



Harvest Scientific Services Pty Ltd
Geotechnical Environmental & Resource Consultants
ABN 43 132 363 289

LANDSCAPE MANAGEMENT PLAN (Including Quarry Closure, Rehabilitation and Post Extraction Land-use)

EXISTING SAND AND SOIL EXTRACTION OPERATIONS

**Lot 32 DP 635271 and Lot 22 DP 833317
Macarthur Road, Spring Farm**

Prepared for:

M Collins and Sons (Holdings) Pty Ltd

**Job reference: 201279
30th October 2016**

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Revisions register

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3	07/07/2011	Final draft
4	12/07/2011	Report finalised
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		Added Appendix E – Consultation approval correspondence with governing
		Updated outdated abbreviations for governing authorities – EPA, DPE, DPIW
		Removal of past tense phrasing to reflect definitive commitments (eg
		Added date of CAA to Appendix 3
		Various typographical errors corrected
		Updated Section 2.1 to include Section 8.9.5 of Mod 3 EA
		Rehabilitation phase program included in Section 5.12
		Added monitoring, reviewing and implementation responsibilities and reporting
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Executive summary

Background

M Collins and Sons (Holdings) Pty Ltd (MCS) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 and Lot 32 DP 635271 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 MCS was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

On the 25th October 2012 MCS was granted a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land at Lot 32 DP 635271. This approval enabled the following activities:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Stockpiling, dry screening of sand and soil within the quarry floor on Lot 22 but not on Lot 32;
- Active extraction within Lot 32 DP635271 on 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land.
- On Lot 22 DP833317 permission exists to open and work five hectares at any one time;
- Extraction and rehabilitation works to occur in concert over an 8 year period (completion in 2019);
- Placement of tailings from the sand wash-plant for land-forming and rehabilitation purposes; and
- Rehabilitation maintenance activities to occur over an additional 2 year period.

Director General Requirements (DGRs)

Director General Requirements for the proposed modification were issued on 23 December 2010 and included the following requirements relating to quarry closure and rehabilitation:

'Quarry closure and rehabilitation – including:

- *a detailed description of the proposed measures that would be undertaken during the closure of the Quarry;*
- *a detailed revision of the quarry rehabilitation strategy, including justification for the proposed final land form and consideration of the objectives of the relevant strategic land use objectives'*

Harvest Scientific Services Pty Ltd (HSS) was engaged by MCS to prepare a Landscape Management Plan (LMP) to address the above DGRs.

Aims and objectives

The LMP aims to provide a clear, concise and practical framework for the restoration of the vegetation impacted by the activity and in accordance with relevant legislation and the DG requirements.

The objectives of the LMP are to:

- summarise local vegetation characteristics;
- describe the restoration activities necessary to ensure an appropriate growing medium and progressive re-vegetation with local provenance vegetation and/or pasture species.
- describe the maintenance program to ensure vegetation establishment;

- ensure that re-vegetation activities are consistent with the proposed rehabilitation works on the adjacent Lot 22 DP 833317, as outlined in this LMP;
- Establish practical plans and guidelines for the ongoing management of species richness and ecosystem function;
- Implement a monitoring program that will effectively guide adaptive management rather than prescriptive management;
- Facilitate regeneration of structural diversity and complexity of the adjacent endangered ecological community, River-Flat Eucalypt Forest on Coastal Floodplains;
- Describe the restoration activities necessary to progressively restore native vegetation throughout the designated restoration zone;
- Describe the maintenance program to ensure vegetation establishment;
- Protect adjacent remnant 'River-Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodland on Coastal Floodplains' from human disturbance regimes within 2 years;
- Restoration zones 1 and 2 containing forbs and indigenous grass cover of 55% cover or greater;
- Progressive rehabilitation Lot 22 zone 4 open paddock, gentle slope towards the Nepean River with native grasses and agricultural pasture species (Figure 3);
- Create specialised habitat attributes for arboreal marsupials by 2 years post extraction;
- To assess the capacity of the proposed restoration program to return Lot 32 (Zone 3 Figure 3) agricultural production areas to 'Class 1' agricultural land; and
- Provide an outline of the proposed post-extraction land-use.

Site description and existing vegetation

The extraction area is bound to the east by a Dry River anabranch (which parallels the flow of the Nepean River), the west by the Nepean River, the north by Camden Bypass and the south by former and active extraction areas that are under-going rehabilitation works and active extraction works, respectively.

(a) Lucerne paddock

Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for the growing of Lucerne.

(b) Bank of the Nepean River

Vegetation immediately to the west of the extraction area and on the bank of the Nepean River is mapped by Actinotus (2011) as 'Riparian Forest on Coastal Floodplains'.

This vegetation comprises of a mature stand of tall forest structure to 25m in height, dominated by River Peppermint and Broad-leaved Apple, with River Sheoak common along the edge bank of the river. Common associated shrub and twiner species include Wonga Wonga Vine (*Pandorea pandorana*) and Tree Violet (*Melicytis dentatus*), with Scurvy Weed occurring in the ground cover, the forest occurring on periodically flooded, undisturbed deep Quaternary alluvial sediments along the banks of the Nepean River. The extent of the distribution of this assemblage in the subject area is about 7,100 m². The assemblage has long been infested with woody weeds and with a high frequency of occurrence of Wandering Jew in the ground cover probably as a result of historical clearing of a natural understorey stratum.

(c) Dry River Anabranch

Vegetation immediately to the east of the extraction area along the dry banks of the anabranch is mapped by Actinotus (2011) as 'Alluvial Woodland on Coastal Floodplains'.

This vegetation is a mature stand of tall woodland structure to 30m in height, dominated by River Peppermint, Broad-leaved Apple and River Sheoak. Common associated shrub species include Blackthorn (*Bursaria spinosa* var *macrophylla*), Twiggy Heath-myrtle (*Sannantha pluriflora*), Scrubby Spurge

(*Phyllanthus gunnii*) and Tree Violet (*Melicytis dentatus*), with Spiny-headed Mat-rush (*Lomandra longifolia*) and Bamboo Grass (*Austrostipa ramosissima*) occurring in the ground cover. The woodland is established on a dry drainage course on periodically flooded, undisturbed Quaternary alluvial sediments. The extent of the distribution of this assemblage in the subject area is about 5,000 m². The assemblage has long been infested with woody weeds with Wandering Jew in the ground cover.

Landscape Management

(a) Water Management Act (WM Act) 2000 and 'Controlled Activity Approval'

The soil extraction activities and associated re-vegetation works involve works within 40 meters of a water course (i.e. the Nepean River and the Dry Anabranh) and are therefore considered to be a controlled action under the *Water Management Act* (WM Act) 2000.

MCS have a current Controlled Activity Approval (CAA), which is administered by the NSW Department of Primary Industries Water (DPIW). The expiry date of the CAA is the 08 October 2018.

(b) Erosion and sediment controls

The erosion and sediment controls implemented as part of the sand and soil extraction and rehabilitation works are outlined in a separate document entitled 'Water Management and Erosion and Sediment Control Plan' (WM & ESCP), as prepared by HSS. This LMP assumes that all erosion and sediment controls outlined in the ESCP will be implemented.

(c) Restoration program

This LMP has been prepared giving consideration to the NSW Office of Environment and Heritage, Environmental Protection Authority EPA formally DECCW) guidelines and addresses the following issues: legislative requirements and LMP methodology, existing site conditions, riparian zone protection, initial weed control, site preparation, supply of plant material, plant installation, program of works, costing, and monitoring and evaluation.

For re-vegetation works, the site has been divided into three distinct zones (Figure 3), which are summarised as follows:

Zone 1. The Nepean River.

Zone 2. Dry River Anabranh.

Zone 3. Open paddock agricultural production areas.

Zone 4. Riparian linkage (non-agricultural production).

Zones 1 and 2 are then further broken down into sub-zones depending on the specific rehabilitation actions required for each zone. Sub-zones denoted by the letter 'a' will be subject to progressive weed removal and limited plantings (where necessary), whilst zones denoted by the letter 'b' will be subject to complete re-planting and ongoing maintenance.

All plants to be used in the restoration works in zones 1, 2 and 4 are sourced from local provenance material collected in the local area and grown by local nurseries. All vegetation is planted as forestry tubes, hikos or enviro cells. All plant species are suitably guarded to prevent herbivore and weed competition and to encourage optimum growing conditions.

The restoration project also includes a two year maintenance bush regeneration component, targeting remnant vegetation (zones 1a and 2a). Areas subject to complete replanting (zones 1b and 2b) will be subject to a 2 year maintenance period. The restoration program includes the preparation of yearly monitoring and evaluation reports, as required by the guidelines, to assess the success of the restoration program and the achievement (or otherwise) of clear performance targets.

Conclusion

Providing the rehabilitation protocols outlined in this report are implemented, it is concluded that:

- This LMP provides MCS, contractors, Council and relevant Government Authorities with a common document that clearly sets out the performance targets, restoration principles, monitoring and maintenance procedures required for the long term sustainable management of the ecological plantings and their surrounding environment; and
- Lot 32 zone 3 open paddock area will have the capacity for use as 'Class 1' Agricultural land.

Importantly, implementation of this LMP will produce a sustainable post-extraction landscape, including enhanced biodiversity outcomes beyond those directly occasioned by extraction activities. Such landscapes will ultimately be little different to distant observers in a visual sense to that which is currently prevailing.

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Appendix F	Final Landform Design

Abbreviations

CAA	Controlled Activity Approval
CC	Camden Council
CMA	Catchment Management Authority
CRZ	Core riparian zone
DEHWA	Department of Environment, Heritage, Water and the Arts
DPE	Department of Environment & Planning
EECs	Endangered Ecological Communities
EP&BC Act	Environment Protection and Biodiversity Act 1999
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environmental Protection Authority
ESCP	Erosion and Sediment Control Plan

LGA	Local government area
LMP	Landscape Management Plan
NES	National environmental significance
DPIW	NSW Department of Primary Industries Water
TSC Act	Threatened Species Conservation Act 1995
VB	Vegetated buffer
WMA	Water Management Act 2000
WM & ESCP	Water Management and Erosion and Sediment Control Plan

1. INTRODUCTION

M Collins and Sons Holdings Pty Ltd (MCS) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 MCS was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

On the 25th October 2012 MCS was granted a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land at Lot 32 DP 635271. This approval enabled the following activities:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Dry screening of sand and soil excluded from Lot 32;
- Stockpiling and dry screening of sand and soil within the quarry floor on Lot 22, not on Lot 32;
- Active extraction within Lot 32 DP635271 on 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land.
- On Lot 22 DP833317 permission exists to open and work five hectares at one time; Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019);
- Placement of tailings from the sand wash-plant for land-forming and rehabilitation purposes; and
- Rehabilitation maintenance activities are proposed to occur over an additional 2 year period.

Harvest Scientific Services Pty Ltd (HSS) has been engaged by MCS to review and update the Landscape Management Plan (LMP) to address Consent Modification 3, Schedule 3, Conditions 17 and 18,.

1.1. Aims and objectives

The LMP aims to provide a clear, concise and practical framework for the restoration of the vegetation impacted by the activity and in accordance with relevant legislation and the DG requirements.

The objectives of the LMP are to:

- summarise local vegetation characteristics;
- describe the restoration activities necessary to ensure an appropriate growing medium and progressive re-vegetation with local provenance vegetation and/or pasture species.
- describe the maintenance program to ensure vegetation establishment;
- ensure that re-vegetation activities are consistent with the rehabilitation works on the adjacent Lot 22 DP 833317, as outlined in this LMP;
- Establish practical plans and guidelines for the ongoing management of species richness and ecosystem function;
- Implement a monitoring program that will effectively guide adaptive management rather than prescriptive management;
- Facilitate regeneration of structural diversity and complexity of the adjacent endangered ecological community, River-Flat Eucalypt Forest on Coastal Floodplains;
- Describe the restoration activities necessary to progressively restore native vegetation throughout the designated restoration zone;
- Describe the maintenance program to ensure vegetation establishment;

- Protect adjacent remnant 'River-Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodland on Coastal Floodplains' from human disturbance regimes within 2 years;
- Restoration zones 1 and 2 containing forbs and indigenous grass cover of 55% cover or greater;
- Progressive rehabilitation Lot 22 zone 4 open paddock, gentle slope towards the Nepean River with native grasses and agricultural pasture species (Figure 3);
- Create specialised habitat attributes for arboreal marsupials by 2 years post extraction;
- To assess the capacity of the restoration program to return Lot 32 zone 3 agricultural production areas to 'Class 1' agricultural land; and
- Provide an outline of the proposed post-extraction land-use.

1.2. Relevant legislative policies

The LMP has been prepared in accordance with the provisions contained in relevant legislation and policy guidelines, including but not limited to those listed in the following sections.

1.2.1. Water Management Act 2000

Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events. This LMP, and the subsequent implementation of recommended restoration works, has considered the implications of the Water Management Act (WMA) 2000.

A controlled activity approval under the WMA is required for certain types of developments and activities that are carried out in or within 40 metres of the high bank of a river, lake or estuary. This includes the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise. The EPA is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, i.e. the bed and a distance inland of 40 metres from a river, lake or estuary.

The soil extraction activities and associated re-vegetation works involve works within 40 meters of a water course (i.e. the Nepean River and the Dry Anabran) and are therefore considered to be a controlled action under the *Water Management Act* (WMA) 2000.

MCS has a current Controlled Activity Approval (CAA), which is administered by the NSW Department of Primary Industries Water (DPIW). The expiry date of the CAA is the 08 October 2018. A copy of the existing CAA is appended as Appendix C.

1.2.2. Threatened Species Conservation Act 1995

The Threatened Species Act (TSC Act) 1995 includes schedules that list threatened species, populations and ecological communities and key threatening processes. The objectives of the TSC Act are to:

- Conserve biological diversity and promote ecologically sustainable development, to prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- To eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The activity is not expected to impose a significant negative effect on any other local populations of native biota, including threatened species, EECs and their habitats listed on the TSC Act, which occur on the study site or in adjoining habitats.

1.2.3. Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) makes it an offence for a person to undertake an action that has the potential to significantly impact on a matter of 'national environmental significance' (NES) without first obtaining a permit from the Commonwealth Minister for Environment and Heritage. Matters of national environmental significance include: declared World Heritage areas; declared Ramsar wetlands; listed threatened species and ecological communities; listed migratory species; listed marine species; nuclear actions; and the environment of Commonwealth marine areas.

The activity is not expected to impose a significant negative impact on any other local populations of native biota, including threatened species, EECs and their habitats listed on the EPBC Act, which occur on the study site or in adjoining habitats.

1.2.4. Noxious Weed Act 1993

This LMP also considers the landowner's obligations to control weeds listed as noxious and/or environmental in the Camden LGA. During the revegetation activities, site owners are legally obliged to 'fully and continuously suppress and destroy' any noxious weed colonisation.

Several listed noxious weed species were found during the flora assessment. Weed control methodologies outlined in this plan will be implemented upon initiation of clearing works to decrease the chances of site infestation by invasive noxious weed species.

1.3. Project team

1.3.1. Names and qualifications

Name	Position	Qualifications	Relevant experience
Mart Rampe	Principal	Bachelor of Science in Applied Geology	37 + years in Earth Sciences, including 22+ years in quarry and mine site rehabilitation.

1.3.2. Related projects

Landscape Management Plan for Spring Farm Sand and Soil Extraction (continuation of existing operations), Lot 22 DP 833317 dated 10 February 2010 (Harvest Scientific Services Pty Ltd, 2010).

2. LMP OVERVIEW

2.1. Site opportunities and constraints

The rehabilitation of the Dry River Anabranh and the Nepean River embankment provide opportunities in riparian system restoration. Opportunities embraced in the restoration program include:

- Revegetating large areas of native vegetation associated with both the Nepean River and the Dry River Anabranh;
- Rehabilitating areas of existing native vegetation;

- Integrating ecological function and engineering design to achieve balanced landscape outcome and riparian function;
- Improving vegetation cover throughout the site and surrounds;
- Enhance visual screening by embellishment of the anabranch vegetation;
- Staged retention of existing screening south of the extraction site;
- Staged retention of vegetation cover on areas not being extracted and progressive rehabilitation of extracted areas;
- Rehabilitation of the Nepean River riparian zone;
- Use of recessive colours for visually intrusive plant, equipment, fencing and the like;
- Removing heavy weed infestations throughout the old river anabranch and along the eastern 'bank' of the Nepean River; and
- Improve water quality leaving the development site and entering Nepean Catchment.

