of runways and refuge sites for native fauna for the duration of clearing works.

5.1.4 Topsoil Management

The key method of rehabilitation involves the transfer of topsoil and brush material obtained directly from cleared strips prior to their excavation. This material will be utilised in rehabilitation as:

- a seed source
- mulch
- erosion control and
- habitat for small fauna.

The direct return (within a 4 - 6 week period of clearing) of topsoil and brush matting is the chief method employed for revegetation of native vegetation in the existing extraction area. The timing of the clearing and return of soil and brush material is programmed to ensure that the maximum amount of viable seed and the best growing conditions coincide to produce the best chance of achieving high species diversity.

Topsoil extracted during the operation of the Quarry will be managed in accordance with the topsoil management measures outlined below in order to protect topsoil quality and enhance rehabilitation outcomes:

- where possible, topsoil will be stripped when moist to help maintain viability and to reduce dust generation
- the topsoil stripped will be between 100 - 300 mm in depth (dependent on the soil type present)
- where practical, topsoil will be direct-returned to reshaped areas within the existing Quarry which are available for revegetation
- topsoil stockpiles are to be located away from quarrying, traffic areas and watercourses and positioned within the perimeter of the closed water management system
- topsoil stockpiles will be located within the Quarry disturbance area and not within conservation areas adjacent to the Quarry
- level or gently sloping areas will be selected as stockpiles sites to minimise erosion and potential soil loss
- silt fences will be established clear of drainage lines and will be installed at the base of stockpiles to prevent soil loss to the surrounding area
- stockpiles will be generally less than 3 m high and will be set out in windrows to maximise surface exposure and biological activity
- stockpiles to be kept longer than 3 months (i.e. approximately how long it will take to establish a stable vegetative cover) will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species
- weed growth will be monitored on a monthly basis and controlled either by removing by hand or spraying if large areas (i.e. >40 m²) are observed
- prior to re-spreading, weed growth will be scalped from the top of the stockpiles to minimise the transport of weeds into rehabilitated areas.

5.2 Operational Controls

5.2.1 Controlling Access and Traffic

Measures to be implemented to minimise unauthorised access to the site will include the following:

- the extraction area will be demarcated where appropriate and vehicular access to the extraction area will be restricted
- existing Quarry site boundary fencing will be maintained

Onsite vehicular movements will be limited to 20 km/hour and will be indicated through the presence of signage installed on haul roads and access roads to minimise fauna injury/road kills.

5.2.2 Weed Management

Consistent with the Development Consent conditions, an effective weed control program will be implemented to limit the spread and colonisation of noxious and environmental weeds within the Quarry.

In general, the weed control program for the Quarry will include:

- annual inspections across the site (with a focus on rehabilitation areas) to;
 - undertake appropriate, targeted weed control activities (including minimum disturbance techniques such as hand removal where feasible), specific to the weed species identified
 - assess the effectiveness of the control programs and in response make any necessary modifications
- general observations of the presence of weeds will also be made as part of monthly inspections of the drainage lines and closed water management system
- monthly targeted weed control activities across the site.

In particular, the presence of Crofton weed (*Ageratina adenophora*) has been recorded on the site and is a declared weed under the NSW *Biosecurity Act 2015*. Under the NSW *Biosecurity Act 2015*, this plant is regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk it poses. Any person who deals with this plant has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practical. The specific methodologies for the control of Crofton weed within the site are as follows:

- all areas of Crofton weed will be removed mechanically and/or chemically (depending on the most suitable method for the maturity of the weed) and stockpiled within the area of infestation to ensure it is isolated from native vegetation
- stockpiled areas of Crofton weed are to be dealt with either by use of herbicides or through burning
- topsoil within areas of Crofton weed can only be translocated into rehabilitation areas of the site after being treated with the measures listed above
- no Crofton weed or topsoil within Crofton weed infestations will be transferred offsite.

Weed control works will include the development and implementation of an eradication plan applicable to the circumstances, which may include manual removal, spot spraying or biological control. The specific method selected will consider the known locations of threatened flora and fauna species. Low impact weed management techniques such as manual removal will be used within 40 m of known threatened species records.

The weed control works will also consider:

- minimisation of vegetation disturbance by reducing the number of tracks
- minimisation of clearing and other disturbance of vegetation associated with civil works
- maintenance of topsoil stockpiles to eradicate weed infestation.

Weed management will be undertaken in accordance with most recent information available on the NSW WeedWise online resource (DPI, 2018). Actual control measures will be determined based upon the area in which activities are being undertaken (i.e. herbicides will be avoided where possible near water bodies) and the size of infestation present (mechanical removal may be more appropriate for small scale infestations). Where required, herbicide types and application rates will be informed by the control specifications from the NSW WeedWise recommendations (DPI, 2018). Herbicide application will be undertaken by suitably qualified personnel (Level 3 Chemical Accreditation).

5.2.3 Pest Management

Pest management will be conducted as required based on annual survey results or reports from neighbours or other authorities. Experienced pest control contractors will be engaged to perform any control programs required, including baiting, trapping, warren ripping and open range shooting. Where possible, Dixon Sand will work in collaboration with neighbouring land-owners to develop a strategic approach to pest management. Pest management will be undertaken across both operational and rehabilitation areas.

Monitoring of pest species populations and the effectiveness of the control program will be undertaken and reported annually as part of general biodiversity monitoring. Recommendations and the proposed control program for subsequent years will also be included as an outcome of the monitoring.

5.2.4 Sediment and Erosion Control

Erosion and migration of sediment from within the site into adjacent vegetation has the potential to facilitate weed invasion through the introduction of weed seeds and nutrients that favour weed species.

This potential impact will be avoided through the implementation of appropriate erosion and sediment control measures in accordance with the Soil and Water Management Plan. This will include:

- Clearly identifying and delineating areas required to be disturbed and ensuring that disturbance is limited to those areas;
- clearing as little vegetation as required and minimising machinery disturbance outside of these areas;
- installing appropriate erosion and sediment controls prior to stripping topsoil or disturbing areas;
- limiting the number of roads and tracks established;
- stabilising site entry/exit points to ensure sediment is not tracked onto sealed roadways;
- construction of drains upslope of areas to be disturbed to convey clean runoff away from most disturbed areas where required;
- reshaping, topsoiling and vegetating road and cut and fill batters as soon as practical;
- construction of sediment dams where required to capture and treat runoff from disturbed catchment areas;
- Diversion of surface and road runoff away from disturbed areas;
- Regular maintenance of all erosion control works and rehabilitated areas; and
- Revegetation of areas as soon as practical following the completion of earthworks or operations.

5.2.5 Fire Management

Bushfire prevention is required under the *Rural Fires Act 1997*. The absence of fire will lead to a build-up of fire fuel and risk of high intensity bushfire. Dixon Sand as the owner of the land is required to take practicable steps to prevent the occurrence of bushfires on the land and minimise the spread of bushfire.

The primary management objective in relation to fire management is to protect lives, biodiversity values and infrastructure assets from the impacts of bushfires.

Key control measures will focus on:

- documentation of access and water supply points for suppression activities as detailed in the Bushfire Management Plan (Umwelt, 2018c)
- use of cool burns when deemed necessary (with any required approvals and/or permits from Rural Fire Service) to reduce fuel build-up to protect biodiversity and conservation values
- inspect and monitor firefighting equipment on site, as detailed in the Bushfire Management Plan Part 1 : Environmental Management (Umwelt, 2018c), refer to <http://www.dixonsand.com.au/environment>
- communication of bushfire control measures and response procedures for provision to key stakeholders, including land managers, neighbours, consultants, contractors and employees.

Any fuel hazard reduction burns will be planned in accordance with the *Bush Fire Environmental Assessment Code for New South Wales* (NSW Rural Fire Service, 2006a) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* (NSW Rural Fire Service, 2006b). Burn intervals will consider the guidelines contained within the *Threatened Species Hazard Reduction Lists* as well as the OEH recommendations in the *Guidelines for Ecologically Sustainable Fire Management* (NPWS, 2004).

Current recommendations under the Code and Guidelines are:

- In woodland vegetation, fire should not occur within 5 years of a previous fire and consideration will be given to burning within 30 years of any previous fire, with occasional intervals greater than 25 years being desirable and
- In grassland vegetation derived from the woodland vegetation, the recommended fire intervals are the same as woodland vegetation.

5.2.6 Buffer Zones and Set-backs

The following buffer zones and set backs will be established and maintained (as per Baulkham Shire Council Extractive Industries Development Control Plan 16):

- 10 m from adjoining property boundaries
- 30 m from Wisemans Ferry Road
- 40 m from the Maroota State Forest
- 40 m from archaeological site # 45-2-0081
- 40 m from the top bank of Little Cattai Creek
- 100 m from the dwellings adjacent to Hitchcock Road and Wisemans Ferry Road.

All effort will be made to retain any mature vegetation in the designated buffer zones. These areas will be used as supply zones for seeds, brush seedlings (for transplanting) and cuttings for extraction strips if required.

5.2.7 Training and Awareness

All site personnel working at the Quarry will undergo an induction. The induction includes information on managing the biodiversity values of the site, the requirements of the land disturbance management controls and operational controls set out in this BRMP. After completing the induction, workers will sign a statement of attendance and records of this are kept in the administration office.

Tool-box meetings are held to discuss whole-of-site production, management, safety and environmental issues. Matters relating to rehabilitation and biodiversity management are raised during these meetings when necessary.

5.3 Onsite Revegetation Strategies and Locations

The following are revegetation strategies that will be employed in non-rehabilitation areas. These methods are less involved than those that will be required for rehabilitation strategies in areas that have previously been subject to quarrying activities.

Revegetation activities will be undertaken in the following areas:

- 30 m buffer from Wisemans Ferry Road
- 100 m from the dwellings adjacent to Hitchcock Road and Wisemans Ferry Road during Stage 3 (2006 consent) quarrying
- within drainage lines
- along windrows
- previously disturbed area (1.1 ha) in the south-east of the 40 m buffer with Maroota State Forest
- Environmental Bunds – Visual and Noise areas at the following locations:
 - along the western boundary of the site during extraction of Stage 3 (2006 consent)
 - Along the north-east boundary of the site prior to extraction of Stage 5 (2006 consent)
 - along the western boundary of Cell 4, prior to early extraction works in Cell 4 (Mod 1 consent)
 - set back a minimum of 50 m from the western boundary of Cell 5 prior to early extraction works in Cell 5 (Mod 1 consent).

The vegetation and revegetation management measures described in this plan aim to restore the ecological integrity and functioning of the site as close as possible to its condition prior to clearing and quarrying works. This will be accomplished by preserving the flora and fauna habitat outside the clearing footprint and providing measures to effectively revegetate areas to be cleared. The strategies for regeneration and revegetation are outlined below.

5.3.1 Defining Buffer Areas and Revegetation Areas

The buffer and supplementary planting areas will be clearly defined and be marked either by high visibility tape, fencing or an equivalent boundary marker that will be installed any time prior to the commencement of clearing works. Clearly defined boundaries will prevent unnecessary and inadvertent clearing of vegetation and/or habitats and unauthorised access by grazing stock or people.