Constraints encountered during project design include:

- The resources required to implement such a comprehensive rehabilitation program; and
- The seasonality of some of the works to be undertaken.

2.2. Project tasks and objectives

This LMP has been prepared giving consideration to the current EPA guidelines (*"How to Prepare a Vegetation Management Plan, Version 6"*). This requires the LMP to address the following issues:

- Site assessment and determination of constraints (eg. flora and fauna, habitat and corridor values, hydrology, fire issues, services, drainage, topography, weeds, etc);
- Definition of project tasks (description of all tasks necessary to implement the plan);
- Preparation of a program of works;
- Liaison with other consultants, landscape architects, government agencies and local Bush-care groups, as required;
- Preparation of a plant species lists, and maps and diagrams;
- Details on site preparation (protection of existing plants, erosion control, site works, weed control, soil amelioration, seed collection, etc);
- Description of planting program and methodology;
- Description of maintenance program;
- Description of monitoring and review process; and
- Addressing other potential issues (signage, other relevant legislation, other site areas, public relations, community involvement, etc).

2.3. Description of key terms

The following key terms are used throughout the description of the restoration program.

- **Regeneration** - Refers to natural regeneration of the vegetation community.
- **Bush regeneration** - Refers to techniques used to assist and promote natural regeneration without utilising plant material propagated in nurseries.
- **Revegetation** - Refers to the planting of tube stock or similar grown from local provenance seed to re-establish vegetation.

- **Restoration** - Refers to a combination of restoration activities and management techniques to restore native vegetation.
- **Forb**. An herbaceous plant that is not a grass.
- **Biodiversity** - The diversity of plant and animal life.
- **Remnant Vegetation** - Where there are no maps available, remnant vegetation is defined as vegetation where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and dominated by species characteristic of the vegetation's undisturbed canopy.
- **Local** - means local environment or site type.
- **Practical completion** - Refers to the completion of installation of revegetation activities.
- **Establishment** - Refers to the minimum 24 month maintenance program (two-years proposed for this project) applied to re-vegetation work to ensure plant establishment.
- **Final Completion** - Refers to the successful completion of the entire restoration program.

2.4. Legislative requirements and work guidelines

2.4.1. Implementation guidelines

All work to be performed on site will be in accordance with the following guidelines:

- DEC *Recovering Bushland: Best Practice Guidelines for Vegetation Restoration on the Cumberland Plain*, 2005;
- Florabank *Seed Collection and Management Guidelines*, updated July 2006;
- DIPNR's *Best Practice Guidelines for Bush Regeneration on the Cumberland Plain*, 2004; and
- Greening Australia NSW Best Practice Revegetation Guidelines, 1999.

3. SITE DESCRIPTION

3.1. Site location

The original combined area for sand and soil extraction was approximately 23 Ha (16 hectares on Lot 22 and 6.8 hectares on Lot 32). It is bound by the Camden Bypass to the north, a dry river anabranch on the East, the adjoining Collins property Lot 22 DP83317 and Lot 1 DP 5877631 on the South and the Nepean River on the West (Figure 1). Currently the approximate extraction area is a combined 7 hectares (2 ha on Lot 22 and 5 Ha on Lot 32)

The extraction area is bound to the east by a Dry River anabranch (which parallels the flow of the Nepean River), the west by the Nepean River, the north by Camden Bypass and the south by former and active extraction areas (Figure 2) that are under-going rehabilitation works and active extraction works, respectively.

Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for Lucerne paddocks.

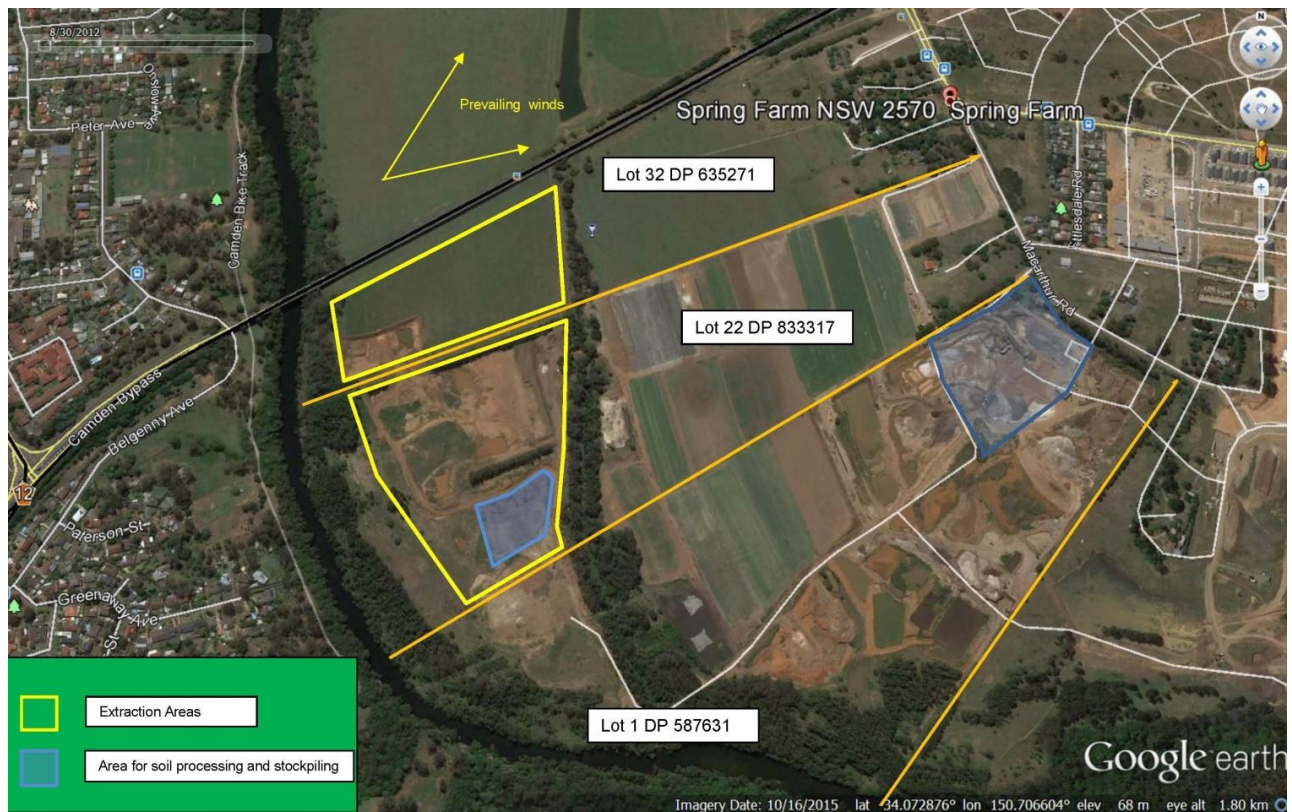


Figure 1. Location of Sand and Soil Extraction and Processing Operations

3.2. Climate

The Commonwealth Bureau of Meteorology website provides climatic information for the study area taken from Camden Airport AWS weather station (closest station to site). A review of this data indicated that the mean rainfall peaks in summer and ranges from 104.3 mm in February down to 39.4 mm in July. Mean daily maximum temperatures range from 29.4°C in summer to 17.2°C in winter with mean minimum temperatures ranging from 16.7°C in summer down to 2.9°C in winter (BoM 2009).

3.3. Vegetation

The extraction area (Figure 2) resembles a landscape consistent with most alluvial agricultural landscapes in the Macarthur district, including a long history of agricultural activities. The vegetation in and around the extraction area includes the features outlined below.

Lucerne paddock

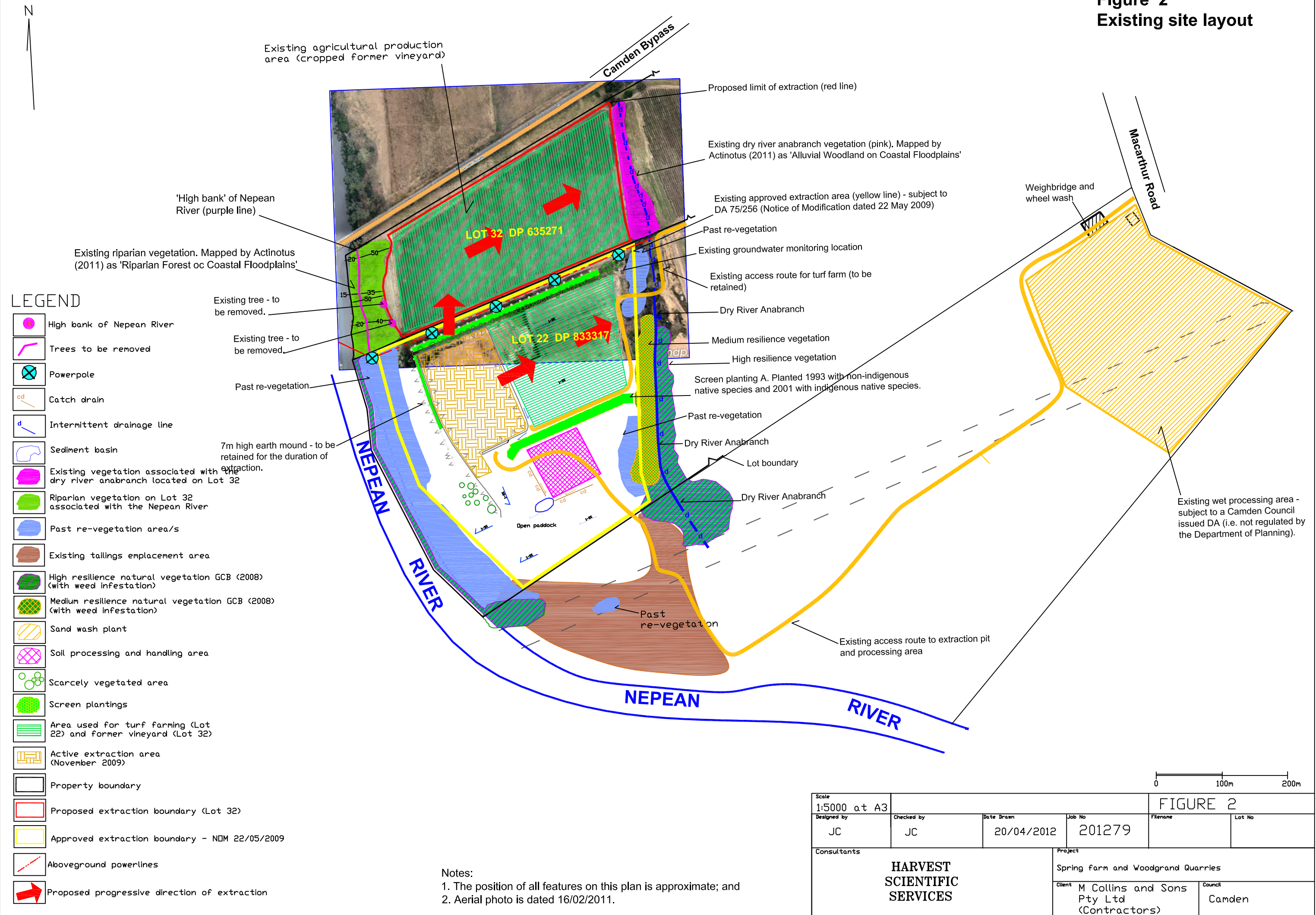
Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for the growing of Lucerne.

Bank of the Nepean River

Vegetation immediately to the west of the extraction area and on the bank of the Nepean River is mapped by Actinotus (2011) as 'Riparian Forest on Coastal Floodplains'.

This vegetation is a mature stand of tall forest structure to 25m in height, dominated by River Peppermint and Broad-leaved Apple, with River Sheoak common along the edge bank of the river. Common associated shrub and twiner species include Wonga Wonga Vine (*Pandorea pandorana*) and Tree Violet (*Melicetyis dentatus*), with Scurvy Weed occurring in the ground cover, the forest occurring on periodically flooded, undisturbed deep Quaternary alluvial sediments along the banks of the Nepean River. The extent of the distribution of this assemblage in the subject area is about 7,100 m². The assemblage has long been infested with woody weeds and with a high frequency of occurrence of Wandering Jew in the ground cover probably as a result of historical clearing of a natural understorey stratum.

Figure 2
Existing site layout



Dry River Anabran

Vegetation immediately to the east of the extraction area along the dry banks of the anabran is mapped by Actinotus (2011) as 'Alluvial Woodland on Coastal Floodplains'.

This vegetation is a mature stand of tall woodland structure to 30m in height, dominated by River Peppermint, Broad-leaved Apple and River Sheoak. Common associated shrub species include Blackthorn (*Bursaria spinosa* var *macrophylla*), Twiggy Heath-myrtle (*Sannantha pluriflora*), Scrubby Spurge (*Phyllanthus gunnii*) and Tree Violet (*Melicytis dentatus*), with Spiny-headed Mat-rush (*Lomandra longifolia*) and Bamboo Grass (*Austrostipa ramosissima*) occurring in the ground cover. The woodland is established on a dry drainage course on periodically flooded, undisturbed Quaternary alluvial sediments. The extent of the distribution of this assemblage in the subject area is about 5,000 m². The assemblage has long been infested with woody weeds with Wandering Jew in the ground cover.

3.4. Proposed impacts to native vegetation

The activity is not expected to impose a significant negative impact on any other local populations of native biota, including threatened species, EECs and their habitats listed on the TSC Act and EP&BC Act, which are restricted to adjoining habitats and are not found in the area of extraction.

Impacts to vegetation will be limited to the removal of two isolated River Peppermint trees. These trees were assessed by Actinotus (2011) and were found to be of poor condition and their removal would not constitute a significant impact. The area of extraction has been designed to ensure impacts to native vegetation is minimal and does not constitute a 'significant impact'.

The project includes the restoration of native vegetation along the eastern 'bank' of the Nepean River and either side of the Dry Anabran as described in this LMP. It is anticipated that this restoration program, through time, will significantly improve the cover and condition of native vegetation throughout these riparian zones when compared to existing conditions and thus improve migration of fauna and flora (transported in fauna droppings etc) and into restoration areas.

3.5. Topography, geology and soils

The site area is characterised by gently sloping to flat (0 - 5%) undulating rises on Terresa Park Soil Landscape group, which is a fluvial unit associated with Tertiary and Quaternary flood plains and terraces of the Nepean River. Soil types include brown sandy loam, reddish brown sandy clay, and light clay. Quaternary alluvial deposits of the Nepean River Valley underlie the flat-lying area. The Quaternary alluvial deposits of the Nepean River are mainly derived from weathering of Permian and Triassic bedrock and comprise typically grey-brown medium grained quartz sand with layers of silt and humic clay.

3.6. Hydrology

The study area is located within the Cumberland sub-region of the Hawkesbury-Nepean Catchment Management Authority (CMA). The site includes the old river Anabran, which parallels the flow of the Nepean River. The sand extraction activities, which involve works within 40 meters of this waterway and the Nepean River, is considered a controlled action under the WMA 2000.

3.7. Adjacent land use

The site is primarily set in a rural area with surrounding land uses and features including the Camden Bypass to the north, the Nepean River to the west, a vineyard to the east and the existing extraction operations to the south.