No stockpiling of equipment, machinery, soil or vegetation will occur within these areas.

5.3.2 Windrows and Drainage Lines

Stands of native vegetation will be progressively re-established within the drainage lines and in windrows along the lot boundaries. Windrows will provide wind protection for agricultural land, while additional planting in drainage lines will act as soil stabilisers and decrease runoff rates into waterbodies. Plantings in drainage lines will be appropriate to these areas of higher flow and moisture, and will assist in improving the quality of surface water leaving the site.

5.3.3 Environmental Bunds

The purpose of construction of Environmental (noise and visual) bunds are to act as a screen to operational noises and local visual amenity for nearby residents (refer to Acoustic Bund Construction Noise Management Plan (CNMP)). Environmental bunds constructed for Stage 3 and Stage 5 will be 5 m in height and have maximum final gradients of 1 in 3 (vertical : horizontal). Environmental bunds for Cell 4 and Cell 5 (Mod 1 extraction area) will be a minimum of 7 m high with a minimum 80 m return and 50 m setback respectively. These must be installed prior to their respective early extraction works.

Bunds will initially be seeded with cover crops (refer to **Section 6.10**), to reduce the potential for soil erosion. These areas will then be subject to planting of native trees and shrubs to provide further ongoing screening. If necessary for screening purposes, temporary bunds may also be constructed by pushing cleared topsoil to the boundaries of extraction.

Bunds will be retained until they no longer act to minimise visual/noise impacts. Remaining bunds will be removed when the area they are in is due for reshaping to final landform. Bunds with established revegetation will have their topsoil retained for spreading over the final reshaped landform, with the remainder of the bund flattened and reshaped to make the final landform.

5.3.4 30 metre Buffer from Wisemans Ferry Road

Appendix 2 of the Development Consent shows the buffer zones around the Quarry. The 30 m buffer to Wisemans Ferry Road contains fragmented stands of mature vegetation including *Angophora* spp., *Eucalyptus* spp., and *Acacia* spp. This area will be subject to the following additional revegetation activities (ERM, 2007):

- Additional planting within the 30 m buffer to Wisemans Ferry Road to minimise visual impacts of the Quarry on motorists.
- Be dense enough to form a viable forested buffer to onsite activities.
- Seeds will be collected from this area and other areas of native vegetation surrounding Haerses Road, and propagated prior to planting. Supplementary planting will be undertaken using local provenance plants where possible.
- Rehabilitation and weeding in the area will be progressive throughout the life of the operation and will continue until the rehabilitated areas are established.

5.3.5 Buffer to Maroota State Forest

This is a previously disturbed area of land identified as suitable for rehabilitation, located to the south east of Haerses Road, within the buffer area to Maroota State Forest (refer to **Figure 1.2**). It is 1.1 ha in size and was subject to disturbance prior to Dixon Sand's acquisition of the land. This area has undergone some natural regeneration (*Hakea* spp., *Acacia* spp., *Leptospermum* spp., *Eucalyptus* spp. and various ferns and grasses) since Dixon Sand's acquisition. However, the area is heavily weed infested (particularly with pampas grass (*Cortaderia selloana*), whiskey grass (*Andropogon virginicus*), *Paspalum* sp., Crofton weed (*Ageratina adenophora*) and kikuyu (*Pennisetum clandestinum*), and requires assistance to ensure it returns to sustainable native vegetation and habitat. The method proposed by Dixon Sand's qualified revegetation manager (Bush-It Pty Ltd) in November 2007 (in ERM, 2007) is as follows:

- use topsoil from the area upslope of the site that is the remnant vegetation cleared for quarrying activities
- translocate the soil to cover the groundcover vegetation, starting from the western section and moving to the east in stages, as soil becomes available from areas cleared above the site adjacent to Haerses Road
- spread soil to a depth of 200mm over this area (this will provide a good base for plant generation, while also smothering weed species)
- ongoing weeding of the site whilst regeneration is occurring on an as needed basis.

5.3.6 Tubestock Planting

Supplementary planting areas identified above will be subject to targeted tube-stock planting activities. Tube-stock will comprise local tree and shrub species from the list identified in **Appendix 3**. These tubestock will where possible be sourced from local seed collection.

5.4 Haerses Road and Porters Road BioBank Sites

The Haerses Road and Porters Road BioBank Sites will be managed in accordance with the approved BioBanking Agreements. No management or monitoring actions are required to be completed under this management plan.

6.0 Rehabilitation Strategy

Rehabilitation strategies will be undertaken within areas that have previously been subject to quarrying.

Extraction and rehabilitation of each quarry stage will occur progressively following cessation of quarrying, with cleared vegetation and topsoil from one strip transferred directly for use in rehabilitation of the next progressively extracted strip.

6.1 Rehabilitation Objectives

Rehabilitation of the Quarry will be undertaken in accordance with the Development Consent, refer to **Table 6.1**.

Table 6.1 Haerses Road Quarry Rehabilitation Objectives

Feature	Objective
All areas of the site affected by the development	<ul style="list-style-type: none"> • Safe • Hydraulically and geotechnically stable • Non-Polluting • Fit for the intended final land uses • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land.
Surface Infrastructure	<ul style="list-style-type: none"> • Decommissioned and removed, unless otherwise agreed by the Secretary
Quarry benches and pit floor	<ul style="list-style-type: none"> • Landscaped and vegetated using native trees and understory species
Final void	<ul style="list-style-type: none"> • Minimise the size, depth and slope of the batters of the final void • Minimise the drainage catchment of the final void

6.2 Rehabilitation Strategy for the next 3 years (2018 – 2020)

During the next 3 years, the primary rehabilitation activities within the Quarry will involve ongoing development of quarrying areas and control of weed and feral species. The objective will be to undertake pre-disturbance activities that aim to minimise the ecological impacts of the quarrying operation as well as commence rehabilitation as soon as practical behind the quarrying activities so as to minimise the extent of disturbance on site. As such, the key rehabilitation and ecological management strategies to be adopted over this time include:

- Define the limits of clearing for and install survey pegs to mark the extent of extraction
- Conduct pre-clearance surveys ahead of the vegetation clearing and quarrying operations in accordance with **Section 5.1.1.2**. Based on the outcomes of these inspections, undertake the following where required:
 - implement specific tree felling procedures as outlined in **Section 5.1.1.4**, in order to minimise the impacts to flora and fauna from the quarrying operation
 - collect seed and regenerative material for use in rehabilitation, as per **Section 5.1.2**
 - salvage soil resources for use in rehabilitation of earlier strips as outlined in **Section 6.7.1**

- undertake ongoing feral animal and weed monitoring and treatment works as required as outlined in **Sections 5.2.2 and 5.2.3.**
- undertake rehabilitation activities in accordance with the general requirements of **Sections 6.2 and 6.3**
- undertake rehabilitation and ecological monitoring activities as per the monitoring program outlined in **Sections 7.1 and 7.2.**

Following native vegetation establishment in rehabilitation areas fauna habitat features such as rock piles, reinstated logs and nest-boxes for hollow dependent fauna will be incorporated into the rehabilitation.

6.3 Conceptual Final Landform

The conceptual final landform for the Quarry site is shown in **Figure 6.1** and will generally integrate into the surrounding terrain across the site and adjoining land. The final landform aims to restore native vegetation and fauna habitat in rehabilitation areas through targeted vegetation establishment and the introduction of fauna habitat features. The conceptual final landform will include the following:

Native Vegetation

- The west of Lot 177 DP 752039 and Lot 216 DP 752039 will slope generally to the west and be planted with native flora species consistent with the following vegetation communities:
 - HN582 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion
 - HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateau of the Sydney Basin Bioregions
 - HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western Sydney and Southern Sydney, Sydney Basin Bioregion
- Fauna habitat features such as rock piles, reinstated logs and nest-boxes for hollow dependent fauna will be incorporated into the rehabilitation, providing for the colonisation of native fauna species

Agricultural Land

- Lots 176 and east of Lot 177 DP 752039, Lot A and Lot B DP 407341 and Lot 170 DP 664767 final landform will:
 - Slope west or north-west and maintain existing water flow paths to adjacent properties.
 - Be regenerated with vegetation consistent with an agricultural landscape, primarily consisting of horticultural crops.

6.4 Intended Final Land Use

The land uses intended for the rehabilitated landform is a mix of Class 4 agricultural land and native vegetation, consistent with the surrounding landscape. Permanent water storage will also be retained on Lot 177 DP 752039 to support the proposed agricultural land uses. The rehabilitation areas provide an opportunity to link rehabilitation with existing remnant vegetation to the east and west. The intended final land use for the site is presented in **Figure 6.2**. A detailed Quarry Closure Plan will be completed approximately 3 years prior to closure. Dixon Sand will consult with relevant stakeholders including The Hills Shire Council and DPE in regards to the development of the Quarry Closure Plan.

6.5 Preliminary Rehabilitation Performance and Completion Criteria

Rehabilitation performance and completion criteria will be utilised to demonstrate achievement of rehabilitation objectives. The preliminary rehabilitation performance and completion criteria, trigger actions and responses for the Quarry are outlined in **Table 6.2**.

The preliminary rehabilitation performance and completion criteria will be reviewed and revised throughout the life of the Quarry and used as the basis for further refinement following the commencement of rehabilitation activities, consideration of the results of rehabilitation monitoring programs and stakeholder feedback.