4. QUARRY CLOSURE

At quarry closure, the site is to consist of the following features:

- **Nepean River Riparian Vegetation.** Approximately 1.05 hectares of riparian vegetation adjacent to the Nepean River. This area will be made up of 0.79ha (**Zone 1a**) of restored existing vegetation and 0.26 hectares of additional plantings (**Zone 1b**);
- **Dry River Anabranh Vegetation.** Approximately 1.06 hectares of riparian vegetation adjacent to the Nepean River. This area will be made up of 0.51ha (**Zone 2a**) of regenerated existing vegetation and 0.55 hectares of additional plantings (**Zone 2b**);
- **Agricultural production land (Zone 3).** Approximately 5.9 hectares of 'Class 1' Agricultural production land. This land will be relatively flat and will slope gently to the south-west, draining towards the Nepean River to ensure free draining compatibility of the final land form with surrounding land uses ;
- **Terminal sedimentation pond.** The terminal sedimentation pond is to be retained as a long-term sediment control measure. This feature will therefore result in long-term water quality improvements from surface waters draining from the agricultural land beyond the life of the extraction project; and
- **Riparian Linkage Zone (Zone 4).** This zone will develop a broad linkage between the Dry River Anabranh and the Nepean River riparian corridor. Works programmed for this area involve the integration of habitat structures, revegetation and weed control.
This land will be a combination of north facing batters rising to provide a feature on the landscape with associated bio-diversity outcomes.
The southern side comprises of exiting batters that are vegetated and adjoin the existing riparian vegetated corridor.

The locations of the above features are depicted on Figure 3.

5. RESTORATION PROGRAM

The following information provides a detailed description of all activities required to implement the LMP. The required activities were determined using field investigations to visually assess, record (photograph) and identify the different native vegetation zones at the site, any threatened or endangered species and the current habitat and wildlife corridor connectivity, as well as assess soil types and on site hydrology for potential erosion hazards.

This information was supplemented by desktop research of existing reports pertaining to the site, and current vegetation maps and restoration guidelines.

5.1. Restoration zones

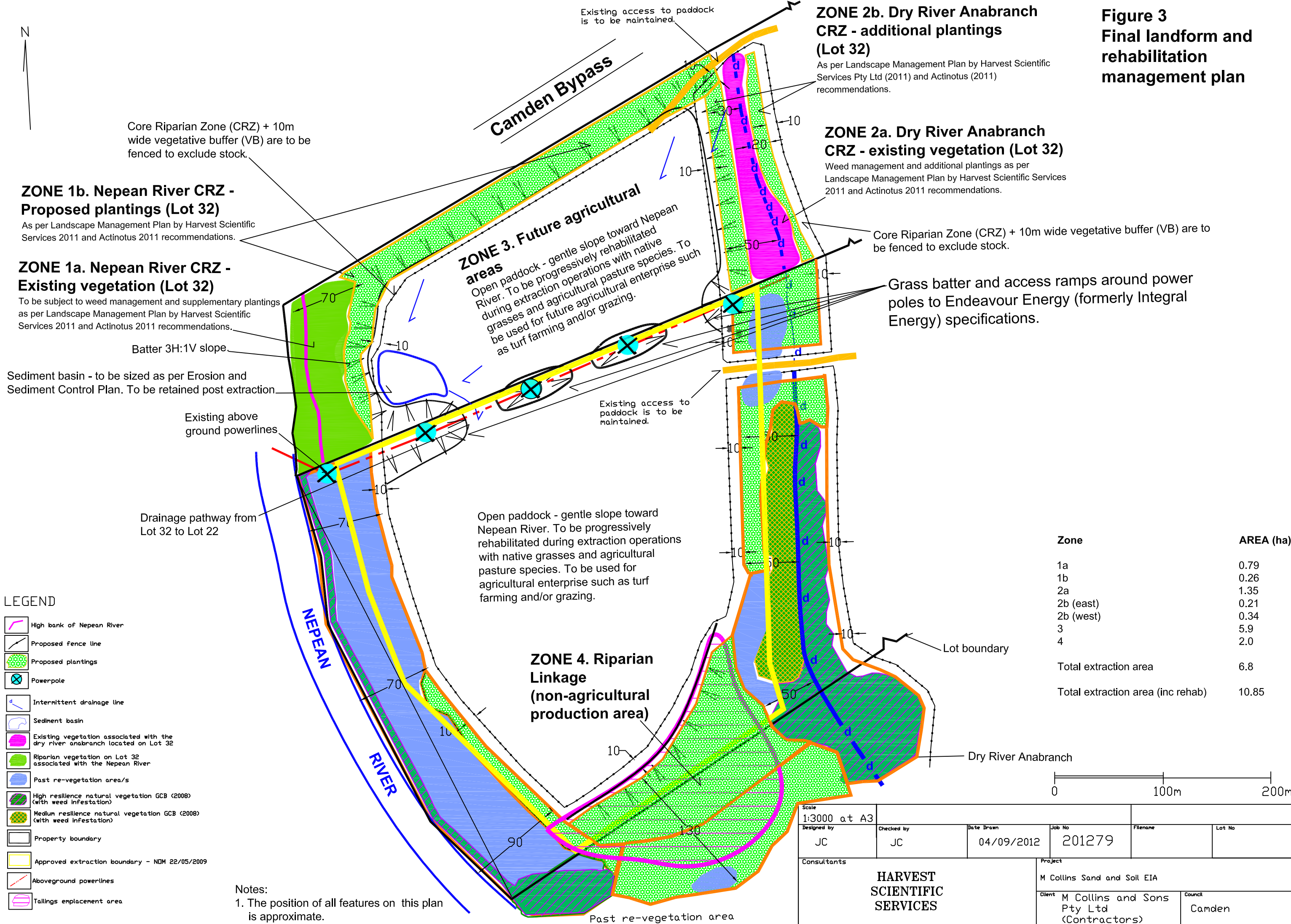
The site can be divided into four distinct zones (Figure 3) that require different vegetation management, these are:

Zone 1a-b (Nepean River) – This zone incorporates a block of remnant Riparian Forest alongside the Nepean River. This area requires a combination of bush regeneration (sub-zone 'a') and revegetation (sub-zone 'b').

Zone 2a-b (Dry River Anabranh) – This zone is located in the Dry River Anabranh, the area supports degraded Riparian Forest impacted from cattle and invasive plant species. Restoration in this area involves a combination of bush regeneration (sub-zone 'a') and revegetation (sub-zone 'b').

Zone 3 (agricultural production areas) – This zone is located in the open paddock area between the Dry River Anabranh and the Nepean River riparian zone. This zone is to be continued to be used for agricultural production land-uses.

Figure 3
Final landform and
rehabilitation
management plan



Zone 4 Riparian linkage (non-agricultural production areas) – This zone links the Nepean River Riparian Corridor at the Dry River Anabranh. It will be permanent bushland that will provide a landscape feature due to the raised platform above the batters that join agricultural land.

5.2. Staging of extraction and rehabilitation

Extraction and rehabilitation is to be staged subject to the following controls:

- Further to approval from Council, 5 hectares can be open at any one time, however the ration of 1 hectare active extraction to 1 hectare rehabilitation will be applied;
- Active extraction on Lot 32 within a 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land; and
- Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019).

The staging proposal is illustrated on Figure 4.

5.3. Noise generating re-vegetation activities

No noise generating activities are to be under-taken outside of standard hours of extraction.

5.4. Riparian corridor zones of the Water Management Act

The WMA describes two distinct management zones associated with riparian vegetation, these being the Core Riparian Zone (CRZ) and the Vegetated Buffer (VB).

- A Core Riparian Zone (CRZ) is the land contained within and adjacent to the channel. The Department will seek to ensure that the CRZ remains, or becomes vegetated, with fully structured native vegetation (including groundcovers, shrubs and trees). The width of the CRZ from the banks of the stream is determined by assessing the importance and riparian functionality of the watercourse, merits of the site and long-term use of the land. There will be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the CRZ.
- A Vegetated Buffer (VB) protects the environmental integrity of the CRZ from weed invasion, micro-climate changes (edge effects), litter, trampling and pollution. There will be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the VB. The width of the VB is 10 metres.

5.5. Site preparation

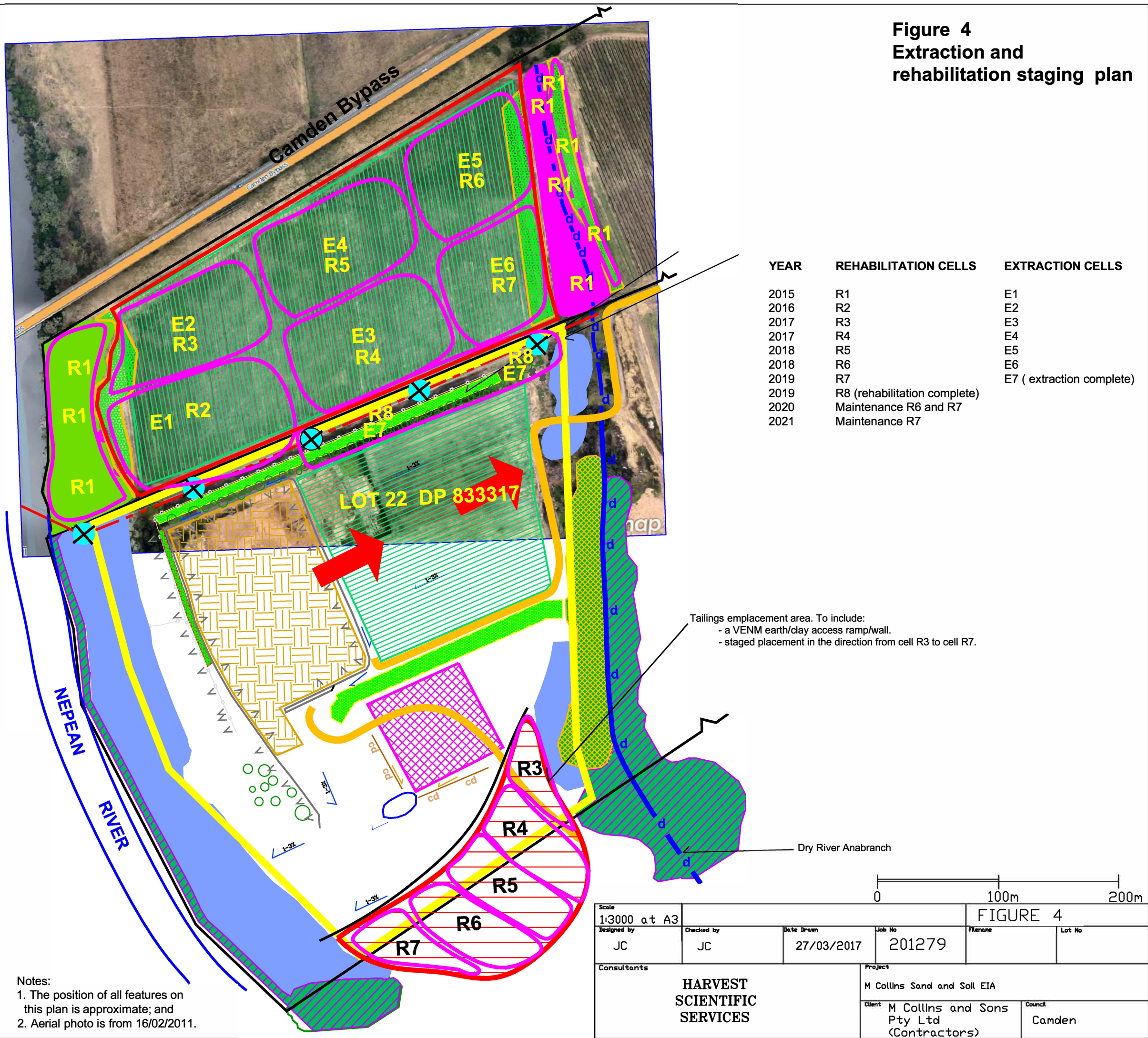
5.5.1. Site protection

Fencing

When establishing or recovering riparian vegetation to maintain land based ecosystems and to conserve biodiversity, an essential management method is to incorporate the protection of riparian vegetation. This requires some form of fencing or other means of controlling the access of heavy machinery, human influences and domestic stock.

Restoration zones 1 and 2 (Figure 3) all require protection during the quarry extraction process and for future access management. These areas are fenced with a 5 strand barbwire fence for the long term protection of the rehabilitated riparian areas. Gates and Cattle Ramps are installed as required for access to extraction areas. The protection of these areas with permanent fencing ensures the long term effective management of the rehabilitated and re-vegetated riparian habitat and its wildlife linkages.

Figure 4
Extraction and
rehabilitation staging plan



Permanent fencing provides conservation and protection to ameliorate threats such as grazing and human disturbance. On completion this will meet a number of priority actions listed as key strategies in EPA and the DEHWA recovery plans for the 'River Flat Eucalypt Forest on Coastal Floodplains'.

Signage is utilised as a tool to identify the restricted vegetation systems to staff, contractors and visitors. It is intended that fencing will not impact on bulk earthworks and extraction activities. All fencing allows for the extraction operation to continue outside these areas as part of the extraction process for some time.

5.5.2. Native and feral animal protection

Damage can occur to some or all of the species and can vary from mild to severe. There are several options to prevent the grazing or browsing of plantings. In the event that the revegetation is suppressed through herbivore activities the following methods will be utilised depending on the severity and type of pest problem.

Tree guards will be utilised as a standard procedure to protect young plants from browsing. The use of 1L milk carton, or equivalent to, tree guards generally gives protection from most herbivores during the plant establishment stage even though they may browse the tops of the plants. If the herbivores continue to suppress revegetation plants, very tall tree guards of rigid corrugated plastic will be used in some areas. Smaller guards are effective in stopping rabbits or hares from destroying young plants.

Reducing populations prior to planting - Rabbit and hare populations will be controlled in an attempt to reduce their numbers at the site prior to planting. Any rabbit burrows will be ripped and existing animals should be poisoned or shot. The Department of Primary Industries (DPI) can advise on effective and humane methods to control rabbits.

Deterrents - There are a number of options available to deter animals from entering a site, D-Ter is one product available for the protection of vegetation. This product is supplied in a powder form and is mixed with water and simply sprayed on plants. This product will be reapplied at regular intervals and after rain.

5.5.3. Litter removal

Currently the sound management of extraction operations has lead to a clean site with little to no litter polluting the natural areas and extraction sites.

During the rehabilitation process all litter is removed by hand systematically as part of the management of natural areas. Litter created in the process of revegetation is removed as an ongoing process and at completion of planting.

5.5.4 Bushfire Management

Ongoing management of undergrowth and removal of accumulated debris is conducted as a fire prevention measure. Suitable fire fighting and first aid equipment is available to respond to fires on site. These include fire hose reels, hoses, water access, pumps and fire extinguishers which are identified by means of installed signage. Bushfire management is integrated on site as part of Emergency Response procedures. In case of a bush fire or fire on site personnel are to assist fire services and emergency services as much as possible, when safe to do so.

5.5.5 Landscaping

Currently implemented measures to minimise visual impacts through landscaping, in addition to those mentioned in Section 2.1 include;

- Not removing vegetation or material from the river frontage;
- 45metre setback from Camden By-Pass to extraction hole top bund;
- No vegetation stripping until cells are activated;
- Working behind extraction face to limit bypass visibility;
- Lot 32 extraction to be 1Ha extraction to 1Ha rehabilitation;

- Landscape areas of native vegetation associated with both the Nepean River and the Dry River Anabranh;
- Landscape areas of existing native vegetation;
- Integrating ecological function and engineering design to achieve balanced landscape outcome and riparian function;
- Improving vegetation cover throughout the site and surrounds;
- Enhance visual screening by embellishment of the anabranh vegetation (as set out within vegetation tables 4 to 6);
- Staged retention of existing screening south of the extraction site where existing tree lines are maintained and coordinated within the extraction schedule;
- Staged retention of vegetation cover on areas not being extracted and progressive rehabilitation of extracted areas, with concurrent rehabilitation/extraction;
- Rehabilitation of the Nepean River riparian zone as per Figure 4;
- Construction of perimeter bunds as per ESCP ESP1 using site soil tailings and existing grass runners and additional seeding as required to minimise visual impact with additional 1 metre height and limiting site within the extraction cell;
- By-products from the extraction program including striping's, tailing, and rejects will be utilised in the rehabilitation and landscaping process, as is the current practice on adjoining land;
- Selection of denser understory as a screen minimizing visual impact;
- Selection of taller native species as a screen minimizing visual impact; and
- Selection and installation of recessive coloured fencing and fixed equipment applicable to the surrounds and area. Use of recessive coloured plant and equipment applicable to the surrounds to minimise visual impacts in conjunction with existing visually minimizing controls.

5.5.6 Final Landform

Achieving free draining and final landform levels with surrounding land uses will occur by following modelled final landform designs attached as Appendix F. Progressive surveyor levels are obtained during rehabilitation and landscaping to gauge accuracy with approved final level designs. The objective for Lot 32 is to rehabilitate approximately 5.9 ha of it to Class 1 Agricultural land use. The objective for Lot 22 on the other hand, is for the rehabilitation of the final landform to agricultural land use (not Class 1). Ongoing monitoring and annual review of achieved levels and progress are conducted to this LMP performance criteria.

5.6. Erosion control

At the completion of earthworks in and surrounding Restoration Zones 1 and 2, appropriate sediment control fencing will be installed as necessary and maintained throughout the duration of the extraction program. Installation will be in accordance with bulk earthworks 'Water Management and Erosion and Sediment Control Plan' (WM & ESCP) as prepared by Harvest Scientific Services .

5.6.1. Soil preparation

Zones 1b (Nepean River – proposed plantings), 2b (Dry Anabranh – proposed plantings) and 4 (Riparian Linkage) (Figure 3)

All battered re-vegetation areas are to be covered to a minimum depth of 500 mm with a clean weed free top soil. In non-battered areas, weeds are to be sprayed out and vegetation is to be planted directly into the natural top-soil horizon.

Ground preparation will consist of deep ripping to a depth of 300 to 400 mm, no further than 300 mm apart. The first stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross-rip is to be undertaken to reduce the chance of incisions after periods of rain and help

retain moisture on sloping surfaces. The fractured soil between rip lines eliminates glazing of the undisturbed soil interface and reduces air pockets and trench effects.

Following ripping, the soil surface may be rotary hoed, if necessary, to create a looser soil surface making it easier to plant tube-stock, encourage good root development and create a larger volume of soft soil which encourages rapid early growth.

Zone 3 (Figure 3) Agricultural production areas

At the completion of extraction within any given extraction cell that is to be utilised for future agricultural production (Zone 3 - Figure 3), the ground is to be prepared by ripping to a depth of 300 to 400 mm, no further than 300 mm apart. First stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross rip will reduce the chance of incisions after periods of rain, help retain moisture on sloping surfaces, fracture soil between rip lines, eliminate glazing of the undisturbed soil interface and reduce air pockets and trench effects.

The entire area is then to be covered to a minimum depth of 500 mm with stock-pilled top-soil (stored in the bunded mound around the extraction pit). Pasture grasses are then to be re-established by either natural re-generation from grass seed stored in the topsoil stock-pile or seeding with pasture species.

Zones 4 (Riparian Linkage) (Figure 3)

These lands comprise of batters and a ridge that is to be capped with at least a 2 metre depth of clean topsoil extracted from the approved extraction areas and including dry tailing soils that remain after the topsoil has been processed.

Ground preparation will consist of deep ripping to a depth of 300 to 400 mm, no further than 300 mm apart. The first stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross-rip is to be undertaken to reduce the chance of incisions after periods of rain and help retain moisture on sloping surfaces. The fractured soil between rip lines eliminates glazing of the undisturbed soil interface and reduces air pockets and trench effects.

Following ripping, the soil surface may be rotary hoed, if necessary, to create a looser soil surface making it easier to plant tube-stock, encourage good root development and create a larger volume of soft soil which encourages rapid early growth.

5.7. Re-vegetation program

Zones 1 (Nepean River – proposed plantings) and 2 (Dry Anabranh – proposed plantings) (Figure 3)

To implement the LMP and achieve recommended targets, a combination of revegetation techniques will be employed throughout Restoration Zones 1 and 2 (Figure 3). Each of the techniques are described below, with Table 1 outlining which species are suited to each revegetation technique.

All revegetation tasks in post extraction areas will commence upon completion of final landform levels. Additional planting in past revegetation sites and bush regeneration areas will commence as soon a plant stocks are available.

The aim of revegetation in this LMP is to restore the natural species composition and structures, combining this with other principles in this report, a self-sustaining ecosystem should result - one that will require minimum human intervention to maintain over time.

Planting locations will generally mimic where species would have naturally grown. This means plant species will be matched with the site conditions. The desired revegetation structure is one that cannot be seen through, creating a natural effect with clumps of vegetation, small clearings which predominantly are planted with ground layer species, and different heights of vegetation species.

To achieve this planting structure, revegetation planting will provide a high composition of ground cover plantings, typically growing less than 1.5 m, making up 50% of the overall planting composition. These plant species will accentually stabilise soils and provide vegetative habitat, food and nesting material for fauna species over a short period. Planting of these plants will range from 4 to 8 plants per m².

This structural layer will then be complemented by planting of mid-canopy species. This layer will again provide a good source of habitat and stability to ground soils. Plants in this structural layer will be planted as a general cover plant and clumped close together for habitat purposes. Taking these principles into account, planting distances will range from 4 plants per m² to 1 plant every 2 m².

The canopy structural layer will be planted with Angophora, Casuarina and Eucalyptus species; this layer will develop with time to dominate the revegetation structure. Planting this layer of vegetation structure at a rate of 1 plant per 5 to 10 m² will allow for thinning revegetation at a later date if required.

Zone 3 (Figure 3) Agricultural production areas

In the areas that are to be used for future agricultural production (Zone 3 – Figure 3), pasture grasses are then to be re-established by direct seeding with pasture species.

Zone 4 (Figure 3) Riparian Linkage (Non-agricultural production area)

To implement the LMP and achieve recommended targets, a revegetation program is to be employed throughout Restoration Zone 4 (Figure 3). Each of the techniques are described below, with Table 1 outlining which species are suited to each revegetation technique.

All revegetation tasks will commence upon completion of final landform levels. Within this area it is intended to spread mulch and forest residues to stabilise soils and prevent erosion whilst the tree canopy matures.

The aim of revegetation in this LMP is to restore the natural species composition and structures, combining this with other principles in this report, a self-sustaining ecosystem should result - one that will require minimum human intervention to maintain over time.

Planting locations will generally mimic where species would have naturally grown. This means plant species will be matched with the site conditions. The desired revegetation structure is one that cannot be seen through, creating a natural effect with clumps of vegetation, small clearings which predominantly are planted with ground layer species, and different heights of vegetation species.

To achieve this planting structure, revegetation planting will provide a high composition of ground cover plantings, typically growing less than 1.5 m, making up 50% of the overall planting composition. These plant species will accentually stabilise soils and provide vegetative habitat, food and nesting material for fauna species over a short period. Planting of these plants will range from 4 to 8 plants per m².

This structural layer will then be complemented by planting of mid-canopy species. This layer will again provide a good source of habitat and stability to ground soils. Plants in this structural layer will be planted as a general cover plant and clumped close together for habitat purposes. Taking these principles into account, planting distances will range from 4 plants per m² to 1 plant every 2 m².

The canopy structural layer will be planted with Angophora, Casuarina and Eucalyptus species; this layer will develop with time to dominate the revegetation structure. Planting this layer of vegetation structure at a rate of 1 plant per 5 to 10 m² will allow for thinning revegetation at a later date if required.

5.7.1. Seed collection

To allow for enough lead-in time for the propagation of local provenance species, seed collection will start as soon as practical. Experienced and qualified bush regeneration staff with a Section 132C Scientific Licence and Florabank seed collection training will perform seed collection activities. All seed collection, management, cleaning and storage will be in accordance with the *Florabank Seed Collection Guidelines* (prepared by Greening Australia and now accepted as industry best practice).

When collecting seed, priority will be placed on sourcing seeds from a site with the same physical characteristics as the site vegetation. Preferably a large population base which is geographically as close as possible to the proposed extraction site. Local genetic material is well adapted to local environmental conditions - including soil, slope, aspect, rainfall and wind. Thus the best long term survival will be achieved by using this local genetic material.

5.7.2. Plant propagation

Plant propagation refers to the germinating of collected seed and the 'growing on' of plants in enviro cells, hiko cells or forestry tubes. All plants will be produced from local provenance seed. This activity will be managed by experienced and qualified bush regeneration staff with a Section 132C Scientific Licence and Florabank seed collection training.

5.7.3. Installation of native tube stock

The vegetation to be restored on site will consist of appropriate mixes of canopy, mid-storey and groundcover species from the suggested plant species shown in Table 1. The general percentage structural composition of canopy to middle storey to groundcovers in these communities is approximately 20%: 30%: 50%.

Most plants will be planted as hiko, enviro cells or tube stock. All tree and shrub species will be suitably guarded to prevent herbivory and weed competition, and to encourage optimum growing conditions. Guards will comprise of a recycled 1 L milk carton tree guard and two bamboo stakes, or equivalent to.

All plants planted as part of the revegetation program will require mulching to approximately 75 to 100 mm in depth at a 400 mm radius from the centre of the plant. This will retain soil moisture, temperature, assist in controlling weed growth and reduce the off target killing of native species during weed controlling activities.

In general, autumn is the best season for planting as summer temperatures can be too high for young plants to establish and frosts in winter impede survival rates. Planting in early spring can be effective as long as a suitable watering regime is implemented. All plants will be installed by hand.

5.7.3.1 Hand installation

After immersion for half an hour in a bucket of water, each plant is planted into a hole that is a minimum of 25% larger than the planting container and its edges will be suitably 'roughed' prior to plant installation. A soil additive, such as Terracottom may be added to provide nutrient, water holding crystal, high cation exchange and root stimulators. This product will significantly increase the survival and establishment rate of plant species if applied at the recommended rate. Soil is then to be filled into the hole and firmed to bring the soil in contact with the plant root zone. An earth saucer is then shaped around each plant, large enough to hold 5 to 10 litres of water and then filled after planting.

All tree or shrub species extending from the tree guard after planting will be planted as deep as possible or until the plant leaves are protected by the tree guard. This will stop any herbivores from pulling the plants out of the ground when grazing on the plant. It is also recommended when planting larger specimens to add a grass species in the same hole and guard.

5.7.3.2 Hand broadcasting of native seed

In managing post extraction rehabilitation areas, the first aim is to establish and maintain a continuous indigenous groundcover, with enough vegetation to protect the soil surface from heavy rain and to provide a filtering capacity where this is required. Hand broadcasting seed is one method utilized to achieve this outcome.

In a bid to develop a robust and resilient groundcover, predominantly native grass seed mixed with seed of suitable species which are readily available and germinate easily (see Table 1) will be hand broadcast throughout the maintenance period of the restoration program. This will add further diversity to the site, particularly ground covers, and assist in achieving recommended targets for planting densities in 3A permit works when required.

5.7.4. Brush matting

This is the practice of laying cut stems/branches (containing ripe fruit) on the soil surface. This technique has two aims - to spread seed and to reduce erosion. This will be a useful technique when local native seed is in abundant supply. The most suitable species for brush matting are those that retain seed capsules on the plant but which shed seed when the branch dries, e.g. (*Leptospermum* spp.), (*Eucalyptus* spp.), She Oak (*Casuarina cunninghamiana*), (*Callistemon salignus*) and Broad-Leaved Apple (*Angophora subvelutina*).

This method of vegetation establishment will be utilised throughout the development of the vegetation in bushland areas and in revegetation. Stems and branches will be laid in thick patches rather than spreading materials thinly over large areas. This will help achieve the development of the micro climates needed for the establishment of seedlings, and in turn reducing high water velocities and the level of maintenance required around seeding areas. Areas which have been brush matted will predominantly be maintained by hand weeding. When placing the materials out the maintenance capacity of the program will be considered.

5.7.5 Rehabilitation/Re-Vegetation potential Risks and Mitigation Controls

Potential Risk	Mitigation Controls
• Native animals	Provide guarding
• Weed competition	Guarding, mulch, spraying
• Weather conditions	Increased watering, irrigation, mulching
• Failed plantings	Regular maintenance and monitoring, re-planting
• Damaged guarding	Regular monitoring, maintenance, replacement
• Final Levels	Regular surveying, review Design plans and progress

5.8. Species for use in re-vegetation activities

The species outlined in Table 1 are for use in the rehabilitation program (from Actinotus, 2012).

The list also includes which species suit the various techniques described to re-establish native vegetation.

Table 1: Plant schedule for revegetation program

Botanical Name	Common Name	Density	Revegetation Activity
Canopy:			
<i>Angophora subvelutina</i>	Broad-leaved apple	1 per 5m2	Planting/ brush matting/ broadcasting
<i>Casuarina cunninghamiana</i>	River-oak	1 per 5m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus amplifolia</i>	Cabbage gum	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus elata</i>	River peppermint	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus tereticornis</i>	Forest red gum	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Melia azedarach</i>	White Ceder	1 per 10m2	Planting/ brush matting/ broadcasting
Middle Storey:			
<i>Acacia parramattensis</i>	Parramatta green wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Acacia floribunda</i>	Sally Wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Acacia decurrens</i>	Sydney Green Wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Backhousia myrtifolia</i>	Grey Myrtle	1 per m2	Planting
<i>Baeckea linifolia</i>		1 per m2	Planting/ brush matting /clumps
<i>Bursaria spinosa</i>	Black thorn	1 per m2	Planting/ brush matting /clumps
<i>Callistemon salignus</i>	Willow bottlebrush	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Commersonia fraseri</i>	Native Hemp	1 per 10m2	
<i>Dodonaea triquetra</i>	Hop Bush	1 per m2	Planting
<i>Ficus coronata</i>	Creek Sandpaper Fig	1 per 10m2	Planting close to river bank
<i>Hymenanthera dentata</i>	Tree violet	1 per 2m2	Planting/ clumps
<i>Kunzea ambigua</i>	Tickbush	1 per 2m2	Planting/ brush matting /clumps/ broadcasting
<i>Leptospermum morrisonii</i>	Tea-tree	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Leptospermum polygalifolium</i>	Lemon-scented tea-tree	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Pomaderris ferruginea</i>	Rusty Pomaderris	1 per 2m2	Planting
<i>Prostanthera lasianthus</i>	Victorian Christmas bush	1 per 2m2	Planting
<i>Trema aspera</i>	Native Peach	1 per 5m2	Planting
Groundcovers:			
<i>Aristida ramosa</i>	Purple wiregrass	8 per m2	Planting/broadcasting
<i>Aristida vagans</i>	Blown Grass	8 per m2	Planting/broadcasting
<i>Austrostipa ramosissima</i>	Stout Bamboo Grass	4 per m2	Planting/broadcasting
<i>Clematis aristata</i>	Old man's beard	1 per m2	Planting
<i>Commelina cyanea</i>	Scurvy weed	4 per m2	Broadcasting (cuttings)
<i>Cymbopogon refractus</i>	Barbed wire grass	4 per m2	Planting/broadcasting
<i>Desmodium varians</i>		4 per m2	Planting
<i>Dichelachne crinata</i>	Longhaired plume grass	4 per m2	Planting/broadcasting
<i>Dichelachne micrantha</i>	Shorthair plumegrass	4 per m2	Hand broadcasting
<i>Dichondra repens</i>		4 per m2	Broadcasting (cuttings)
<i>Einadia hastata</i>		4 per m2	Planting
<i>Entolasia marginate</i>	Bordered panic grass	8 per m2	Planting/Broadcasting
<i>Eustrephus latifolius</i>	Wombat Berry	1 per m2	Planting
<i>Geranium homeanum</i>		4 per m2	Planting
<i>Glycine clandestina</i>	Twining glycine	2 per m2	Planting

Botanical Name	Common Name	Density	Revegetation Activity
<i>Hardenbergia violacea</i>	False sarsaparilla	1 per m2	Planting
<i>Hydrocotyle peduncularis</i>	Penny Wort	2 per m2	Planting
<i>Imperata cylindrica</i>	Blady Grass	4 per m2	Planting
<i>Lomandra longifolia</i>	Mat rush	4 per m2	Planting
<i>Microlaena stipoides</i>	Weeping meadow grass	4 per m2	Planting
<i>Opercularia aspera</i>	Course stink weed	1 per m2	Planting
<i>Oplismenus aemulus</i>		4 per m2	Planting (cuttings)
<i>Phyllanthus gunnii</i>		1 per m2	Planting
<i>Pratia purperescens</i>		4 per m2	Planting (cuttings)
<i>Poa labillardieri</i>	Large tussock grass	2 per m2	Planting/ broadcasting
<i>Pteridium esculentum</i>	Bracken	4 per m2	Planting (cuttings)
<i>Sigesbeckia orientalis</i>	Indian Weed	4 per m2	Planting
<i>Stellaria flaccida</i>	Forest starwort	4 per m2	Planting (cuttings)
<i>Stephania japonica</i>	Tape Vine	4 per m2	Planting
<i>Styandra glauca</i>	Nodding Blue Lily	4 per m2	Planting
<i>Themeda australis</i>	Kangaroo grass	4 per m2	Planting/ broadcasting
<i>Urtica incisa</i>	Scrub Nettle	2 per m2	Planting
<i>Viola hederacea</i>	Native violet	4 per m2	Planting
<i>Wahlenbergia gracilis</i>	Native bluebell	4 per m2	Planting

5.9. Maintenance program – re-vegetation

The completion of the revegetation (planting works) and target weed control activities will be considered the date of 'Practical Completion' for the restoration works and will signal the commencement of the two year plant maintenance program. The completion of the two year maintenance program will be considered as 'Final Completion' for the revegetation works. Maintenance activities will include such things as watering, herbicide spraying and general maintenance. Practical completion will occur on a staged basis and the maintenance period will commence as each stage reaches practical completion.