Table 6.2 Preliminary Rehabilitation Performance and Completion Criteria

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Trigger	Potential Corrective Action
Decommissioning	<ul style="list-style-type: none"> All surface infrastructure will be decommissioned and removed. 	<ul style="list-style-type: none"> Surface infrastructure not removed. 	<ul style="list-style-type: none"> Decommission and remove any remaining infrastructure.
Landform	<ul style="list-style-type: none"> Rehabilitated slopes are stable. No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use. Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff. Surface layer is free of any hazardous materials. 	<ul style="list-style-type: none"> Rehabilitated slope are unstable. Erosion causing a safety issue or impacting final land use. Unstable contour banks, evidence of overtopping or scouring as a result of runoff Hazardous material present on surface. 	<ul style="list-style-type: none"> Stabilise slopes via erosion control or earthworks Adapt erosion control strategy to stabilise landform. Undertake repairs of erosion control structure, modify erosion control strategy as appropriate Remove hazardous material in accordance with legislative requirements.
Soil	<ul style="list-style-type: none"> Topsoil or a suitable alternative has been spread uniformly over the rehabilitation surface. Monitoring demonstrates soil profile development in rehabilitated areas (e.g. development of organic layer, litter layer). 	<ul style="list-style-type: none"> Non-uniform spreading of topsoil or alternative on rehabilitated surface. No evidence of soil profile development in rehabilitated areas. 	<ul style="list-style-type: none"> Monthly rehabilitation inspection to identify need for corrective action. Topsoil to be re-worked to achieve uniform distribution Soil profile development influenced by original placement techniques and vegetation growth. Corrective actions to be developed based on specific conditions.
Water	<ul style="list-style-type: none"> Runoff water quality from the site does not pose a threat to downstream water quality. 	<ul style="list-style-type: none"> Poor quality runoff downstream. 	<ul style="list-style-type: none"> Review water quality results and determine activities/site locations contributing to water quality. Modify erosion control/water treatment measures as required.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Trigger	Potential Corrective Action
Native Vegetation	<ul style="list-style-type: none"> • Revegetation areas contain flora species assemblages and ground cover is within OEH benchmark of the target native vegetation communities (refer to BioNet Vegetation Information System (BioNet VIS)). • Second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e. evidence of fruiting of native species observed). • More than 75% of trees are healthy and growing as indicated by long term monitoring. • Ground cover species are characteristic of target vegetation communities • The presence of weeds is within OEH benchmark of the target native vegetation communities (refer to BioNet VIS). 	<ul style="list-style-type: none"> • Flora species and ground cover not in line with OEH benchmark for target native species. • Limited or no second generation tree seedlings present. • Long term monitoring shows less than 75% of trees are healthy and growing. • Low species diversity in ground cover, not characteristic of target vegetation communities. • Weeds greater than OEH benchmark for target native vegetation communities. 	<ul style="list-style-type: none"> • Undertake supplementary seeding/planting. • To be assessed during rehabilitation monitoring and undertake active revegetation if required. Review planting techniques to confirm they are appropriate. • Implement works to improve ecosystem health. Actions implemented contingent upon cause of identified issue. • Implement actions to improved ground cover. These actions may include thinning of understory or supplementary ground cover seeding/planting. • Increase targeted weed control measures.
Agricultural Land	<ul style="list-style-type: none"> • Rehabilitated land is compatible with proposed agricultural land use) as demonstrated by soil assessment • Landform comprises broad gentle slopes between 2 - 5% • Land capable of supporting suitable sterile cover crop 	<ul style="list-style-type: none"> • Soil unsuitable for agricultural land use. • Slopes greater than 2 - 5%. • Land not supporting suitable crop cover. 	<ul style="list-style-type: none"> • Implement remediation actions as identified by soil assessment. • Slopes to be re-worked to appropriate grade • Undertake soil treatment if required and reseed cover crop.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Trigger	Potential Corrective Action
Weed and Pests	<ul style="list-style-type: none"> Regular inspections indicate declining weed diversity, density and abundance and a decline in signs of feral animal activity. The presence of weeds is within OEH benchmark of the target native vegetation communities (refer to BioNet VIS). There is no evidence of significant damage resulting from feral animal activity 	<ul style="list-style-type: none"> Increased noxious or environmental weeds and evidence of feral animal activity. Presence of weeds above OEH benchmark of the target native vegetation. Evidence of significant feral animal damage to rehabilitation area. 	<ul style="list-style-type: none"> Undertake weed/feral animal control as required Undertake weed/feral animal control as required Adapt/modify feral animal control strategy.
Bushfire Hazard	<ul style="list-style-type: none"> Appropriate bushfire hazard controls have been implemented. 	<ul style="list-style-type: none"> Increased bushfire hazards identified. 	<ul style="list-style-type: none"> Liaise with RFS and adapt bushfire control measures. Update Bushfire Management Plan as required.
Ongoing Public Safety	<ul style="list-style-type: none"> Appropriate mechanisms are established to control access and manage public safety post-closure. 	<ul style="list-style-type: none"> Evidence of unauthorised access. 	<ul style="list-style-type: none"> Review site security and re-secure site access points where possible

[2x click to insert picture]

Figure 6.1 Proposed Final Landform

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[2x click to insert picture]

Figure 6.2 Intended Final Land Use

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6.6 Rehabilitation Species Selection

Two types of rehabilitation plantings will be undertaken, being agricultural land and native vegetation as described in greater detail below. The intended final land use and the proposed portions of the suite to be returned to agricultural and a native vegetation final land use are detailed on **Figure 6.2**.

6.6.1 Agricultural Land

Rehabilitation works undertaken in Lots 176 and east of Lot 177 DP 752039, Lot A and Lot B DP 407341 and Lot 170 DP 664767 will utilise cover crop species for initial stabilisation and to increase organic content of soils. Initial agricultural area rehabilitation species mixes will include legume species to encourage nitrogen accumulation of soil and increase soil fertility. Agricultural crops to be established are likely to include those grown throughout the Maroota area, including oats, sorghum and sunflowers. A typical pasture mix will be sown at a rate of 50 kilograms per hectare during the autumn months, while seeding rates will be increased in areas of limited topsoil to establish a satisfactory cover of plants.

6.6.2 Native Vegetation

Native communities will be planted as described in **Section 6.3** with the species selected from the list provided in **Appendix 3**.

6.7 Regeneration and Revegetation Strategies

6.7.1 Direct Transfer of Topsoil and Brush Materials

The key method of rehabilitation involves the transfer of topsoil and brush material obtained directly from cleared strips prior to their excavation. This material will be utilised as a seed source, mulch, erosion control, and will provide some habitat for fauna. This technique will ensure that the topsoil used will contain a native seedbank that will represent the original vegetation communities of the site prior to clearing. Cleared logs, large boulders and felled trees will also be utilised for ground fauna habitat, threatened flora habitat (providing areas of open ground in the heath habitats) and soil stabilisation.

The timing of the clearing and return of soil and brush material is programmed to ensure that the maximum amount of viable seed and the best growing conditions coincide to produce the best chance of achieving high species diversity.

6.7.2 Direct Planting

The species composition will initially be determined by germination of the direct transfer of topsoil and brush material, and later added to by direct planting using local plant material where possible, to achieve a similar diversity and structure as the community previously existing on the site.

Seeds and plant material (cuttings) used to augment the rehabilitation areas will be sourced locally. Tubestock utilised will preferentially be 6 - 9 months old at the time of planting to maximise the potential for successful rehabilitation. Seeds and tubestock will comprise species consistent with vegetation communities identified in **Section 6.3**.

6.7.3 Cover Crops

The use of cover crops will be utilised in areas proposed as Class 4 Agricultural land rehabilitation and/or where a lack of transferable weed free topsoil and/or brush material occurs, and will be required for the stabilisation and mulching of new areas prior to further regeneration. These will comprise short lived, non-invasive and sterile seasonal species for this use. Where appropriate, these crops will also be used to assist in stabilising any temporary stockpiles or bund walls as required.

6.7.4 Habitat Augmentation

Habitat features salvaged during tree-felling such as hollow-bearing trees and logs will be used for habitat augmentation. When habitat features are being relocated, care will be taken not to damage the native vegetation at the location it is being relocated to.

The salvage process will be an ongoing one, as it relies on the progress of the clearing within the approved modification area. In a similar manner, the deployment of stockpiled habitat features will be dependent on the progress of rehabilitation/regeneration works. This will be completed progressively, once rehabilitation/regeneration works are completed within discrete areas.

7.0 Biodiversity and Rehabilitation Monitoring

Biodiversity and rehabilitation monitoring is required by Condition 36 (h) Schedule 3 of the Development Consent. The following sections outline the biodiversity and rehabilitation monitoring undertaken at the Quarry.

7.1 Rehabilitation Monitoring

7.1.1 Rehabilitation Inspections

Visual inspections of all rehabilitated areas will be undertaken monthly as part of water management system inspections. These will be complemented with more detailed 6-monthly (or other frequency as agreed with DPE) rehabilitation inspections that will be undertaken over the life of the quarrying operations to assess:

- soil conditions and erosion (i.e. stability)
- drainage and sediment control structures
- runoff water quality
- germination rates
- plant health
- natural regeneration
- weed diversity and abundance
- evidence of feral animals.

This will be done by visual inspection and photographing of all rehabilitation areas where necessary. Water quality of runoff from the Quarry disturbance area will be monitored in accordance with procedures set out in the Water Management Plan, including monitoring of licenced discharge water quality prior to discharge, and quarterly monitoring of receiving water quality.

Outcomes of the rehabilitation inspections will be recorded and any required management actions that are identified as part of the inspection, are to be implemented within one month of issue identification. Where necessary, rehabilitation and revegetation procedures will be amended accordingly with the aim of continually improving standards. The results of the rehabilitation inspections will be compared with the rehabilitation objectives and performance indicators.

Dependent upon the outcomes of the rehabilitation inspection as outlined above, the scope of the rehabilitation care and maintenance phase will include the following:

- re-seeding/planting of rehabilitation areas that may have failed
- weed and feral animal control
- fire management
- additional watering requirements for dry areas
- thinning of colonising species to reduce competition, if required

- erosion control works
- maintenance fertilising
- repair of fence lines, access tracks and other general related land management activities.

It is envisaged that this program will be continued as required until it can be demonstrated that the rehabilitation of the Quarry has satisfied the completion criteria.

7.1.2 Rehabilitation and Revegetation Methodology Records

Dixon Sand will record the details of each rehabilitation and revegetation campaign so that they are available for later interpretation of rehabilitation monitoring results. This will allow the continual improvement of rehabilitation and revegetation standards on site. Some of the key monitoring parameters to be included in the strategy are:

- Landform design details
- Drainage design details
- Substrate characterisation
- Site preparation techniques such as topsoil preparation, time of sowing, soil ameliorate used and so on
- Revegetation methodologies such as cover crop and rate, seed viability
- Weather conditions
- Photographic records
- Initial follow-up care and maintenance works.

7.1.3 Monitoring Rehabilitation against Completion Criteria

Preliminary completion criteria for the Quarry are provided in **Table 6.2**. Rehabilitation monitoring against completion criteria will be undertaken progressively during rehabilitation of site areas. Refinement of the completion criteria will be undertaken throughout the development of a Quarry Closure Plan, which will be developed 3 years from closure.

It is envisaged that the review of rehabilitation monitoring against completion criteria will occur as part of subsequent reviews of this BRMP. The progressive achievement (or otherwise) of these completion criteria will also be assessed and discussed in the Annual Review, which will include the identification of instances where criteria is not met, and measures taken to address any such issue.

7.2 Ecological Monitoring

Dixon Sand will implement an ecological monitoring program that is intended to monitor the effects of the development on the biodiversity values of the site and the success of revegetation works. Ecological monitoring is undertaken 6-monthly for the first 3 years with the monitoring frequency reviewed following review of monitoring results.

This monitoring program includes 10 monitoring locations:

- 5 agricultural monitoring sites (for extractions Stages 1 - 5 as per the 2006 Development Consent). Monitoring will occur progressively as each extraction Stage is completed and rehabilitated.

- 5 Ecological rehabilitation monitoring sites (for extraction Cells 1 - 5 as per Mod 1) (with at least one baseline monitoring event to occur in the four different vegetation communities prior to clearing).

Each monitoring site will include floristic monitoring, photo monitoring and a habitat assessment. The details of these monitoring methodologies are provided in **Appendix 4**.