5.9.1. General maintenance

General maintenance activities will include repairing damaged tree guards, monitoring survival rates, installing replacement plants where required, weeding inside the tree guards and continued follow-up spot spraying. Over the first year all plant losses should be replaced and any remaining plants will be planted into the existing site as infill plantings to increase the density of the overall revegetation.

5.9.2. Watering

All plants will be 'watered in' on installation, with each plant receiving a minimum of five litres. All plantings will then receive a further three applications of water during the first 8 weeks, if required, to assist plant establishment. Should weather conditions remain dry for an extended period of time follow-up watering may be required. If so, discussion between client and contractor may be necessary to cover the cost of additional watering.

5.9.3. Maintenance spraying

To ensure the success of the revegetation activities it is essential to control weed infestation. Weeds compete with the newly installed plants for nutrients and water thereby limiting their survival and growth rates.

The revegetation will be continually maintained to a weed free state through a weed spraying program which is guided by the weather conditions, season and site monitoring. Generally the site should be monitored for weed growth after extended rain and at the start and the end of seasons.

Areas where revegetation activities are dominated by hand planting, spraying of Round-up® and Biactive herbicides will occur using 'back packs'. Suitably qualified bush regeneration contractors will carry out all spraying.

5.10. Bush regeneration and weed control

Bush regeneration of the riparian remnant will meet a number of priority actions listed as key strategies in EPA and the DEHWA recovery plans for the 'River Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodlands on Coastal Floodplains'.

The greatest likelihood of colonisation by native understorey (woody and herbaceous) will be from adjacent remnant vegetation. The riparian areas range from healthy resilient sections to heavily impacted and degraded areas. Through a comprehensive bush regeneration program, working from resilient riparian forest areas to more degraded vegetation, native vegetation will be restored to a resilient and robust plant community. Rehabilitating the riparian forest will provide the revegetation with the source of native propagules it requires, enhancing genetic exchange between the existing remnant forest and revegetation.

To meet statutory obligations listed in the Noxious Weeds Act, a weed control program targeting noxious weeds will be implemented prior to any revegetation work and all remaining weeds will be included in the bush regeneration program. All weed control and bush regeneration activities are to be completed by a suitably qualified contractor.

The suitably qualified contractor will make monthly observations. Annual reporting will be supplied by the contractor (using the criteria outlined in Appendix B regarding bush regeneration practices and rehabilitation) as listed below;

- Re-vegetation Activities minimum survival rate criteria 85%. All re-vegetation observations less than 85% triggers replacement of vegetation; and
- Weed Re-Growth cover observations above 15% trigger implementation of appropriate weed control activities.

5.10.1. Improving habitat value

Different fauna species require different structures as habitat for living, nesting and roosting. places to hide from predators, food and water, protection from weather, and opportunities to find mates. Most of these elements that make up this habitat take a long time to develop in a revegetated site, such as tree branches, hollows, dense or open shrubs, a complex ground layer, a range of bark types, different litter and root types. While leaf litter is often present after one year, fallen logs may take decades to develop and tree hollows may not form for up to 100 years. Thus, the more of these structures that are present, the greater the diversity of fauna that can be supported. Many plant species are also dependent on having a range of fauna species for services such as seed dispersal, pollination and distribution of symbiotic organisms.

When implementing the restoration of the post extraction sites, strong emphasis will be placed on a range of plant species to provide structural diversity for the development of a resilient ecosystem, providing habitat for a range of species. Developing this habitat value increases the extent of the native vegetation and therefore adds to its value as habitat.

Revegetation may increase the viability of small flora and fauna populations and provide a buffer to existing remnants. In addition, the remnants will provide habitat features such as hollows and high roost sites, which will not be present in the revegetation site until it is much older (Ryan, 1999)

Although revegetation will be used as a basic building block for the development of ecosystem function and habitat, it alone cannot provide all required habitat values for one to a hundred years. Combining revegetation with the integration of logs, trunks, organic matter, artificial hollows and nesting boxes will significantly advance the ecological function of the site and the value of revegetation as habitat.

Plant species utilised in the revegetation program will offer a variable set of habitat establishment properties. Planting large quantities of forbs, grasses and scrambling plants will provide initial habitat for some ground dwelling fauna. Plantings of shrub species particularly the spiky Blackthorn (*Bursaria spinosa*) in dense thickets and clumps throughout the revegetation site will provide shelter opportunities for small bird species. Planting species which provide food and a source of nesting material will encourage the use of the revegetation site as a resource to fauna residing in adjacent remnants. (See Table 1)

Woody material including logs, trunks, branches and sticks are to be placed throughout the areas to be revegetated. Utilising these materials can possibly advance habitat value by many years. The logs will provide instant habitat and a source of nutrients. They will provide possible roosting sites, provide niches for the retention of moisture and shelter from sun, wind and frost. They will help retain soil and nutrients through periods of heavy rain and trap pockets of organic matter for the succession of soil organisms and invertebrates.

Any sterile dead woody weeds removed as part of the bush regeneration are to be placed as stacks of timber or layered across the contours of the vegetation sites. All trees removed from the property or debris of trees after storms or alternatively, trunks and branches from off-site tree removal can be brought to the site and dispersed a minimum of 5 metres into the revegetated areas. Once large trees, branches or trunks are dispersed into the revegetated areas, suitable plants are to be planted to strengthen the habitat potential of the material. To allow enough lead time for the collection of suitable materials, companies involved in tree removal and site clearing are contacted and stock piles of large trees, branches or trunks will be accumulated.

All plantings are to be mulched with recycled greenwaste. A minimum of one barrow load or a radius of 500mm around plants will provide the usual mulch benefits and support the advancement of many soil organisms and invertebrates by providing a source of food and shelter. The developments of these organisms will in turn provide benefits to the environment and the fauna species which interact with it.

5.10.1.1 Nesting Boxes

The installation of nesting boxes for fauna habitat will be one method utilised as compensation for lack of habitat availability in the revegetation. Nesting boxes in the revegetation will target arboreal marsupials as some members of this group can recolonise revegetation areas if hollows are present or provided. This group of fauna are considerably less mobile than other species (Birds, Bats, and Macropods) placing a greater reliance on localised habitat availability. The boxes will artificially increase the amount of locally available hollows for these arboreal marsupials, increasing the value of revegetation as a habitat resource. (Cunningham *et al*, 2007).

Nest Box Location

The location of the nesting box can be critical. A north-east to south-east aspect appears to be preferred by most species. Various orientations and exposure may need to be trialled. The entrance is to face away from prevailing winds and rain. Boxes are to be at a height to meet the species needs, and out of reach of human hands, to avoid vandalism, and potential predators, such as cats (Platt, 1999).

10 nesting boxes are to be placed in revegetation areas adjoining remnant riparian forest. The boxes will be located a minimum of 6m into vegetation in amongst areas of placed logs, trunks and branches with dense vegetation planted around. The boxes will be fixed to a 3600 mm x 200 mm treated pine pole. The poles will be placed 1000 mm into the ground and the earth will be rammed around the base firmly. The boxes will then be attached from 200 mm to 2600 mm above ground level.

Table 2: Inside dimensions of nest boxes for some species that will use the general nest box design*

	A (height)	B (depth)	C (width)	D (entrance)
Brushtail Possum (also suits ducks)	500	250	290	100-120
Ringtail Possum	400	240	200	70-80
Feather-Tailed Glider	400	240	200	32-35/ 35-40
Rosellas	400	240	200	70
*Note: All measurements are in mm and all depths are minimum				

5.10.2. Targeted weed control

This component of the restoration program refers to the control of listed noxious weeds such as Alligator Weed, Green Cestrum, African Box Thorn, Small-leaved Privet, Large-leaved Privet, Blackberry Complex

and Bridal Creeper. This program requires specialised equipment and chemicals and will be managed by appropriately trained and experienced staff. Appendix A provides a summary of the most appropriate weed treatments. Control of these plants usually requires several treatments and is most effective during summer.

5.10.3. Noxious weeds

The *Noxious Weeds Act 1993* provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land.

The study area contains six species declared as noxious weeds in Camden LGA as shown in Table 3, below.

Table 3: Noxious weeds recorded in the Camden LGA area

Common name	Scientific name	Control category*
Green Cestrum	<i>Cestrum parqui</i>	3
Alligator Weed	<i>Alternanthera philoxeroides</i>	3
African Box Thorn	<i>Lycium ferocissimum</i>	4
Small-leaved Privet	<i>Ligustrum sinense</i>	4
Large-leaved Privet	<i>Ligustrum lucidum</i>	4
Blackberry complex	<i>Rubus fruticosus</i> sp. agg.	4
Bridal Creeper	<i>Asparagus asparagoides</i>	5

*Summary of responsibilities for treatment:

- For Category 3 'the plant must be fully and continuously suppressed and destroyed'.
- For Category 4 'the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority'; and
- For Category 5 'the requirements in the *Noxious Weeds Act 1993* for a notifiable weed must be complied with'.

5.11. Bush regeneration program

Restoration zones 1a and 2a (Figure 4) will be subjected to a comprehensive bush regeneration program. All bush regeneration will start after completion of the extensive weeding program in line with the extraction and concurrent rehabilitation program set out in Figures 3 and 4. All rehabilitation targets are set annually and reported within the AEMR. The site has scattered specimens of woody weeds which will be strategically controlled at the discretion of the bush regenerator. Weeds to be targeted include large woody weeds such as Southern Nettle Tree (*Celtis australis*), Large-leaved Privet (*Ligustrum lucidum*) and Small-leaved Privet (*Ligustrum sinensis*), Honey Locust (*Gladitsia triocanthus*) and a variety of other environmental and noxious weeds.

The bush regeneration program will first work to recover resilient areas which are supporting a diversity of native plant species which demonstrate structural complexities characteristic of riparian forest. Work will then graduate from these areas to assist limits of riparian forest which are in a state of decline. Working in this manner will allow the program to utilise the local ecosystem functions as a fundamental tool to stimulate natural resilience, eventually providing the necessary recovery mechanisms required for the colonisation of adjacent revegetation areas with remnant flora and fauna.

The bush regeneration program will run the entire length of the overall restoration program. 4 The primary bush regeneration sessions will occur in the 24 months covering all areas. This will allow for an average 7 visits in each site over the first 24 months. Following the 24 month establishment period there will be 14

visits scheduled per year for all areas. It is anticipated that beyond the 2 year restoration program the number of visits will eventually reduce to 6 maintenance visits per year for the whole site.

A 2 year maintenance program will run concurrently with the bush regeneration program. Tables 4 to 6 below indicates the specific restoration actions to be incorporated into zones 1, 2 and 4, with Table 7 outlining specific performance criteria. All work sessions are based on a two person team.

Table 4: Specific Restoration Actions for Zone 1 Nepean River – refer to Figure 3

Item	Description of Rehabilitation Actions - Zone 1(a) – 0.79 ha	No. Required (indicative)
1.	Target Weed control	2 days
2.	Bush regeneration program	
2.1.	Primary bush regeneration works	12 sessions first 2 years
2.2.	Secondary bush regeneration program	12 sessions remaining 2 years
3.	Monitoring and reporting program throughout two year maintenance period	2 reports
Item	Description of Rehabilitation Actions - Zone 1(b) – 0.26 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(a) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	1,600
4.	Installation of plants	
4.1.	Hand Installation	1,600
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	14 visits (all tasks)
8.	Broadcast seeding	1 days

Table 5: Specific Restoration Actions for Zone 2 Dry River Anabranh - refer to Figure 3

Item	Description of Rehabilitation Actions – Zone 2(a) – 0.51 ha	No. required (indicative)
1.	Target Weed control	1 days
2.	Bush regeneration program	
2.1.	Primary bush regeneration works	12 sessions first 2 years
2.2.	Secondary bush regeneration program	12 sessions remaining 2 years
3.	Monitoring and reporting program throughout two year maintenance period	2 reports
Item	Description of Rehabilitation Actions - Zone 2(b) – 0.55 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(b) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	12,400
4.	Installation of plants	
4.1.	Hand Installation	12,400
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	20 visits (all tasks)

Table 6: Specific Restoration Actions for Zone 4 Riparian Linkage
non-agricultural production area - refer to Figure 3

Item	Description of Rehabilitation Actions – Zone 2(a) – ~2.0 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(b) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	12,400
4.	Installation of plants	
4.1.	Hand Installation	12,400
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	20 visits (all tasks)

Table 7: Performance completion criteria

Performance Criteria and reference	
Final Landform	Appendix F – progressive and final surveyor levels
Class 1 Agricultural land use – approximately 5.9 Ha on Lot 32 (Ground cover for pasture/future agricultural area)	NSW Agricultural Land Suitability Classification System. Figure 3 Zone 3 - Minimum 80% - ground cover for pasture grasses to ensure Zone 3 is re-established as a viable future agriculture area Appendix F
Agricultural riparian lands – Lot 22 and the balance of Lot 32	Figure 3 Appendix F
Plantings	Minimum 85% survival rate for tubestock Appendix B
Weed control	Triggered at 15% weed regrowth – Section 5.10 Appendix A Appendix B

5.12. Monitoring and reporting

In order to accurately evaluate the progress and performance success of the rehabilitation and restoration works to the LMP performance criteria and objectives, an initial report will be prepared at 'Practical Completion' and then progress summary reports be prepared every twelve months throughout the two year maintenance period and rehabilitation phase. These reports will be brief, approximately one page, and include a copy of the field monitoring sheet (or similar) in Appendix B. These reports will be provided to the client and Camden Council.

The monitoring and evaluation program will address the following:

- Plant growth, percentage cover and survival rates;
- Plant losses through herbivory, disease, vandalism, storm damage or other factors;
- Weed regrowth and control measures;
- Plant replacement;
- Achieved extraction, rehabilitation and levels;
- Guard repair and weeding inside guards; and
- Maintenance watering regime.

The above items will be monitored and evaluated through the establishment of one representative quadrant in each of the major vegetation communities at the practical completion stage. It is also essential to keep regular accurate photo-records of the progress of the restoration works by setting up an appropriate number of representative fixed photo-points across all restoration zones. Photos will be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations will be clearly marked on site and mapped by GPS.

Initial implementation ongoing monitoring and review are the responsibility of the EMR. The Landscape Contractor will provide monthly rehabilitation, maintenance and progress observation reports, to ensure compliance with the LMP performance criteria, which include photo evidence pre and post works. The monthly observation reports are provided to the client EMR for internal progress monitoring, review and project management to ensure compliance with the performance objectives and criteria within this LMP. The observation reports also contain recommendations by the Landscape Contractor to the client in regard to issues affecting the ongoing success, or otherwise, of the rehabilitation and restoration works, and the possible need for additional activities that may be required outside the normal maintenance program. It is the responsibility of the General Manager for monitoring, reviewing and ongoing implementation of the LMP in consultation with the EMR and Landscape Contractor on a monthly and annual basis. The Landscape Contractor will also complete an annual report outlining rehabilitation completed, where the next annual schedule will be prepared. Although these recommendations are to be on the annual report, these recommendations will be noted by the contractor as and when applicable. The above reporting requirements are summarised below as Table 8.