7.3 Summary of Rehabilitation and Biodiversity Monitoring

A summary of rehabilitation and biodiversity monitoring requirements is provided in **Table 7.1**. The monitoring program outlined below provides for the completion of monitoring on a 6-monthly basis where there is potential for changes to the ecosystem health to occur during a 6 month period. The monitoring program and frequency below is supported by a detailed program of rehabilitation inspections which are undertaken on a monthly basis to identify any issues which need to be addressed. The outcome of the Rehabilitation Inspection as referenced in **Table 7.1** below may lead to the initiation of the corrective action process as defined in **Table 10.1**.

Table 7.1 Biodiversity and Rehabilitation Monitoring Regime

Monitoring Type	Location	Parameters Monitored	Frequency of Monitoring	Season/ Month	Monitoring Method	Responsibility
Rehabilitation Inspections	Rehabilitation Areas	General status of rehabilitation areas	Monthly	NA	Observation	Environmental Officer or Delegate
		Weed and pest inspections	6-monthly	NA	Observation	Environmental Officer or Delegate
		Soil conditions and erosion, drainage and sediment control structures, runoff water quality, germination rates, plant health, natural regeneration, weed infestation, evidence of feral animals.	6-monthly	NA	Field survey and photo monitoring	Environmental Officer or Delegate
Agricultural Rehabilitation Monitoring	Stage 1 - 5 Rehabilitation Areas (2006 Development Consent)	Pasture composition and biomass, erosion, rock cover, soil exposure, weed infestation, evidence of feral animals.	6-monthly	Spring	Field survey and photo monitoring	Environmental Officer or Delegate
Ecological Rehabilitation Monitoring	Cell 1 - 5 Rehabilitation Areas (Mod 1)	Evidence of natural regeneration, evidence of disturbance by pests or weed invasion, habitat and fauna assessment (undertaken 6-monthly), floristic structure (undertaken annually)	6- monthly/ Annually (for floristic monitoring)	Spring (floristic monitoring)	Field survey and photo monitoring	Environmental Officer or Delegate

8.0 Reporting

8.1 Annual Review

A summary of biodiversity and rehabilitation monitoring results will be provided in the Quarry Annual Review. The Annual Review will be prepared and submitted to the Secretary, in accordance with Condition 12, Schedule 5 of the Development Consent. The Annual Review will be made available to the public through the Community Consultative Committee (CCC) and the Dixon Sand web site <http://www.dixonsand.com.au>.

A discussion of the effectiveness of the biodiversity and rehabilitation management controls utilised at the Quarry will be reported to DPE in the Annual Review. The Annual Review will also identify whether any change to existing or additional management controls are required to be implemented at the Quarry in order to achieve the rehabilitation objectives or completion criteria.

8.2 External Reporting

In accordance with Schedule 5, Condition 11 of the Development Consent, Dixon Sand will provide regular reporting on the environmental performance of the operations on its website. This will include outcomes of plans and programs as contained within this BRMP.

8.3 Incident and Non-Compliance reporting

Incidents that have caused, or threaten to cause material harm to the environment will be reported to the Secretary, EPA and relevant stakeholders immediately once the Quarry becomes aware of the incident in accordance with the Quarry's Pollution Incident Response Management Plan (PIRMP). Reporting for material harm incidents will be undertaken in accordance with Schedule 5, Condition 9 and 10 of the Development Consent.

Condition 9 Schedule 5 of the Development Consent requires Dixon Sand to report any incident to DPE and any other relevant agencies immediately after it becomes aware of the incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the air quality exceedance.

Condition 10 Schedule 5 of the Development Consent specifies that within 7 days of becoming aware of the non-compliance, Dixon Sand must notify the Department in writing to compliance@planning.nsw.gov.au and identify:

- the Development Consent number and name
- the condition of the consent relevant to the exceedance
- the nature and details of the exceedance
- the time and date of the exceedance
- measures that have been , or will be, implemented to prevent re-occurrence

Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

8.4 Adaptive Management

In accordance with Schedule 5, Condition 7 of the Development Consent, Dixon Sand will assess and manage biodiversity and rehabilitation related risks to ensure compliance with the objectives and completion criteria outlined in this plan.

Where a non-compliance relating to biodiversity and rehabilitation impact has occurred, Dixon Sand, at the earliest opportunity will:

- take all reasonable and feasible steps to ensure the exceedance ceases and does not reoccur
- consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Secretary describing those options and any preferred remediation measures or other course of action
- implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary.

Contingency measures that will be implemented while reasonable and feasible options are being explored include demarcating affected areas to prevent further access, implementing additional sediment and erosion controls to minimise potential for further disturbance.

9.0 Review and Improvement

Ongoing monitoring and review on the performance and implementation of this BRMP will be undertaken in accordance with the Quarry EMS and Development Consent, which require review of the plan within 3 months of the submission of:

- an incident report under Schedule 5 Condition 10;
- an annual review under Schedule 5 Condition 12;
- an Independent Environmental Audit report under Schedule 5 Condition 13; and
- any modifications to this consent.

The Quarry will notify DPE in writing of any review of this BRMP. Should a review lead to any revisions to this BRMP, the revised document will be submitted to DPE within 6 weeks of the review. Updated versions of this BRMP will be made publicly available on the Dixon Sand website in accordance with Schedule 5 Condition 15 of the Development Consent.

10.0 Threats and Corrective Actions

10.1 Threats and Corrective Actions

There are risks associated with successful implementation of the BRMP. In order to ensure delivery of the stated outcomes, and compliance with the approval conditions, a range of further actions are to be undertaken if monitoring identifies performance indicators/completion criteria are trending towards not being met.

The results of monitoring detailed in **Section 7** will feed into the adaptive management process (refer to **Section 8.4**). The Environmental Officer will utilise the results of the monitoring activities to identify any corrective actions required to meet the objectives and targets. The indicative triggers and corrective actions outlined in **Table 10.1** that have been identified would be subject to review based on the adaptive management process.

Table 10.1 Potential Threats Identified and Recommended Corrective Actions

Threat	Potential Corrective Actions	Timing/Frequency
Inadequate resourcing	<ul style="list-style-type: none"> Review and reallocate budget or resources to provide for the implementation of the BRMP 	<ul style="list-style-type: none"> Within 2 weeks of identification
Noxious or environmental weeds leading to degradation of biodiversity values in the biodiversity offset area, buffer areas and/or rehabilitation areas	<ul style="list-style-type: none"> Adapt weed management strategy and modify accordingly Actively monitor the results of modifying strategy. 	<ul style="list-style-type: none"> Strategy to be developed within 2 weeks of identification Control works to be undertaken within 1 month of identification Monitoring to be undertaken 3 months following identification
Feral animal species leading to degradation of biodiversity values in the biodiversity offset area, buffer areas and/or rehabilitation areas	<ul style="list-style-type: none"> Adapt feral animal control strategy and modify accordingly Actively monitor the results of modifying strategy. 	<ul style="list-style-type: none"> Strategy to be developed within 2 weeks of identification Control works to be undertaken within 1 month of identification Monitoring to be undertaken 3 months following identification
Unauthorised access resulting in damage	<ul style="list-style-type: none"> Identify access points and repair as required Rehabilitate any damaged areas Review site security. 	<ul style="list-style-type: none"> Within 1 week of identification during site operations or monitoring
Erosion	<ul style="list-style-type: none"> Adapt erosion control strategy and modify accordingly Supplementary planting of native plants Actively monitor the results of modifying strategy 	<ul style="list-style-type: none"> Strategy to be developed within 2 weeks of identification Control works to be undertaken within 1 month of identification Monitoring to be undertaken within 3 months following identification
Low species diversity in the rehabilitation areas	<ul style="list-style-type: none"> Targeted weed control Consider the need for active revegetation techniques including direct seeding or tubestock planting, following appropriate ground preparation such as weed control, ripping and augering. 	<ul style="list-style-type: none"> Undertake weed control within 1 month of issue identification Implement active revegetation within 1 month of identifying requirement
Revegetation survival	<ul style="list-style-type: none"> Identify why survival is not being achieved and replace plants that have not survived, such as: <ul style="list-style-type: none"> Assess planting methods (i.e. timing/use of tree guards) Assess nursery methods (i.e. watering/hardening methods) Implement appropriate control measures to minimise potential for further losses 	<ul style="list-style-type: none"> Within 1 month of identification Within 3 months of identification

Threat	Potential Corrective Actions	Timing/Frequency
Environmental conditions affecting establishment or growth of planted or seeded vegetation	<ul style="list-style-type: none"> • Undertake supplementary watering of rehabilitation • Review species diversity and provide supplementary seeding/planting 	<ul style="list-style-type: none"> • Within 1 week of identification and ongoing as required • Review as part of annual monitoring
Poor survival rate of propagated threatened flora specimens	<ul style="list-style-type: none"> • Identify why death occurred • Implement appropriate control measures such as establishing additional no-go areas • Review and trial alternative propagation methods • Provide supplementary planting of propagated specimens 	<ul style="list-style-type: none"> • Within 1 month of identification • Within 3 months of identification
Bushfire	<ul style="list-style-type: none"> • Implementation of controls as described in the Bushfire Management Plan Part 1: Environmental Management 	<ul style="list-style-type: none"> • As directed by the Bushfire Management Plan

11.0 Accountabilities

Environmental management at Dixon Sand will be the responsibility of all employees and contractors, with the Dixon Sand Quarry Manager having overall responsibility for environmental management of the operations. Environmental roles and responsibilities related to biodiversity and rehabilitation management for the project personnel are outlined in **Table 11.1**.

Table 11.1 Roles and Responsibilities

Role	Accountabilities for this document
Quarry Manager	<p>Approve appropriate resources for the effective implementation of this plan.</p> <p>Coordinate and assist with the review of this plan in accordance with the requirements of the Development Consent.</p> <p>Schedule rehabilitation activities as per this plan.</p> <p>Coordinate the implementation of biodiversity and rehabilitation management controls and strategies in accordance with this Plan.</p>
Environmental Officer	<p>Coordinate the biodiversity and rehabilitation monitoring requirements of this plan.</p> <p>Ensure monitoring records are effectively maintained on site.</p> <p>Ensure that the personnel involved in carrying out and monitoring of the activities required under this plan are suitably qualified, licensed and experienced to undertake the task.</p> <p>Ensure all internal and external biodiversity and rehabilitation reporting requirements are met.</p> <p>Periodically review monitoring results and progress against targets and performance indicators in accordance with the requirements of this plan.</p> <p>Assess the effectiveness of the management strategies and instigate the adaptive management process as required.</p> <p>Identify any corrective actions required to meet the objectives and targets of this plan.</p> <p>Coordinate biodiversity and rehabilitation related incident investigations and reporting as required by legislation and internal standards and guidelines.</p> <p>Review of this plan as required by the Development Consent.</p>
All employees and contractors	<p>Comply with all requirements in this Plan.</p> <p>Report all potential environmental incidents to the Quarry Manager immediately.</p> <p>Seek approval from the Quarry Manager prior to making changes to infrastructure/ processes which may result in increased biodiversity and rehabilitation risks.</p>

12.0 Definitions

The terminology utilised within this BRMP is defined in **Table 12.1** below.

Table 12.1 Definitions

Term	Definition
BioNet VIS	BioNet Vegetation Information System
BRMP	Biodiversity and Rehabilitation Management Plan
CCC	Community Consultative Committee
Development Consent	DA 165-7-2005 Mod 2
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EIS	Environmental Impact Statement
DA	Development Application
DPE	Department of Planning and Environment
Incident	An occurrence or set of circumstances that: Causes, or threatens to cause material harm to the environment; or results in non- compliance with the consent
OEH	Office of Environment and Heritage
Secretary	The Secretary of the NSW Department of Planning and Environment, including any authorised delegate or nominee.

13.0 References

DLWC (Department of Land and Water Conservation), 2000. Rehabilitation and Revegetation Strategy prepared by Soil Service.

Environmental Resource Management Australia (ERM) 2005. Proposed Sand Quarry at Haerses Road, Maroota – Environmental Impact Statement. Prepared on behalf of Dixon Sand (Penrith) Pty Ltd

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NSW Department of Primary Industries (DPI), 2018. NSW WeedWise web page.
<http://weeds.dpi.nsw.gov.au/>

NSW Rural Fire Service, 2006a. *Bush Fire Environmental Assessment Code for New South Wales*

NSW Rural Fire Service, 2006b. *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code*

National Parks and Wildlife Services (NPWS) 2004. *Guidelines for Ecologically Sustainable Fire Management*

Office of Environment and Heritage (OEH) 2017. *Biodiversity Assessment Method*. 59 Goulburn Street, Sydney NSW 2000 PO Box A290, Sydney South NSW 1232

Office of Environment and Heritage (OEH) 2018. *BioNet – gateway to NSW Biodiversity Information* webpage. Accessed April 2018 from
http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx

Office of Environment and Heritage (OEH) 2018. *BioNet Vegetation Information System*. Accessed August 2018 from <https://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm>

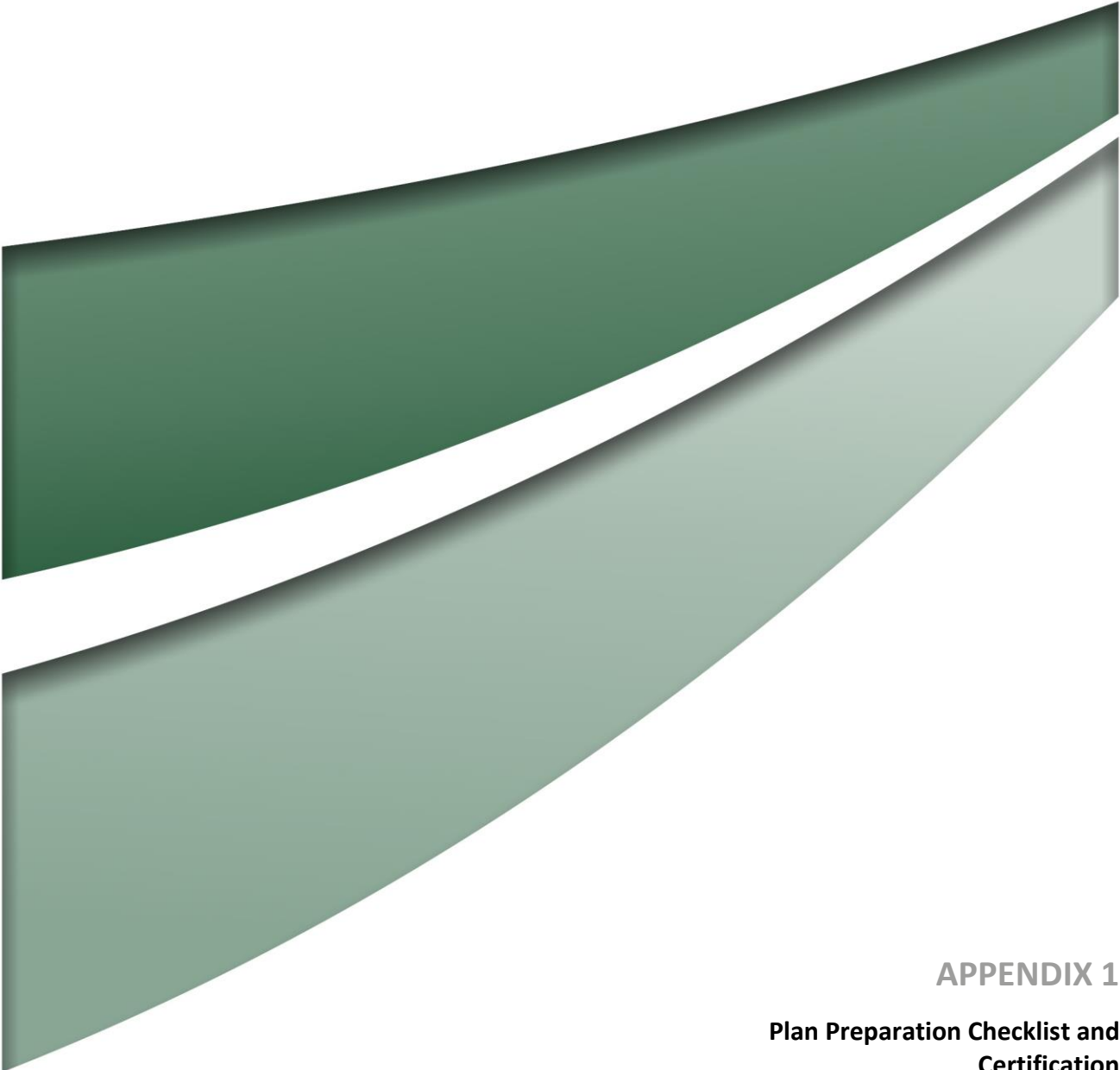
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Umwelt (Australia) Pty Limited 2016b. *Haerses Road Quarry Extraction Area Modification – Biodiversity Assessment Report*. Prepared on behalf of Dixon Sand (Penrith) Pty Ltd

Umwelt (Australia) Pty Limited 2018a. *Haerses Road Biobank Site Biodiversity Assessment Report*. Prepared on behalf of Dixon Sand (Penrith) Pty Ltd

Umwelt (Australia) Pty Limited 2018b. *Porters Road BioBank Site Biodiversity Assessment Report*. Prepared on behalf of Dixon Sand (Penrith) Pty Ltd

Umwelt (Australia) Pty Limited 2018c. *Haerses Road Quarry Bushfire Management Plan Part 1: Environmental Management*. Prepared on behalf of Dixon Sand (Penrith) Pty Ltd



APPENDIX 1

Plan Preparation Checklist and Certification

Appendix 1 – Plan Preparation Checklist & Certification

The Environmental Management Plan Requirements guidelines state that the following checklist must be completed and supplied to the Department with an Environmental Management Plan (EMP) and Sub-plans. *(Note: the items marked as NA are not required to be included in the Sub-plan).*

Requirement	Plan Reference	Yes/No/NA
Document preparation and endorsement		
Has the Plan been prepared in consultation with all relevant stakeholders? (Section 3.1)	Section 2.4	Yes
Have the views of the relevant stakeholders been taken into consideration, have appropriate amendments been made to the Plan and does the Plan clearly identify the location of any changes? (Section 3.1)	Appendix 2	Yes
Has the Plan been certified on behalf of the proponent? (Section 3.2)	Appendix 1	Yes
Version content		
Does the Plan include the required version control information? (Section 2.3)	Before Table of Contents	Yes
Does the Plan reference the project description as required in Section 2.4?	Section 1.0	Yes
Does the Plan identify the components of the project to which it applies (i.e. scope)? (Section 2.5).	Section 1.2	Yes
Does the Plan describe the proponent's Environmental Management System (EMS), and identify how the Plan relates to other documents required by the conditions of consent? (Section 2.6)	NA (Sub-plan)	NA (Sub-plan)
Does the Plan identify continuous improvements processes from the EMS that will be adopted? (Section 2.6)	NA (Sub-plan)	NA (Sub-plan)
Does the Plan include (unaltered) all the conditions of consent to the addressed by the Plan and identify where in the Plan each requirement has been addressed? (Section 2.7.1)	Section 2.1	Yes
Have all other additional approvals been identified? Has appropriate information been provided regarding how each additional approval is relevant? (Section 2.7.2)	Section 2.5	Yes
Have all relevant guidelines, policies and standards been identified, including details of how they are relevant? (Section 2.7.3)	Section 2.3	Yes
Has the project's organisational structure been included? (Section 2.8)	NA (Sub-plan)	NA (Sub-plan)
Are the roles and responsibilities of key positions or personnel (including any specialists required by the conditions of consent) outlined? (Section 2.8)	Section 11	Yes
Is the process that will be adopted to identify and analyse the environmental risks included? (Section 2.9)	NA (Sub-plan)	NA (Sub-plan)
Does the Sub-plan identify the relevant sections of the EIA documents that contain the assessment of the matter/s addressed by the Plan? (Section 2.10)	Section 2.2	Yes
Have all further studies required to support mitigating measures been identified and included? (Section 2.11)	Section 2.5	Yes

Requirement	Plan Reference	Yes/No/NA
Have project hold points been identified and included? (Sections 2.7.2 and 2.12)	Section 2.6	Yes
Have all mitigation measures from conditions of consent been included unaltered? (Section 2.13)	Section 2.1	Yes
Have any new mitigation measures been written in committed language and all relevant information included? (Section 2.13)	Section 5.0	Yes
Have the tools that will be used to communicate Plan requirements to project personnel been included? (Section 2.14)	Section 5.2.7	Yes
Is an environmental inspection program described as required? (Section 2.15.1)	NA (Sub-plan)	NA (Sub-plan)
Are relevant details of environmental monitoring that will be carried out included? (Section 2.15.2)	Section 7.0	Yes
Is a compliance monitoring and reporting program (or similar) referenced? (Section 2.15.3)	NA (Sub-plan)	NA (Sub-plan)
Is an independent auditing program referenced? (Section 2.16)	NA (Sub Plan)	NA (Sub Plan)
Are project status notification protocols that comply with conditions included? (Section 2.17.1)	NA (Sub-plan)	NA (Sub-plan)
Does the Plan reference a Community and Stakeholder Engagement Plan (or similar) or include community and stakeholder engagement actions (if required)? (Section 2.17.2)	NA (Sub Plan)	NA (Sub Plan)
Does the document include the incident notification and reporting protocols that comply with the relevant conditions of consent? (Section 2.17.3)	Section 8.3	Yes
Does the document identify the project person or position that is responsible for deciding whether an occurrence is an incident? (Section 2.17.3)	Section 11.0	Yes
Does the document describe corrective and preventative action protocols that address the requirements? (Section 2.18)	Section 10.0	Yes
Does the document identify training and awareness programs as required? (Section 2.19)	Section 5.2.7	Yes
Does the document include details of a document review and revision process that complies with the requirements? (Section 2.20)	Section 9.0	Yes
Does the document include details of public availability requirements? (Section 2.21)	Section 8.0	Yes