Table 8: Environmental monitoring parameters

Monitoring parameter	Monitoring Frequency	Parameters to be measured and equipment required	Responsible Person	Reporting
Water Quality				
Groundwater	Monthly	pH, EC, depth to groundwater (m). Field pH and EC meters, water sampling device, tape measure.	Appropriately qualified consultant.	AEMR
Noise				
Ambient audible noise	Daily	Awareness of noise sources and controls. No routine parameters to be measured	EMR	AEMR
After an investigated noise related complaint warrants monitoring.	If directed by DPE, EPA and/or Camden Council	LA10 (15 minute)	Qualified acoustic consultant.	AEMR
Air quality				
Dust deposition	Monthly	Dust deposition. (g/m ² /month) - Dust monitoring station.	Appropriately qualified consultant.	AEMR
Particulate Matter	Following legitimate dust related complaint thereafter.	TSP and PM ₁₀ Hi Vol sampler with TSP and PM10 head.	Appropriately qualified consultant.	AEMR
Sediment controls				
All sediment controls, including, bunds, straw bale filters and sedimentation basin/s	After each rain event	Visual inspection of sediment control devices by EMR.	EMR.	AEMR
	Monthly monitoring	Visual inspection of sediment controls.	EMR	AEMR

Monitoring parameter	Monitoring Frequency	Parameters to be measured and equipment required	Responsible Person	Reporting
Rehabilitation Works				
Rehabilitation Progress (until practical completion stage)	Monthly monitoring	Visual inspection of re-vegetation progress. Notes on maintenance requirements, including spraying for weeds and replacement of trees / shrubs, as required.	EMR	AEMR
Weed Management (ongoing)	Monthly	Visual inspection of weed infestations and control requirements	EMR / Ecologist	AEMR
	When herbicides are used.	The following is to be recorded in EMM 2. • Date of chemical control; • Herbicide applied; Time applied; and • Wind direction (if any).	EMR/Ecologist	EMM2
Practical Completion	Date of practical completion for each stage	Compliance with the performance criteria in Table 7	EMR/Ecologist	Client, Camden Council and AEMR
Maintenance Phase (2 years following practical completion)	Annual	Compliance with the performance criteria in Table 7	EMR/Ecologist	Client, Camden Council and AEMR
Environmental Management Reporting				
Annual Environmental Management Report (AEMR)	Within 12 months of date of DPE approval (22/05/2009) and modification (Mod 3 25/10/2012) and annually thereafter. Submitted to DPE, EPA and Camden Council and website by 31 st March.	As per s4 of Schedule 5 of Appendix 4.	Environmental consultant	AEMR
Independent Environmental Audit	Before 30 th June 2019 and every three years thereafter.	As per s5 of Schedule 5 of Appendix 4. As per approved DPE correspondence letter dated 30 th September 2016 Appendix 15.	Environmental consultant	Audit Report
Report to DPI for annual production data.	Annually by 15 December.	Complete form.	Industry and Investment (DPI) form	AEMR
EPA License	Annually, by 26 October.	Complete form	EPL licence annual form.	EPA

6. POST EXTRACTION LAND-USE AND AGRICULTURAL CLASSIFICATION

6.1. Existing agricultural classification

Based on the NSW Agriculture (2002) Land Classification System, the flat open paddock area of the subject site Lot 32 is currently classified as 'Class 1' agricultural land. This land within Lot 32, is suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent. There is currently 6.8 hectares of agricultural land.

6.2. Post extraction land-use and agricultural classification

Post-extraction, there will be approximately 5.9 hectares of Class 1 agricultural land on Lot 32 (as per NSW Agricultural Land Suitability Classification system). The reduction in total production area was due to a portion of the site being replanted as either riparian vegetation associated with the Nepean River or the Dry River Anabranche. This loss of land will only marginally reduce the total agricultural productivity of the site but will have significant environmental benefits.

It is noted that DGRs for the proposed modification were issued on 23 December 2010 and as part of the consultation process for the Environmental Assessment, the NSW Department of Trade & Investment, Regional Infrastructure & Services (DT&IRIS, 2011) made the following comments in relation to the post extraction agricultural landform:

'Agriculture issues

'The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops 1 market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil.'

The Landscape Management Plan is adequate for the restoration for agricultural uses. Environmental Risk Assessment - There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level.'

As a response to the above correspondence, Harvest Scientific Services Pty Ltd was engaged by MCS Pty Ltd to prepare an Agricultural Assessment for a portion of the M Collins and Sons (Contractors) Pty Ltd site that has been subject to similar land-forming and rehabilitation controls to those proposed as part of the current sand and soil extension proposal.

The agricultural assessment by Harvest Scientific Services Pty Ltd (2011) concluded that the re-instated rehabilitated landform was classified as 'Class 1' agricultural land.

A copy of this assessment is appended as Appendix D.

6.3. Conclusion

Based on an assessment of the protocols for the re-instatement of areas for agricultural land on Lot 32 and an assessment of a comparable site whereby comparable protocols have been implemented, the controls will result in the re-establishment of 'Class 1' Agricultural land on 5.9ha of land within Lot 32. The balance of Lot 32 and Lot 22 will be retained as agricultural riparian lands as per Figure 3.

7. LIMITATIONS TO THIS REPORT

This report has been prepared subject to a number of limitations. These include:

- The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, the occurrence of earthquakes of any magnitude, extreme rainfall events or the effects of climate change have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose;
- The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points;
- In preparing this report, Harvest Scientific Services Pty Ltd has relied upon certain verbal information and documentation provided by the client and/or third parties. Harvest Scientific Services Pty Ltd did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Harvest Scientific Services Pty Ltd assume no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Harvest Scientific Services; and
- This report is not to be relied upon for any purpose other than that defined in this report

8. CONCLUSION

Providing the rehabilitation protocols outlined in this report are implemented, it concluded that:

- This LMP provides MCS, contractors, Council and relevant Government Authorities with a common document that clearly sets out the performance targets, restoration principles, monitoring and maintenance procedures required for the long term sustainable management of the ecological plantings and their surrounding environment; and
- Open paddock areas on Lot 32 will have the capacity for use as 'Class 1' Agricultural land up to 5.9ha.

Importantly, implementation of this LMP will produce a sustainable post-extraction landscape, including enhanced biodiversity outcomes beyond those directly occasioned by extraction activities. Such landscapes will ultimately be little different to distant observers in a visual sense to that prevailing. The LMP also provides guidance on the plant species, planting techniques, revegetation methods and maintenance requirements for the site. Implementation of the LMP will:

- Revegetate large areas of native vegetation associated with the riparian zones of both the Nepean River (Zone 1 – Figure 3), Dry River Anabranh (Zone 2 – Figure 3) and Riparian Linkage (Zone 4 – Figure 3);
- Allow for continued use of zone 3 (Figure 3) for an agricultural land-use;
- Improve the condition of areas of existing native vegetation, through bush regeneration;
- Improve vegetation cover and connectivity throughout the site and surrounds;
- Remove heavy weed infestations throughout Dry River Anabranh (Zone 2 – Figure 3) and the eastern 'bank' of the Nepean River (Zone 1 – Figure 3); and
- Improve water quality leaving the development site and entering Nepean Catchment.

9. REFERENCES

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Harvest Scientific Services Pty Ltd
Geotechnical Environmental & Resource Consultants
ABN 43 132 363 289

LANDSCAPE MANAGEMENT PLAN (Including Quarry Closure, Rehabilitation and Post Extraction Land-use)

EXISTING SAND AND SOIL EXTRACTION OPERATIONS

**Lot 32 DP 635271 and Lot 22 DP 833317
Macarthur Road, Spring Farm**

Prepared for:

M Collins and Sons (Holdings) Pty Ltd

**Job reference: 201279
30th October 2016**

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Revisions register

Version	Date	Details
1	22/06/2011	Draft document for comment
2	27/06/2011	Minor typographical revisions
3	07/07/2011	Final draft
4	12/07/2011	Report finalised
5	25/07/2011	Minor revisions following client review
6	30/11/2011	Minor revisions to address comments by NSW Department of Planning and Infrastructure dated 06 October 2011.
7	14/12/2011	Minor typographical revisions.
8	17/02/2012	Various typographical changes. Inclusion section for post-extraction land-use.
9	20/04/2012	Various typographical changes. Addition of further detail in relation to tailings emplacement area. Revised Figures 2, 3 and 4.
10	24/04/2013	Updated Figure 3 as per EA (mod 3)
11	14/07/2016	Submitted to DPE
12	30/10/2016	Revisions to address comments by DPE dated 31 st August 2016
		Added Appendix E – Consultation approval correspondence with governing authorities
		Updated outdated abbreviations for governing authorities – EPA, DPE, DPIW
		Removal of past tense phrasing to reflect definitive commitments (eg proposed, should, recommend)
		Added date of CAA to Appendix 3
		Various typographical errors corrected
		Updated Section 2.1 to include Section 8.9.5 of Mod 3 EA
		Rehabilitation phase program included in Section 5.12
		Added monitoring, reviewing and implementation responsibilities and reporting details to Section 5.1.2
		Added Section 5.5.4 Bushfire Management
		Added Section 5.5.5 Landscaping
		Added Section 5.5.6 Final Land Form
		Added 5.7.5 Rehabilitation/Revegetation potential risks/controls
	31/10/2016	Final Submission to DPE for approval
	1/3/2017	Modifications to address NSW Dept Planning letter dated 7/12/2016
	11/7/2017	Modifications to address NSW Dept Planning letter dated 16/06/2017

Executive summary

Background

M Collins and Sons (Holdings) Pty Ltd (MCS) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 and Lot 32 DP 635271 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 MCS was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

On the 25th October 2012 MCS was granted a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land at Lot 32 DP 635271. This approval enabled the following activities:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Stockpiling, dry screening of sand and soil within the quarry floor on Lot 22 but not on Lot 32;
- Active extraction within Lot 32 DP635271 on 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land.
- On Lot 22 DP833317 permission exists to open and work five hectares at any one time;
- Extraction and rehabilitation works to occur in concert over an 8 year period (completion in 2019);
- Placement of tailings from the sand wash-plant for land-forming and rehabilitation purposes; and
- Rehabilitation maintenance activities to occur over an additional 2 year period.

Director General Requirements (DGRs)

Director General Requirements for the proposed modification were issued on 23 December 2010 and included the following requirements relating to quarry closure and rehabilitation:

'Quarry closure and rehabilitation – including:

- *a detailed description of the proposed measures that would be undertaken during the closure of the Quarry;*
- *a detailed revision of the quarry rehabilitation strategy, including justification for the proposed final land form and consideration of the objectives of the relevant strategic land use objectives'*

Harvest Scientific Services Pty Ltd (HSS) was engaged by MCS to prepare a Landscape Management Plan (LMP) to address the above DGRs.

Aims and objectives

The LMP aims to provide a clear, concise and practical framework for the restoration of the vegetation impacted by the activity and in accordance with relevant legislation and the DG requirements.

The objectives of the LMP are to:

- summarise local vegetation characteristics;
- describe the restoration activities necessary to ensure an appropriate growing medium and progressive re-vegetation with local provenance vegetation and/or pasture species.
- describe the maintenance program to ensure vegetation establishment;

- ensure that re-vegetation activities are consistent with the proposed rehabilitation works on the adjacent Lot 22 DP 833317, as outlined in this LMP;
- Establish practical plans and guidelines for the ongoing management of species richness and ecosystem function;
- Implement a monitoring program that will effectively guide adaptive management rather than prescriptive management;
- Facilitate regeneration of structural diversity and complexity of the adjacent endangered ecological community, River-Flat Eucalypt Forest on Coastal Floodplains;
- Describe the restoration activities necessary to progressively restore native vegetation throughout the designated restoration zone;
- Describe the maintenance program to ensure vegetation establishment;
- Protect adjacent remnant 'River-Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodland on Coastal Floodplains' from human disturbance regimes within 2 years;
- Restoration zones 1 and 2 containing forbs and indigenous grass cover of 55% cover or greater;
- Progressive rehabilitation Lot 22 zone 4 open paddock, gentle slope towards the Nepean River with native grasses and agricultural pasture species (Figure 3);
- Create specialised habitat attributes for arboreal marsupials by 2 years post extraction;
- To assess the capacity of the proposed restoration program to return Lot 32 (Zone 3 Figure 3) agricultural production areas to 'Class 1' agricultural land; and
- Provide an outline of the proposed post-extraction land-use.

Site description and existing vegetation

The extraction area is bound to the east by a Dry River anabranch (which parallels the flow of the Nepean River), the west by the Nepean River, the north by Camden Bypass and the south by former and active extraction areas that are under-going rehabilitation works and active extraction works, respectively.

(a) Lucerne paddock

Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for the growing of Lucerne.

(b) Bank of the Nepean River

Vegetation immediately to the west of the extraction area and on the bank of the Nepean River is mapped by Actinotus (2011) as 'Riparian Forest on Coastal Floodplains'.

This vegetation comprises of a mature stand of tall forest structure to 25m in height, dominated by River Peppermint and Broad-leaved Apple, with River Sheoak common along the edge bank of the river. Common associated shrub and twiner species include Wonga Wonga Vine (*Pandorea pandorana*) and Tree Violet (*Melicytis dentatus*), with Scurvy Weed occurring in the ground cover, the forest occurring on periodically flooded, undisturbed deep Quaternary alluvial sediments along the banks of the Nepean River. The extent of the distribution of this assemblage in the subject area is about 7,100 m². The assemblage has long been infested with woody weeds and with a high frequency of occurrence of Wandering Jew in the ground cover probably as a result of historical clearing of a natural understorey stratum.

(c) Dry River Anabranch

Vegetation immediately to the east of the extraction area along the dry banks of the anabranch is mapped by Actinotus (2011) as 'Alluvial Woodland on Coastal Floodplains'.

This vegetation is a mature stand of tall woodland structure to 30m in height, dominated by River Peppermint, Broad-leaved Apple and River Sheoak. Common associated shrub species include Blackthorn (*Bursaria spinosa* var *macrophylla*), Twiggy Heath-myrtle (*Sannantha pluriflora*), Scrubby Spurge

(*Phyllanthus gunnii*) and Tree Violet (*Melicetyis dentatus*), with Spiny-headed Mat-rush (*Lomandra longifolia*) and Bamboo Grass (*Austrostipa ramosissima*) occurring in the ground cover. The woodland is established on a dry drainage course on periodically flooded, undisturbed Quaternary alluvial sediments. The extent of the distribution of this assemblage in the subject area is about 5,000 m². The assemblage has long been infested with woody weeds with Wandering Jew in the ground cover.

Landscape Management

(a) Water Management Act (WM Act) 2000 and 'Controlled Activity Approval'

The soil extraction activities and associated re-vegetation works involve works within 40 meters of a water course (i.e. the Nepean River and the Dry Anabranh) and are therefore considered to be a controlled action under the *Water Management Act* (WM Act) 2000.

MCS have a current Controlled Activity Approval (CAA), which is administered by the NSW Department of Primary Industries Water (DPIW). The expiry date of the CAA is the 08 October 2018.

(b) Erosion and sediment controls

The erosion and sediment controls implemented as part of the sand and soil extraction and rehabilitation works are outlined in a separate document entitled 'Water Management and Erosion and Sediment Control Plan' (WM & ESCP), as prepared by HSS. This LMP assumes that all erosion and sediment controls outlined in the ESCP will be implemented.

(c) Restoration program

This LMP has been prepared giving consideration to the NSW Office of Environment and Heritage, Environmental Protection Authority EPA formally DECCW) guidelines and addresses the following issues: legislative requirements and LMP methodology, existing site conditions, riparian zone protection, initial weed control, site preparation, supply of plant material, plant installation, program of works, costing, and monitoring and evaluation.

For re-vegetation works, the site has been divided into three distinct zones (Figure 3), which are summarised as follows:

Zone 1. The Nepean River.

Zone 2. Dry River Anabranh.