Plan Preparation Certification

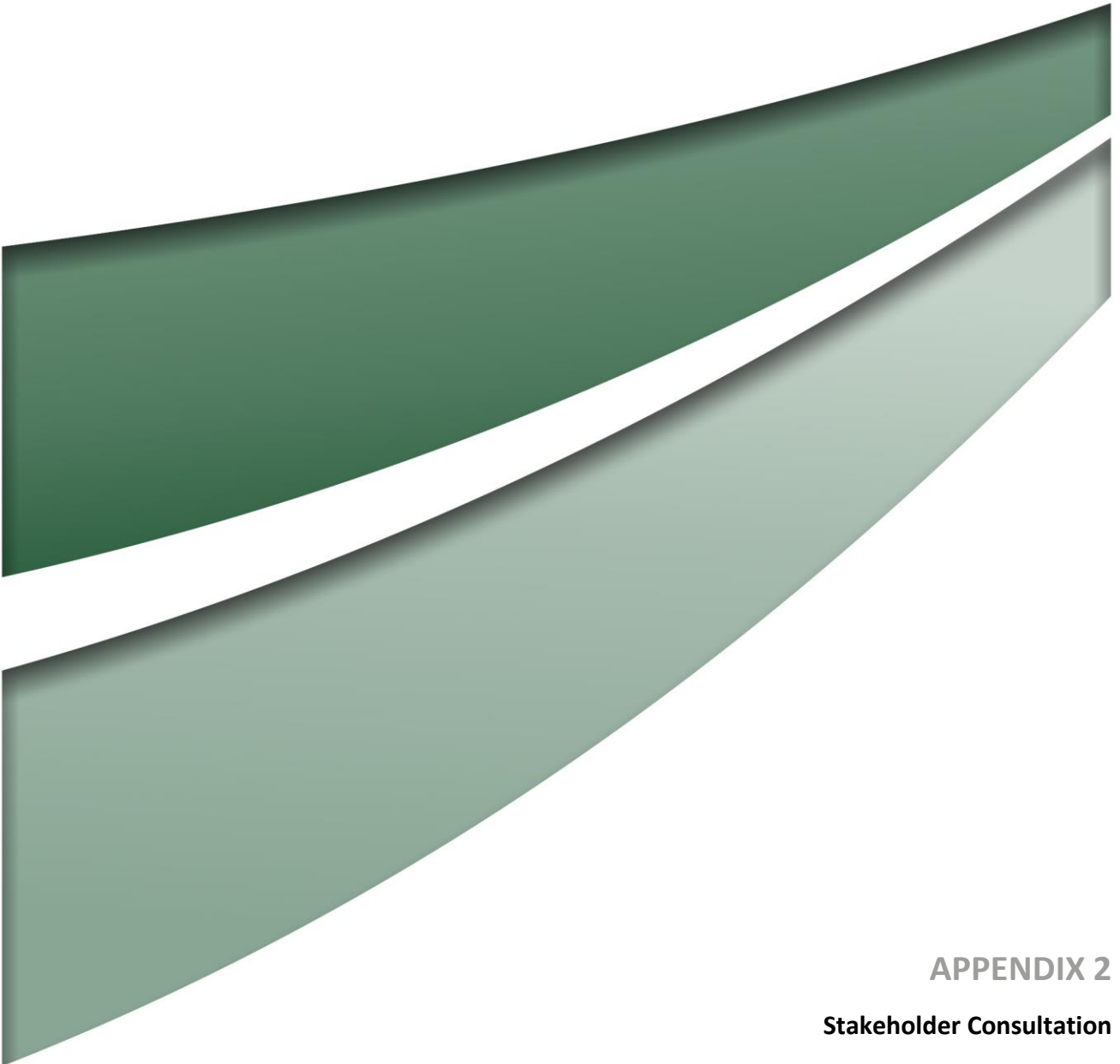
Document Certification Form	
Project Name	Haerses Road Quarry
Project Application Number	DA 165-7-2005
Proponent	Dixon Sand (Penrith) Pty Ltd
Document Title	Haerses Road Quarry Biodiversity and Rehabilitation Management Plan
Document Version	V2a
Date of Issue	17 September 2018

Haerses Road Quarry Biodiversity and Rehabilitation Management Plan has been prepared by Umwelt (Australia) Pty Ltd in response to conditions of consent Schedule 3 Condition 36 DA 165-7-2005 for the Haerses Road Quarry. I am authorised to and have reviewed the document on behalf of Dixon Sand (Penrith) Pty Ltd.

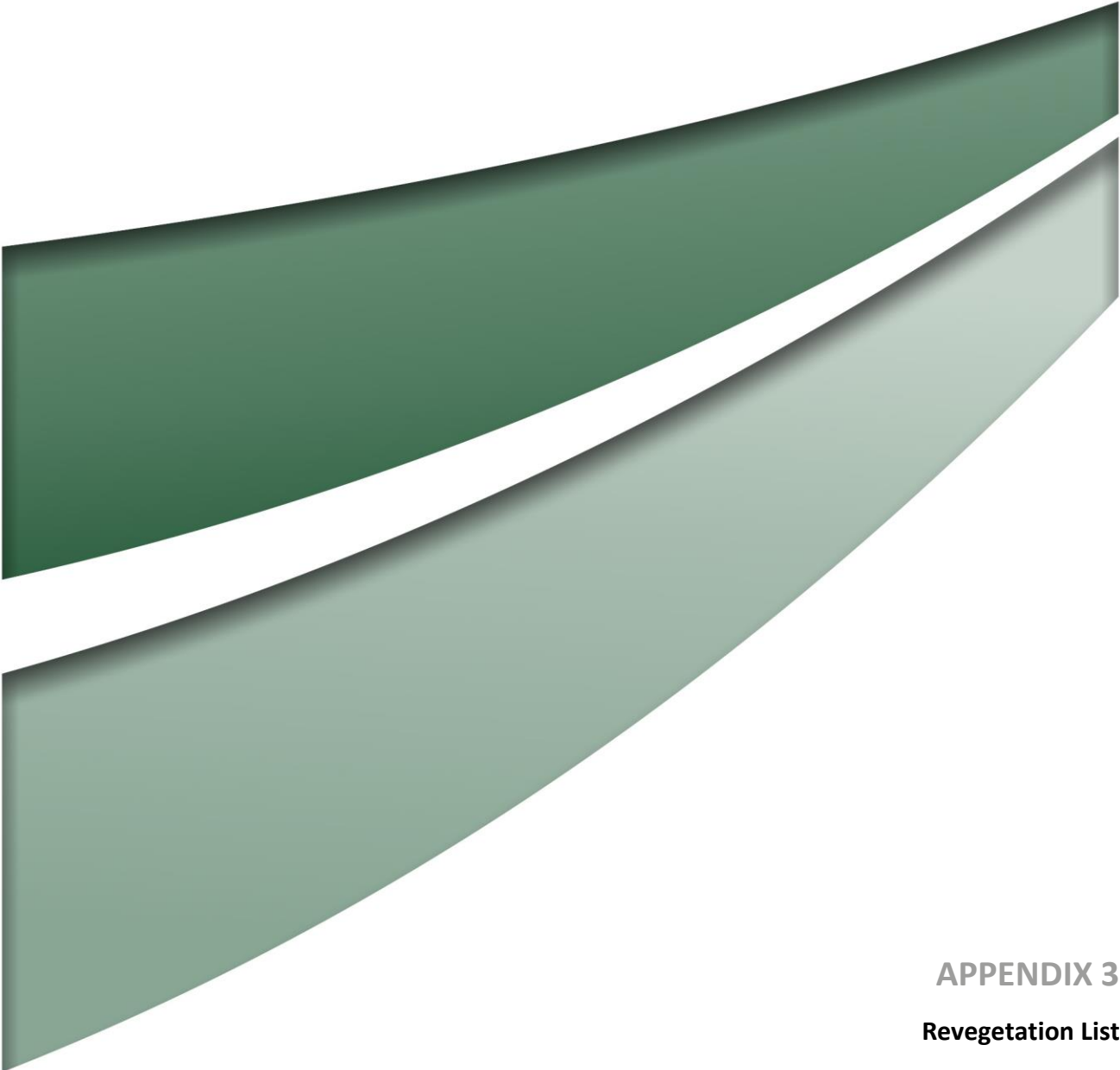
I certify that the Old Northern Road Quarry Haerses Road Quarry Biodiversity and Rehabilitation Management Plan:

- has been prepared in accordance with the relevant condition/s and the Department's Environmental Management Plan
- adequately identifies and addresses all relevant conditions of consent
- has been prepared in accordance with relevant requirements of the conditions of consent regarding stakeholder consultation.

Name of Certifier	Luke Bettridge
Position	Principal Environmental Consultant
Company	Umwelt (Australia) Pty Ltd
Date	17 September 2018



APPENDIX 2
Stakeholder Consultation



APPENDIX 3
Revegetation List

Proposed revegetation species list (derived from flora known to occur in Haerses Road Quarry Site)

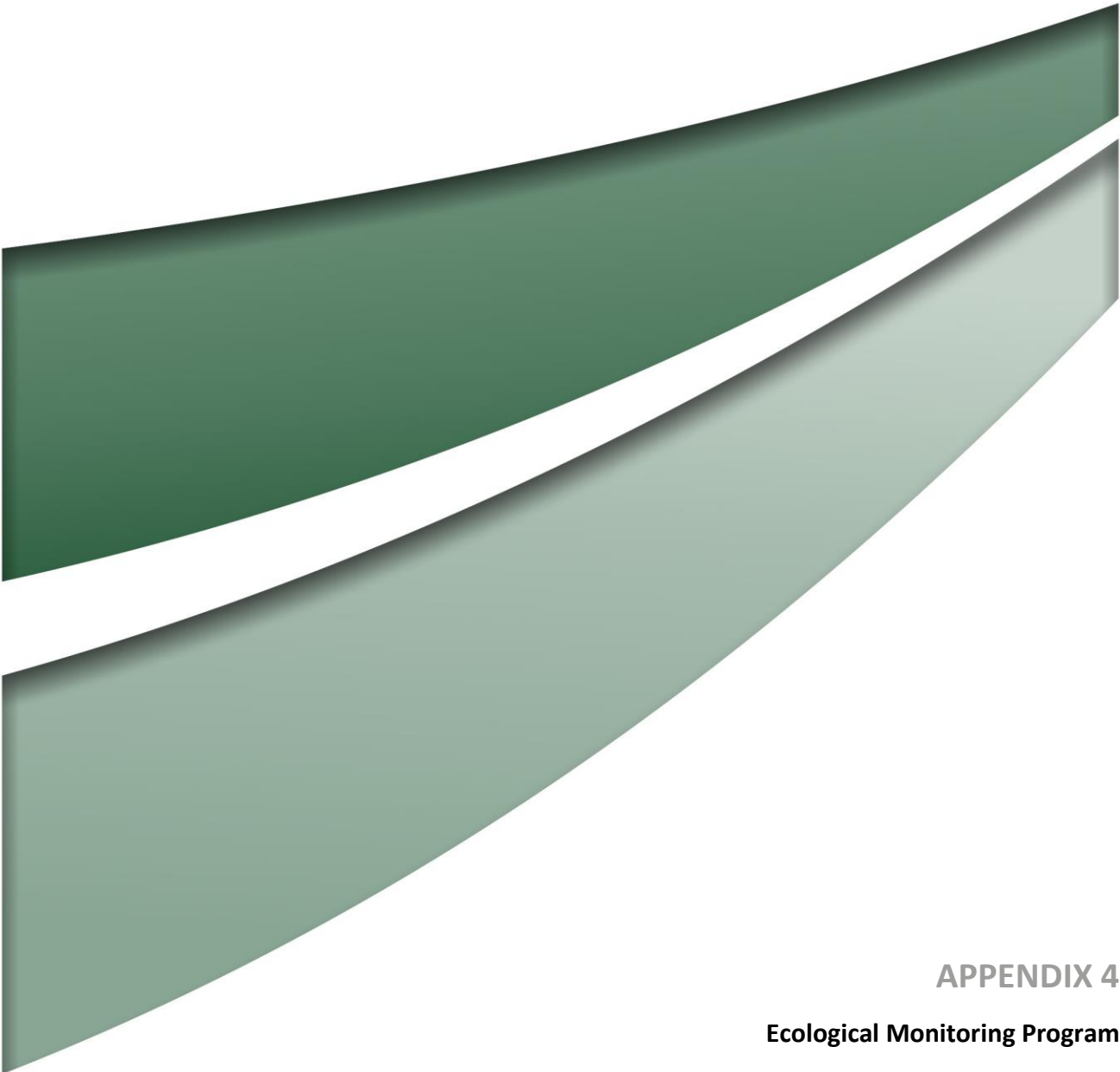
Family	Scientific Name	Common Name	Vegetation Community			
			HN560	HN566	HN582	HN586
Groundcover vegetation						
Ferns						
Adiantaceae	<i>Adiantum aethiopicum</i>	common maidenhair			X	
Aspleniaceae	<i>Asplenium flabellifolium</i>	necklace fern		X		X
Dennstaedtiaceae	<i>Pteridium esculentum</i>	bracken	X			X
Gleicheniaceae	<i>Gleichenia dicarpa</i>	pouched coral fern	X			
Lindsaeaceae	<i>Lindsaea microphylla</i>	lacy wedge fern			X	
Schizaeaceae	<i>Schizaea bifida</i>	forked comb fern				X
Herbs - Monocots						
Anthericaceae	<i>Caesia parviflora</i> var. <i>parviflora</i>			X		
Anthericaceae	<i>Thysanotus tuberosus</i>	common fringe-lily		X		
Colchicaceae	<i>Burchardia umbellata</i>	milkmaids	X			X
Haemodoraceae	<i>Haemodorum planifolium</i>				X	
Orchidaceae	<i>Cryptostylis erecta</i>	tartan tongue orchid				
Orchidaceae	<i>Cryptostylis subulata</i>	large tongue orchid			X	
Phormiaceae	<i>Dianella prunina</i>			X	X	X
Sedges/Rushes - Monocots						
Cyperaceae	<i>Caustis pentandra</i>	thick twist rush			X	
Cyperaceae	<i>Caustis recurvata</i>				X	X
Cyperaceae	<i>Gahnia sieberiana</i>	red-fruit saw-sedge				X
Cyperaceae	<i>Lepidosperma gunnii</i>			X	X	X
Cyperaceae	<i>Ptilothrix deusta</i>		X	X	X	
Cyperaceae	<i>Schoenus brevifolius</i>		X			
Cyperaceae	<i>Schoenus ericetorum</i>			X	X	X
Restionaceae	<i>Empodisma minus</i>		X			
Restionaceae	<i>Leptocarpus tenax</i>		X			
Restionaceae	<i>Lepyrodia scariosa</i>			X	X	X
Grasses/Graminoids - Monocots						
Lomandraceae	<i>Lomandra cylindrica</i>			X		
Lomandraceae	<i>Lomandra glauca</i>	pale mat-rush		X	X	
Lomandraceae	<i>Lomandra longifolia</i>	spiny-headed mat-rush		X		X
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	many-flowered mat-rush		X		
Lomandraceae	<i>Lomandra obliqua</i>			X	X	
Poaceae	<i>Anisopogon avenaceus</i>	oat speargrass				X
Poaceae	<i>Aristida calycina</i> var. <i>calycina</i>				X	
Poaceae	<i>Austrostipa pubescens</i>					X
Poaceae	<i>Cynodon dactylon</i>	common couch				
Poaceae	<i>Entolasia stricta</i>	wiry panic	X	X	X	X

Family	Scientific Name	Common Name	Vegetation Community			
			HN560	HN566	HN582	HN586
Poaceae	<i>Paspalidium distans</i>			X		
Poaceae	<i>Themeda australis</i>	kangaroo grass		X		
Herbs - Dicots						
Apiaceae	<i>Actinotus helianthi</i>	flannel flower				
Apiaceae	<i>Actinotus minor</i>	lesser flannel flower	X	X		X
Apiaceae	<i>Platysace ericoides</i>			X		
Apiaceae	<i>Platysace linearifolia</i>			X	X	X
Apiaceae	<i>Xanthosia pilosa</i>					X
Apiaceae	<i>Xanthosia tridentata</i>	rock xanthosia		X		
Campanulaceae	<i>Wahlenbergia gracilis</i>	sprawling bluebell				
Droseraceae	<i>Drosera peltata</i>	a sundew			X	
Droseraceae	<i>Drosera spatulata</i>		X			
Elaeocarpaceae	<i>Tetratheca glandulosa</i>			X		
Goodeniaceae	<i>Dampiera stricta</i>		X	X	X	X
Goodeniaceae	<i>Goodenia bellidifolia</i>				X	
Goodeniaceae	<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>				X	
Goodeniaceae	<i>Scaevola ramosissima</i>	purple fan-flower		X		X
Haloragaceae	<i>Gonocarpus tetragynus</i>	poverty raspwort		X		
Ericaceae	<i>Melichrus procumbens</i>	jam tarts		X		
Pittosporaceae	<i>Billardiera scandens</i>	hairy apple berry		X		
Rubiaceae	<i>Pomax umbellata</i>	pomax		X		
Stackhousiaceae	<i>Stackhousia nuda</i>		X			
Stackhousiaceae	<i>Stackhousia viminea</i>	slender stackhousia			X	
Stylidiaceae	<i>Stylidium graminifolium</i>	grass triggerplant				X
Violaceae	<i>Hybanthus monopetalus</i>	slender violet-bush			X	
Vines						
Smilacaceae	<i>Smilax glycyphylla</i>	sweet sarsparilla		X		X
Lauraceae	<i>Cassytha glabella</i>			X	X	
Lauraceae	<i>Cassytha pubescens</i>	downy dodder-laurel				X
Shrubs/Small Trees						
Xanthorrhoeaceae	<i>Xanthorrhoea</i> spp.			X	X	
Araliaceae	<i>Astrotricha obovata</i>					X
Casuarinaceae	<i>Allocasuarina distyla</i>				X	
Cunoniaceae	<i>Ceratopetalum gummiferum</i>	Christmas bush		X		X
Dilleniaceae	<i>Hibbertia empetrifolia</i> subsp. <i>empetrifolia</i>			X		X
Dilleniaceae	<i>Hibbertia fasciculata</i>				X	
Ericaceae	<i>Epacris microphylla</i>	coral heath				
Ericaceae	<i>Epacris pulchella</i>	Wallum heath		X	X	X

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Ericaceae	<i>Leucopogon attenuatus</i>	a beard-heath			X	
Ericaceae	<i>Leucopogon ericoides</i>	pink beard-heath		X		
Ericaceae	<i>Leucopogon esquamatus</i>		X			
Ericaceae	<i>Leucopogon microphyllus</i>				X	
Ericaceae	<i>Lissanthe strigosa</i>	peach heath				
Ericaceae	<i>Monotoca scoparia</i>				X	X
Ericaceae	<i>Woolisia pungens</i>				X	
Euphorbiaceae	<i>Amperea xiphioclada</i> var. <i>xiphioclada</i>					X
Fabaceae (Faboideae)	<i>Aotus ericoides</i>			X		
Fabaceae (Faboideae)	<i>Bossiaea ensata</i>	sword bossiaea			X	
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>	variable bossiaea			X	X
Fabaceae (Faboideae)	<i>Bossiaea lenticularis</i>			X		X
Fabaceae (Faboideae)	<i>Bossiaea obcordata</i>	spiny bossiaea		X		
Fabaceae (Faboideae)	<i>Bossiaea scolopendria</i>					X
Fabaceae (Faboideae)	<i>Dillwynia retorta</i>			X	X	
Fabaceae (Faboideae)	<i>Gompholobium glabratum</i>	dainty wedge pea			X	
Fabaceae (Faboideae)	<i>Gompholobium grandiflorum</i>	large wedge pea		X		X
Fabaceae (Faboideae)	<i>Hovea linearis</i>			X		
Fabaceae (Faboideae)	<i>Hovea purpurea</i>				X	
Fabaceae (Faboideae)	<i>Mirbelia rubiifolia</i>	heathy mirbelia		X		X
Fabaceae (Faboideae)	<i>Phyllota grandiflora</i>	heath phyllota			X	
Fabaceae (Faboideae)	<i>Phyllota phyllicoides</i>	heath phyllota			X	
Fabaceae (Faboideae)	<i>Pultenaea retusa</i>		X			
Fabaceae (Faboideae)	<i>Pultenaea tuberculata</i>				X	
Fabaceae (Mimosoideae)	<i>Acacia echinula</i>	hedgehog wattle			X	
Fabaceae (Mimosoideae)	<i>Acacia elongata</i>	swamp wattle	X			
Fabaceae (Mimosoideae)	<i>Acacia linearifolia</i>	narrow-leaved wattle		X		
Fabaceae (Mimosoideae)	<i>Acacia linifolia</i>	white wattle		X		
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>				X	
Fabaceae (Mimosoideae)	<i>Acacia suaveolens</i>	sweet wattle		X	X	X
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	prickly moses				X
Lamiaceae	<i>Hemigenia purpurea</i>				X	
Myrtaceae	<i>Baeckea diosmifolia</i>	fringed baeckea		X	X	X
Myrtaceae	<i>Baeckea imbricata</i>		X			
Myrtaceae	<i>Callistemon citrinus</i>	crimson bottlebrush	X			X
Myrtaceae	<i>Callistemon linearis</i>	narrow-leaved bottlebrush		X		
Myrtaceae	<i>Calytrix tetragona</i>	common fringe-myrtle			X	
Myrtaceae	<i>Darwinia biflora</i>			X	X	
Myrtaceae	<i>Darwinia fascicularis</i>			X		