Zone 3. Open paddock agricultural production areas.

Zone 4. Riparian linkage (non-agricultural production).

Zones 1 and 2 are then further broken down into sub-zones depending on the specific rehabilitation actions required for each zone. Sub-zones denoted by the letter 'a' will be subject to progressive weed removal and limited plantings (where necessary), whilst zones denoted by the letter 'b' will be subject to complete re-planting and ongoing maintenance.

All plants to be used in the restoration works in zones 1, 2 and 4 are sourced from local provenance material collected in the local area and grown by local nurseries. All vegetation is planted as forestry tubes, hikos or enviro cells. All plant species are suitably guarded to prevent herbivore and weed competition and to encourage optimum growing conditions.

The restoration project also includes a two year maintenance bush regeneration component, targeting remnant vegetation (zones 1a and 2a). Areas subject to complete replanting (zones 1b and 2b) will be subject to a 2 year maintenance period. The restoration program includes the preparation of yearly monitoring and evaluation reports, as required by the guidelines, to assess the success of the restoration program and the achievement (or otherwise) of clear performance targets.

Conclusion

Providing the rehabilitation protocols outlined in this report are implemented, it is concluded that:

- This LMP provides MCS, contractors, Council and relevant Government Authorities with a common document that clearly sets out the performance targets, restoration principles, monitoring and maintenance procedures required for the long term sustainable management of the ecological plantings and their surrounding environment; and
- Lot 32 zone 3 open paddock area will have the capacity for use as 'Class 1' Agricultural land.

Importantly, implementation of this LMP will produce a sustainable post-extraction landscape, including enhanced biodiversity outcomes beyond those directly occasioned by extraction activities. Such landscapes will ultimately be little different to distant observers in a visual sense to that which is currently prevailing.

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Appendix F	Final Landform Design

Abbreviations

CAA	Controlled Activity Approval
CC	Camden Council
CMA	Catchment Management Authority
CRZ	Core riparian zone
DEHWA	Department of Environment, Heritage, Water and the Arts
DPE	Department of Environment & Planning
EECs	Endangered Ecological Communities
EP&BC Act	Environment Protection and Biodiversity Act 1999
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environmental Protection Authority
ESCP	Erosion and Sediment Control Plan

LGA	Local government area
LMP	Landscape Management Plan
NES	National environmental significance
DPIW	NSW Department of Primary Industries Water
TSC Act	Threatened Species Conservation Act 1995
VB	Vegetated buffer
WMA	Water Management Act 2000
WM & ESCP	Water Management and Erosion and Sediment Control Plan

1. INTRODUCTION

M Collins and Sons Holdings Pty Ltd (MCS) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 MCS was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

On the 25th October 2012 MCS was granted a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land at Lot 32 DP 635271. This approval enabled the following activities:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Dry screening of sand and soil excluded from Lot 32;
- Stockpiling and dry screening of sand and soil within the quarry floor on Lot 22, not on Lot 32;
- Active extraction within Lot 32 DP635271 on 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land.
- On Lot 22 DP833317 permission exists to open and work five hectares at one time; Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019);
- Placement of tailings from the sand wash-plant for land-forming and rehabilitation purposes; and
- Rehabilitation maintenance activities are proposed to occur over an additional 2 year period.

Harvest Scientific Services Pty Ltd (HSS) has been engaged by MCS to review and update the Landscape Management Plan (LMP) to address Consent Modification 3, Schedule 3, Conditions 17 and 18,.

1.1. Aims and objectives

The LMP aims to provide a clear, concise and practical framework for the restoration of the vegetation impacted by the activity and in accordance with relevant legislation and the DG requirements.

The objectives of the LMP are to:

- summarise local vegetation characteristics;
- describe the restoration activities necessary to ensure an appropriate growing medium and progressive re-vegetation with local provenance vegetation and/or pasture species.
- describe the maintenance program to ensure vegetation establishment;
- ensure that re-vegetation activities are consistent with the rehabilitation works on the adjacent Lot 22 DP 833317, as outlined in this LMP;
- Establish practical plans and guidelines for the ongoing management of species richness and ecosystem function;
- Implement a monitoring program that will effectively guide adaptive management rather than prescriptive management;
- Facilitate regeneration of structural diversity and complexity of the adjacent endangered ecological community, River-Flat Eucalypt Forest on Coastal Floodplains;
- Describe the restoration activities necessary to progressively restore native vegetation throughout the designated restoration zone;
- Describe the maintenance program to ensure vegetation establishment;

- Protect adjacent remnant 'River-Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodland on Coastal Floodplains' from human disturbance regimes within 2 years;
- Restoration zones 1 and 2 containing forbs and indigenous grass cover of 55% cover or greater;
- Progressive rehabilitation Lot 22 zone 4 open paddock, gentle slope towards the Nepean River with native grasses and agricultural pasture species (Figure 3);
- Create specialised habitat attributes for arboreal marsupials by 2 years post extraction;
- To assess the capacity of the restoration program to return Lot 32 zone 3 agricultural production areas to 'Class 1' agricultural land; and
- Provide an outline of the proposed post-extraction land-use.

1.2. Relevant legislative policies

The LMP has been prepared in accordance with the provisions contained in relevant legislation and policy guidelines, including but not limited to those listed in the following sections.

1.2.1. Water Management Act 2000

Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events. This LMP, and the subsequent implementation of recommended restoration works, has considered the implications of the Water Management Act (WMA) 2000.

A controlled activity approval under the WMA is required for certain types of developments and activities that are carried out in or within 40 metres of the high bank of a river, lake or estuary. This includes the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise. The EPA is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, i.e. the bed and a distance inland of 40 metres from a river, lake or estuary.

The soil extraction activities and associated re-vegetation works involve works within 40 meters of a water course (i.e. the Nepean River and the Dry Anabran) and are therefore considered to be a controlled action under the *Water Management Act* (WMA) 2000.

MCS has a current Controlled Activity Approval (CAA), which is administered by the NSW Department of Primary Industries Water (DPIW). The expiry date of the CAA is the 08 October 2018. A copy of the existing CAA is appended as Appendix C.

1.2.2. Threatened Species Conservation Act 1995

The Threatened Species Act (TSC Act) 1995 includes schedules that list threatened species, populations and ecological communities and key threatening processes. The objectives of the TSC Act are to:

- Conserve biological diversity and promote ecologically sustainable development, to prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- To eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The activity is not expected to impose a significant negative effect on any other local populations of native biota, including threatened species, EECs and their habitats listed on the TSC Act, which occur on the study site or in adjoining habitats.

1.2.3. Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) makes it an offence for a person to undertake an action that has the potential to significantly impact on a matter of 'national environmental significance' (NES) without first obtaining a permit from the Commonwealth Minister for Environment and Heritage. Matters of national environmental significance include: declared World Heritage areas; declared Ramsar wetlands; listed threatened species and ecological communities; listed migratory species; listed marine species; nuclear actions; and the environment of Commonwealth marine areas.

The activity is not expected to impose a significant negative impact on any other local populations of native biota, including threatened species, EECs and their habitats listed on the EPBC Act, which occur on the study site or in adjoining habitats.

1.2.4. Noxious Weed Act 1993

This LMP also considers the landowner's obligations to control weeds listed as noxious and/or environmental in the Camden LGA. During the revegetation activities, site owners are legally obliged to 'fully and continuously suppress and destroy' any noxious weed colonisation.

Several listed noxious weed species were found during the flora assessment. Weed control methodologies outlined in this plan will be implemented upon initiation of clearing works to decrease the chances of site infestation by invasive noxious weed species.

1.3. Project team

1.3.1. Names and qualifications

Name	Position	Qualifications	Relevant experience
Mart Rampe	Principal	Bachelor of Science in Applied Geology	37 + years in Earth Sciences, including 22+ years in quarry and mine site rehabilitation.

1.3.2. Related projects

Landscape Management Plan for Spring Farm Sand and Soil Extraction (continuation of existing operations), Lot 22 DP 833317 dated 10 February 2010 (Harvest Scientific Services Pty Ltd, 2010).

2. LMP OVERVIEW

2.1. Site opportunities and constraints

The rehabilitation of the Dry River Anabranh and the Nepean River embankment provide opportunities in riparian system restoration. Opportunities embraced in the restoration program include:

- Revegetating large areas of native vegetation associated with both the Nepean River and the Dry River Anabranh;
- Rehabilitating areas of existing native vegetation;

- Integrating ecological function and engineering design to achieve balanced landscape outcome and riparian function;
- Improving vegetation cover throughout the site and surrounds;
- Enhance visual screening by embellishment of the anabranch vegetation;
- Staged retention of existing screening south of the extraction site;
- Staged retention of vegetation cover on areas not being extracted and progressive rehabilitation of extracted areas;
- Rehabilitation of the Nepean River riparian zone;
- Use of recessive colours for visually intrusive plant, equipment, fencing and the like;
- Removing heavy weed infestations throughout the old river anabranch and along the eastern 'bank' of the Nepean River; and
- Improve water quality leaving the development site and entering Nepean Catchment.

Constraints encountered during project design include:

- The resources required to implement such a comprehensive rehabilitation program; and
- The seasonality of some of the works to be undertaken.

2.2. Project tasks and objectives

This LMP has been prepared giving consideration to the current EPA guidelines (*"How to Prepare a Vegetation Management Plan, Version 6"*). This requires the LMP to address the following issues:

- Site assessment and determination of constraints (eg. flora and fauna, habitat and corridor values, hydrology, fire issues, services, drainage, topography, weeds, etc);
- Definition of project tasks (description of all tasks necessary to implement the plan);
- Preparation of a program of works;
- Liaison with other consultants, landscape architects, government agencies and local Bush-care groups, as required;
- Preparation of a plant species lists, and maps and diagrams;
- Details on site preparation (protection of existing plants, erosion control, site works, weed control, soil amelioration, seed collection, etc);
- Description of planting program and methodology;
- Description of maintenance program;
- Description of monitoring and review process; and
- Addressing other potential issues (signage, other relevant legislation, other site areas, public relations, community involvement, etc).

2.3. Description of key terms

The following key terms are used throughout the description of the restoration program.

- **Regeneration** - Refers to natural regeneration of the vegetation community.
- **Bush regeneration** - Refers to techniques used to assist and promote natural regeneration without utilising plant material propagated in nurseries.
- **Revegetation** - Refers to the planting of tube stock or similar grown from local provenance seed to re-establish vegetation.

- **Restoration** - Refers to a combination of restoration activities and management techniques to restore native vegetation.
- **Forb**. An herbaceous plant that is not a grass.
- **Biodiversity** - The diversity of plant and animal life.
- **Remnant Vegetation** - Where there are no maps available, remnant vegetation is defined as vegetation where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and dominated by species characteristic of the vegetation's undisturbed canopy.
- **Local** - means local environment or site type.
- **Practical completion** - Refers to the completion of installation of revegetation activities.
- **Establishment** - Refers to the minimum 24 month maintenance program (two-years proposed for this project) applied to re-vegetation work to ensure plant establishment.
- **Final Completion** - Refers to the successful completion of the entire restoration program.

2.4. Legislative requirements and work guidelines

2.4.1. Implementation guidelines

All work to be performed on site will be in accordance with the following guidelines:

- DEC *Recovering Bushland: Best Practice Guidelines for Vegetation Restoration on the Cumberland Plain*, 2005;
- Florabank *Seed Collection and Management Guidelines*, updated July 2006;
- DIPNR's *Best Practice Guidelines for Bush Regeneration on the Cumberland Plain*, 2004; and
- Greening Australia NSW Best Practice Revegetation Guidelines, 1999.

3. SITE DESCRIPTION

3.1. Site location

The original combined area for sand and soil extraction was approximately 23 Ha (16 hectares on Lot 22 and 6.8 hectares on Lot 32). It is bound by the Camden Bypass to the north, a dry river anabranch on the East, the adjoining Collins property Lot 22 DP83317 and Lot 1 DP 5877631 on the South and the Nepean River on the West (Figure 1). Currently the approximate extraction area is a combined 7 hectares (2 ha on Lot 22 and 5 Ha on Lot 32)

The extraction area is bound to the east by a Dry River anabranch (which parallels the flow of the Nepean River), the west by the Nepean River, the north by Camden Bypass and the south by former and active extraction areas (Figure 2) that are under-going rehabilitation works and active extraction works, respectively.

Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for Lucerne paddocks.

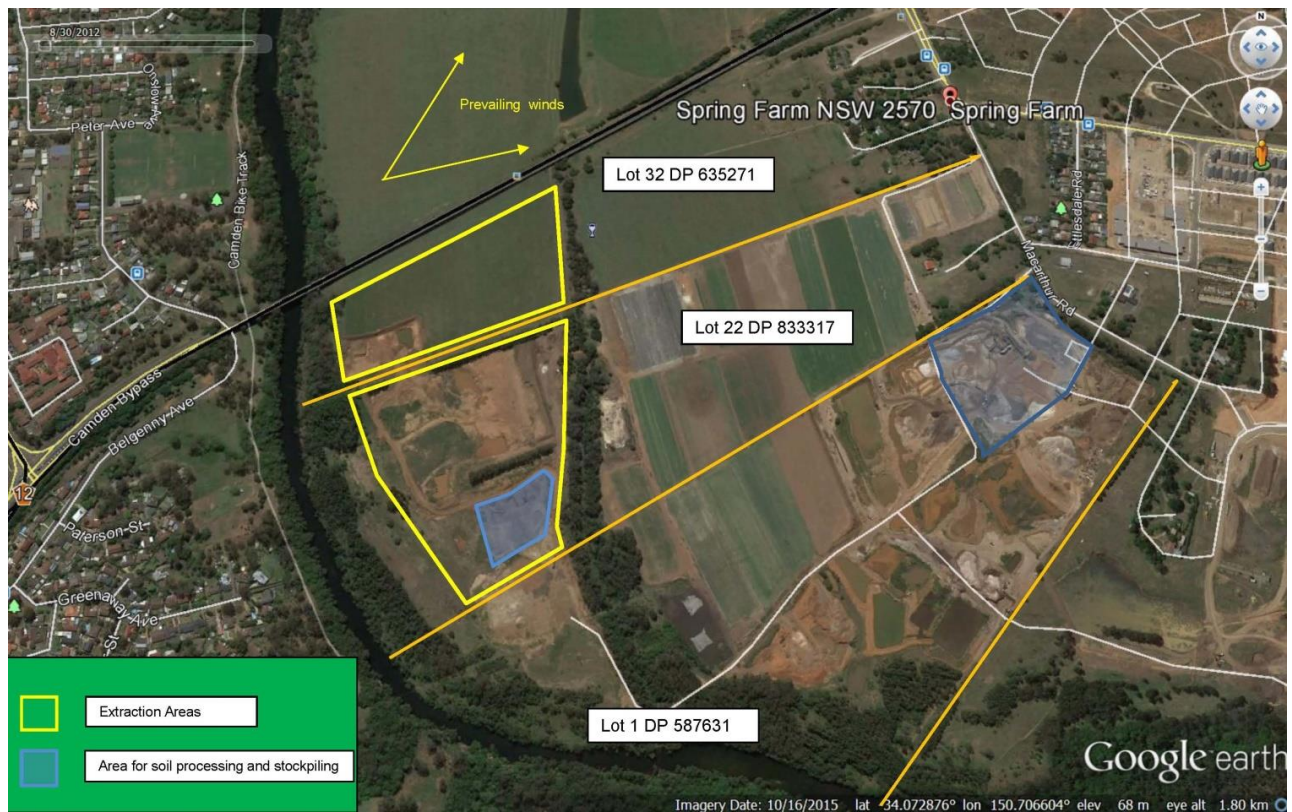


Figure 1. Location of Sand and Soil Extraction and Processing Operations

3.2. Climate

The Commonwealth Bureau of Meteorology website provides climatic information for the study area taken from Camden Airport AWS weather station (closest station to site). A review of this data indicated that the mean rainfall peaks in summer and ranges from 104.3 mm in February down to 39.4 mm in July. Mean daily maximum temperatures range from 29.4°C in summer to 17.2°C in winter with mean minimum temperatures ranging from 16.7°C in summer down to 2.9°C in winter (BoM 2009).