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			HN560	HN566	HN582	HN586
Myrtaceae	<i>Kunzea ambigua</i>	tick bush			X	
Myrtaceae	<i>Leptospermum parvifolium</i>			X		
Myrtaceae	<i>Leptospermum polygalifolium</i>		X	X	X	X
Myrtaceae	<i>Leptospermum squarrosus</i>		X			
Myrtaceae	<i>Leptospermum trinervium</i>	slender tea-tree				X
Olacaceae	<i>Olax stricta</i>				X	
Phyllanthaceae	<i>Phyllanthus hirtellus</i>	thyme spurge		X		
Proteaceae	<i>Banksia ericifolia</i>	heath-leaved banksia	X	X	X	
Proteaceae	<i>Banksia marginata</i>	silver banksia			X	
Proteaceae	<i>Banksia oblongifolia</i>	fern-leaved banksia	X	X	X	
Proteaceae	<i>Banksia serrata</i>	old-man banksia				X
Proteaceae	<i>Banksia spinulosa</i>	hairpin banksia		X		X
Polygalaceae	<i>Comesperma defoliatum</i>		X			
Proteaceae	<i>Grevillea buxifolia</i>	grey spider flower		X	X	
Proteaceae	<i>Grevillea mucronulata</i>			X		X
Proteaceae	<i>Grevillea speciosa</i>	red spider flower			X	X
Proteaceae	<i>Hakea dactyloides</i>	finger hakea		X	X	
Proteaceae	<i>Hakea gibbosa</i>			X	X	
Proteaceae	<i>Hakea sericea</i>	needlebush		X		
Proteaceae	<i>Isopogon anemonifolius</i>	broad-leaf drumsticks			X	
Proteaceae	<i>Isopogon anethifolius</i>	narrow-leaf drumsticks		X		
Proteaceae	<i>Lambertia formosa</i>	mountain devil		X	X	X
Proteaceae	<i>Lomatia silaifolia</i>	crinkle bush		X		X
Proteaceae	<i>Persoonia lanceolata</i>	lance leaf geebung		X	X	
Proteaceae	<i>Persoonia levis</i>	broad-leaved geebung		X	X	X
Proteaceae	<i>Petrophile pulchella</i>	conesticks	X	X	X	X
Rutaceae	<i>Boronia ledifolia</i>	Sydney boronia		X	X	X
Rutaceae	<i>Boronia pinnata</i>				X	X
Rutaceae	<i>Philotheca salsolifolia</i>				X	
Santalaceae	<i>Exocarpos cupressiformis</i>	cherry ballart		X		
Sterculiaceae	<i>Lasiopetalum parviflorum</i>			X		
Thymelaeaceae	<i>Pimelea linifolia</i>	slender rice flower			X	
Thymelaeaceae	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>					X
Trees						
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	blueberry ash				X
Myrtaceae	<i>Angophora costata</i>	Sydney red gum				X
Myrtaceae	<i>Angophora hispida</i>	dwarf apple		X	X	
Myrtaceae	<i>Eucalyptus haemastoma</i>	broad-leaved scribbly gum		X		
Myrtaceae	<i>Eucalyptus piperita</i>	Sydney peppermint				X
Myrtaceae	<i>Eucalyptus punctata</i>	grey gum		X		X

Family	Scientific Name	Common Name	Vegetation Community			
			HN560	HN566	HN582	HN586
Myrtaceae	<i>Eucalyptus sparsifolia</i>	narrow-leaved stringybark		X	X	
Myrtaceae	<i>Eucalyptus squamosa</i>	scaly bark		X		
Myrtaceae	<i>Corymbia eximia</i>	yellow bloodwood		X		
Myrtaceae	<i>Corymbia gummifera</i>	red bloodwood		X	X	X
Myrtaceae	<i>Syncarpia glomulifera</i>	turpentine		X		X
Rutaceae	<i>Nematolepis squamea</i> subsp. <i>squamea</i>	satinwood			X	



APPENDIX 4
Ecological Monitoring Program

Details of monitoring methodologies required are provided in the following sections

Agricultural Rehabilitation Monitoring

At the 5 agricultural monitoring sites (former extraction Stages 1 to 5, 2006 Development Consent), a transect will be assessed each of 50 m in length. The following information was collected at each 10 m interval along the transect for a 1 m² sub-plot area:

- pasture composition (species list, annual and perennial pastures, legume content)
- weed species (species list and percent cover)
- percent of groundcover/bare ground and
- pasture biomass (as a photograph).

The following general observations were also made along the 50 m transect:

- Photo monitoring from a single standard monitoring point facing along the transect
- erosion, using the following scale
 - 1 - (no erosion)
 - 2 - sheet erosion
 - 3 - rill erosion (<0.3m deep)
 - 4 - gully erosion (>0.3m<1m deep)
 - 5 - gully erosion (>1 m deep) and
 - tunnel erosion adapted from rating of National Committee on Soil and Terrain (2009) noting the distance along the transect
- rocks present
- presence/absence of topsoil and
- other factors likely to influence rehabilitation development.

Ecological Rehabilitation Monitoring

The five Ecological Rehabilitation Monitoring sites (extraction Cells 1 to 5 as per Mod 1) will be established progressively in areas proposed to be returned to native vegetation. These will comprise floristic monitoring, photo monitoring and habitat assessment as described below.

Floristic Monitoring

Floristic monitoring will be undertaken at each permanent flora monitoring site in a manner consistent with the Biodiversity Assessment Method (OEH 2017) and will consist of a 50 m transect, 50 m x 20 m plot, with a 20 m x 20 m sub-plot, a 10 m x 10 m sub-plot and a 2 m x 2 m subplot.

- Composition - native plant species richness by growth form (within the 20 m x 20 m plot)
- Structure – estimate foliage cover of native and exotic species by growth form (within the 20 m x 20 m plot)
- Function (within the 20 m x 50 m plot):

- Number of large trees
- Presence or otherwise of tree stem size classes
- Presence or otherwise of canopy species regeneration
- Length of fallen logs
- Percentage cover for litter as recorded from five 1 m x 1 m plots
- Number of trees with hollows
- High threat exotic cover

Photo Monitoring

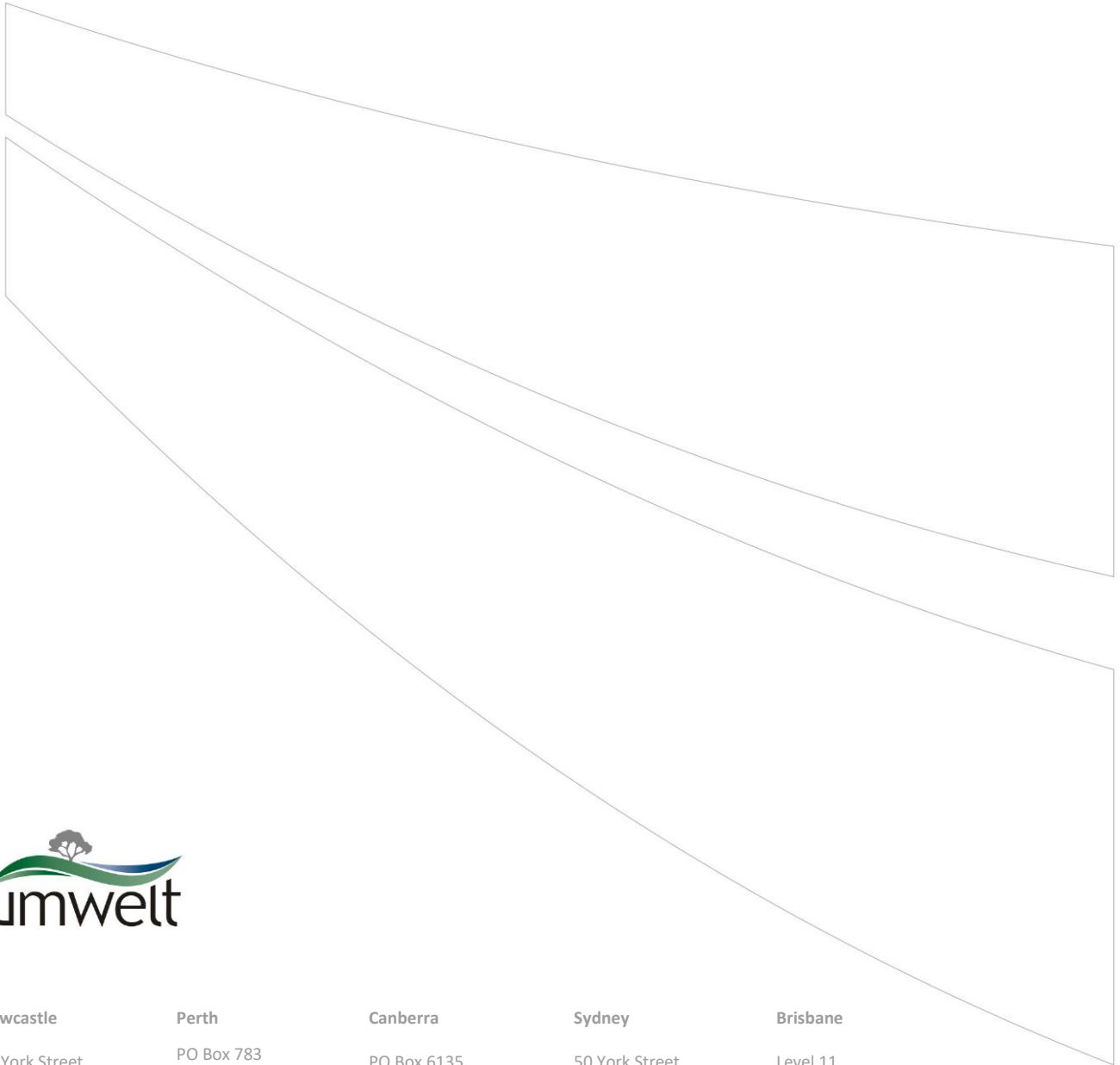
Photo monitoring will be undertaken at each permanent flora monitoring location facing left, centre and right at the start of the 50 m transect.

Habitat Assessment

Habitat assessment will also be undertaken in each 50 m x 20 m plot. Habitat features recorded at each site will include:

- General vegetation health;
- Evidence of natural seedling recruitment;
- Occurrence and abundance of weed species;
- Structure and floristics of vegetation cover;
- Signs of disturbance (by stock, people or feral animals);
- Nature and extent of erosion
- Evidence of fire
- Characteristic of ground cover (e.g. leaf litter, rocks, logs and soil)
- Nectar or fruit resources and perch sites
- Hollow resources
- Water resources; and
- Secondary evidence of fauna use such as scats, tree scratches or diggings.





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