3.3. Vegetation

The extraction area (Figure 2) resembles a landscape consistent with most alluvial agricultural landscapes in the Macarthur district, including a long history of agricultural activities. The vegetation in and around the extraction area includes the features outlined below.

Lucerne paddock

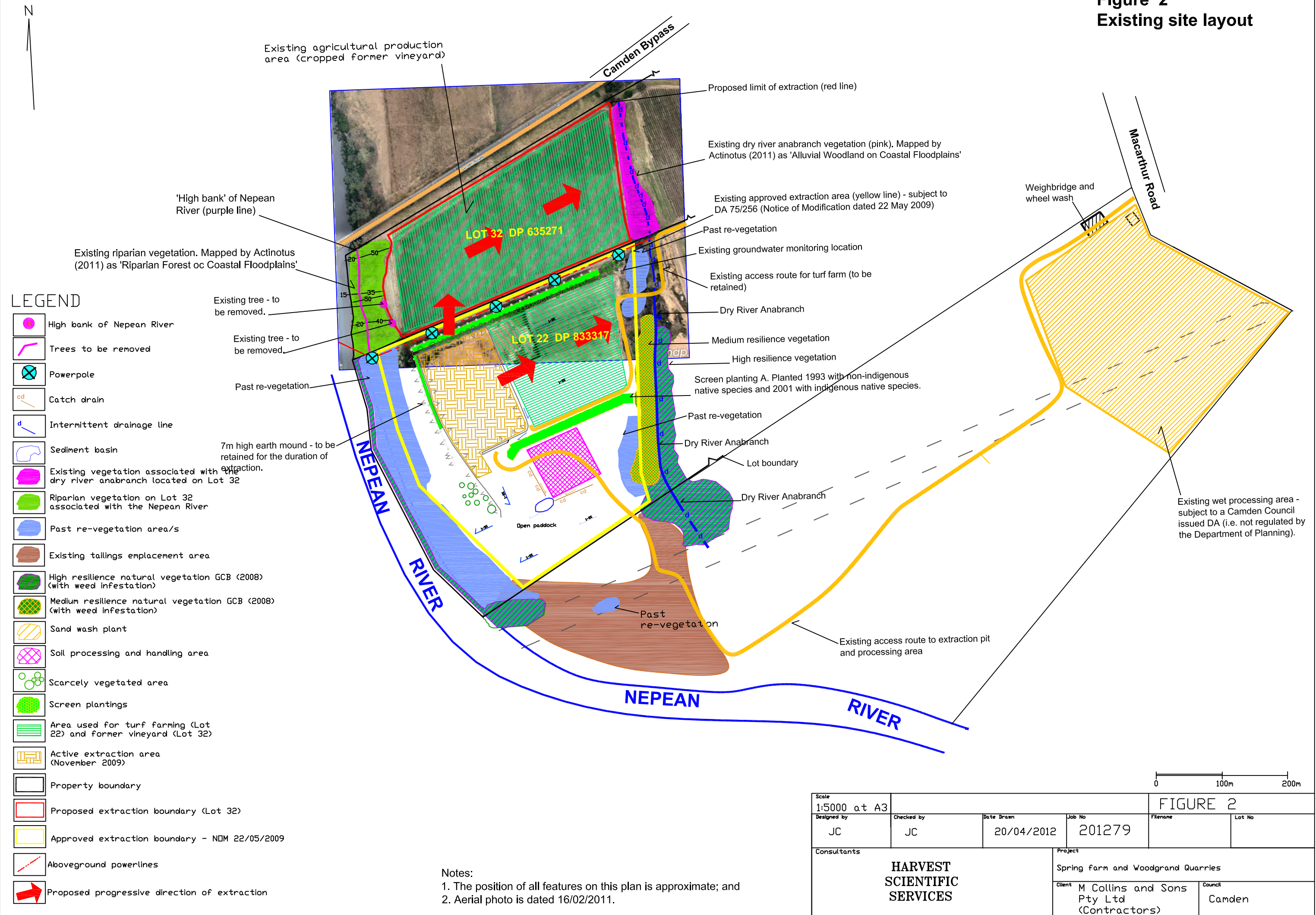
Vegetation within the extraction area has been extensively modified through historic clearing and ongoing agricultural activities. The extraction area was previously utilised for the growing of Lucerne.

Bank of the Nepean River

Vegetation immediately to the west of the extraction area and on the bank of the Nepean River is mapped by Actinotus (2011) as 'Riparian Forest on Coastal Floodplains'.

This vegetation is a mature stand of tall forest structure to 25m in height, dominated by River Peppermint and Broad-leaved Apple, with River Sheoak common along the edge bank of the river. Common associated shrub and twiner species include Wonga Wonga Vine (*Pandorea pandorana*) and Tree Violet (*Melicetyis dentatus*), with Scurvy Weed occurring in the ground cover, the forest occurring on periodically flooded, undisturbed deep Quaternary alluvial sediments along the banks of the Nepean River. The extent of the distribution of this assemblage in the subject area is about 7,100 m². The assemblage has long been infested with woody weeds and with a high frequency of occurrence of Wandering Jew in the ground cover probably as a result of historical clearing of a natural understorey stratum.

Figure 2
Existing site layout



Dry River Anabran

Vegetation immediately to the east of the extraction area along the dry banks of the anabran is mapped by Actinotus (2011) as 'Alluvial Woodland on Coastal Floodplains'.

This vegetation is a mature stand of tall woodland structure to 30m in height, dominated by River Peppermint, Broad-leaved Apple and River Sheoak. Common associated shrub species include Blackthorn (*Bursaria spinosa* var *macrophylla*), Twiggy Heath-myrtle (*Sannantha pluriflora*), Scrubby Spurge (*Phyllanthus gunnii*) and Tree Violet (*Melicytis dentatus*), with Spiny-headed Mat-rush (*Lomandra longifolia*) and Bamboo Grass (*Austrostipa ramosissima*) occurring in the ground cover. The woodland is established on a dry drainage course on periodically flooded, undisturbed Quaternary alluvial sediments. The extent of the distribution of this assemblage in the subject area is about 5,000 m². The assemblage has long been infested with woody weeds with Wandering Jew in the ground cover.

3.4. Proposed impacts to native vegetation

The activity is not expected to impose a significant negative impact on any other local populations of native biota, including threatened species, EECs and their habitats listed on the TSC Act and EP&BC Act, which are restricted to adjoining habitats and are not found in the area of extraction.

Impacts to vegetation will be limited to the removal of two isolated River Peppermint trees. These trees were assessed by Actinotus (2011) and were found to be of poor condition and their removal would not constitute a significant impact. The area of extraction has been designed to ensure impacts to native vegetation is minimal and does not constitute a 'significant impact'.

The project includes the restoration of native vegetation along the eastern 'bank' of the Nepean River and either side of the Dry Anabran as described in this LMP. It is anticipated that this restoration program, through time, will significantly improve the cover and condition of native vegetation throughout these riparian zones when compared to existing conditions and thus improve migration of fauna and flora (transported in fauna droppings etc) and into restoration areas.

3.5. Topography, geology and soils

The site area is characterised by gently sloping to flat (0 - 5%) undulating rises on Terresa Park Soil Landscape group, which is a fluvial unit associated with Tertiary and Quaternary flood plains and terraces of the Nepean River. Soil types include brown sandy loam, reddish brown sandy clay, and light clay. Quaternary alluvial deposits of the Nepean River Valley underlie the flat-lying area. The Quaternary alluvial deposits of the Nepean River are mainly derived from weathering of Permian and Triassic bedrock and comprise typically grey-brown medium grained quartz sand with layers of silt and humic clay.

3.6. Hydrology

The study area is located within the Cumberland sub-region of the Hawkesbury-Nepean Catchment Management Authority (CMA). The site includes the old river Anabran, which parallels the flow of the Nepean River. The sand extraction activities, which involve works within 40 meters of this waterway and the Nepean River, is considered a controlled action under the WMA 2000.

3.7. Adjacent land use

The site is primarily set in a rural area with surrounding land uses and features including the Camden Bypass to the north, the Nepean River to the west, a vineyard to the east and the existing extraction operations to the south.

4. QUARRY CLOSURE

At quarry closure, the site is to consist of the following features:

- **Nepean River Riparian Vegetation.** Approximately 1.05 hectares of riparian vegetation adjacent to the Nepean River. This area will be made up of 0.79ha (**Zone 1a**) of restored existing vegetation and 0.26 hectares of additional plantings (**Zone 1b**);
- **Dry River Anabranh Vegetation.** Approximately 1.06 hectares of riparian vegetation adjacent to the Nepean River. This area will be made up of 0.51ha (**Zone 2a**) of regenerated existing vegetation and 0.55 hectares of additional plantings (**Zone 2b**);
- **Agricultural production land (Zone 3).** Approximately 5.9 hectares of 'Class 1' Agricultural production land. This land will be relatively flat and will slope gently to the south-west, draining towards the Nepean River to ensure free draining compatibility of the final land form with surrounding land uses ;
- **Terminal sedimentation pond.** The terminal sedimentation pond is to be retained as a long-term sediment control measure. This feature will therefore result in long-term water quality improvements from surface waters draining from the agricultural land beyond the life of the extraction project; and
- **Riparian Linkage Zone (Zone 4).** This zone will develop a broad linkage between the Dry River Anabranh and the Nepean River riparian corridor. Works programmed for this area involve the integration of habitat structures, revegetation and weed control.
This land will be a combination of north facing batters rising to provide a feature on the landscape with associated bio-diversity outcomes.
The southern side comprises of exiting batters that are vegetated and adjoin the existing riparian vegetated corridor.

The locations of the above features are depicted on Figure 3.

5. RESTORATION PROGRAM

The following information provides a detailed description of all activities required to implement the LMP. The required activities were determined using field investigations to visually assess, record (photograph) and identify the different native vegetation zones at the site, any threatened or endangered species and the current habitat and wildlife corridor connectivity, as well as assess soil types and on site hydrology for potential erosion hazards.

This information was supplemented by desktop research of existing reports pertaining to the site, and current vegetation maps and restoration guidelines.

5.1. Restoration zones

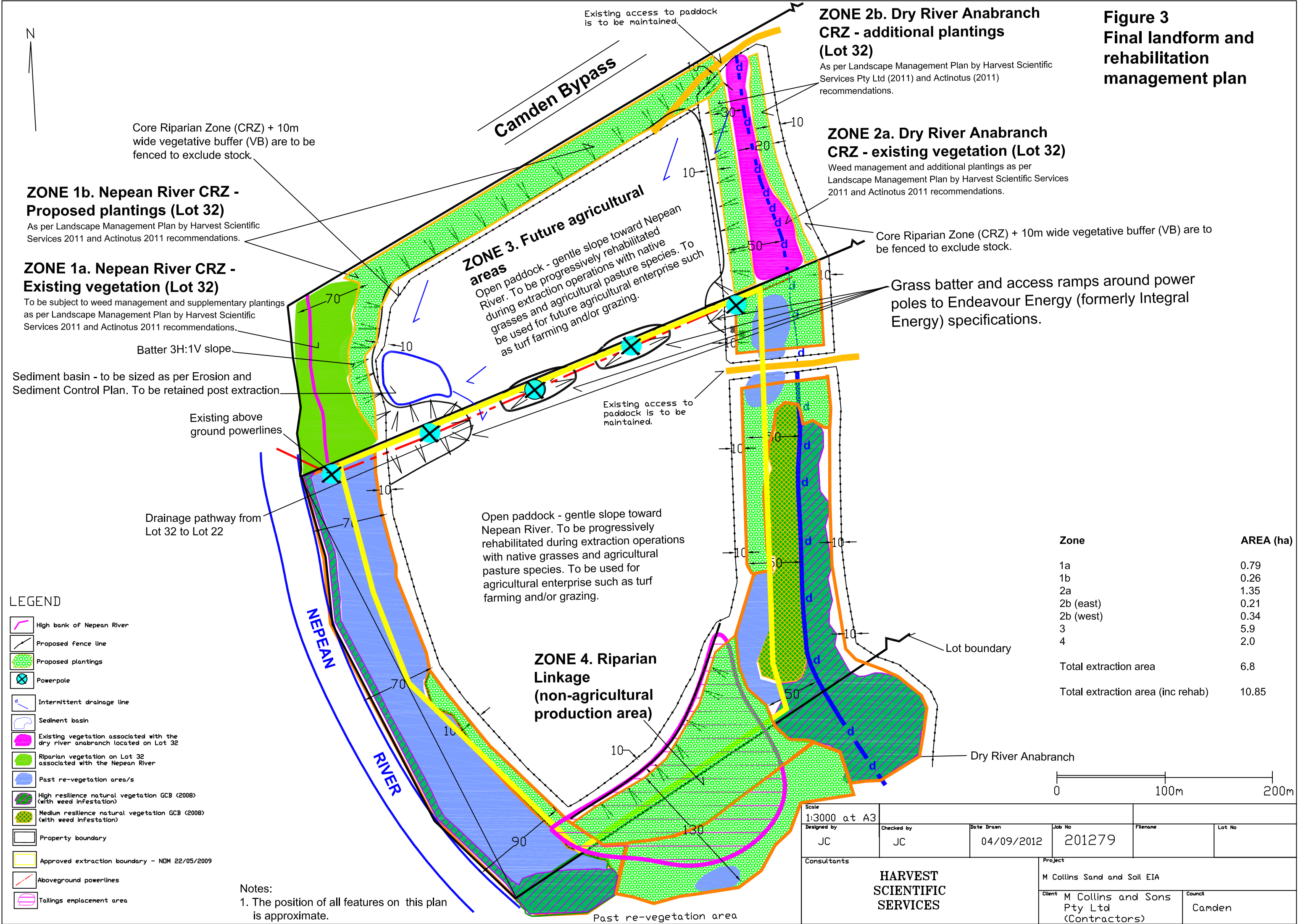
The site can be divided into four distinct zones (Figure 3) that require different vegetation management, these are:

Zone 1a-b (Nepean River) – This zone incorporates a block of remnant Riparian Forest alongside the Nepean River. This area requires a combination of bush regeneration (sub-zone 'a') and revegetation (sub-zone 'b').

Zone 2a-b (Dry River Anabranh) – This zone is located in the Dry River Anabranh, the area supports degraded Riparian Forest impacted from cattle and invasive plant species. Restoration in this area involves a combination of bush regeneration (sub-zone 'a') and revegetation (sub-zone 'b').

Zone 3 (agricultural production areas) – This zone is located in the open paddock area between the Dry River Anabranh and the Nepean River riparian zone. This zone is to be continued to be used for agricultural production land-uses.

Figure 3
Final landform and
rehabilitation
management plan



Zone 4 Riparian linkage (non-agricultural production areas) – This zone links the Nepean River Riparian Corridor at the Dry River Anabranh. It will be permanent bushland that will provide a landscape feature due to the raised platform above the batters that join agricultural land.

5.2. Staging of extraction and rehabilitation

Extraction and rehabilitation is to be staged subject to the following controls:

- Further to approval from Council, 5 hectares can be open at any one time, however the ration of 1 hectare active extraction to 1 hectare rehabilitation will be applied;
- Active extraction on Lot 32 within a 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land; and
- Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019).

The staging proposal is illustrated on Figure 4.

5.3. Noise generating re-vegetation activities

No noise generating activities are to be under-taken outside of standard hours of extraction.

5.4. Riparian corridor zones of the Water Management Act

The WMA describes two distinct management zones associated with riparian vegetation, these being the Core Riparian Zone (CRZ) and the Vegetated Buffer (VB).

- A Core Riparian Zone (CRZ) is the land contained within and adjacent to the channel. The Department will seek to ensure that the CRZ remains, or becomes vegetated, with fully structured native vegetation (including groundcovers, shrubs and trees). The width of the CRZ from the banks of the stream is determined by assessing the importance and riparian functionality of the watercourse, merits of the site and long-term use of the land. There will be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the CRZ.
- A Vegetated Buffer (VB) protects the environmental integrity of the CRZ from weed invasion, micro-climate changes (edge effects), litter, trampling and pollution. There will be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the VB. The width of the VB is 10 metres.

5.5. Site preparation

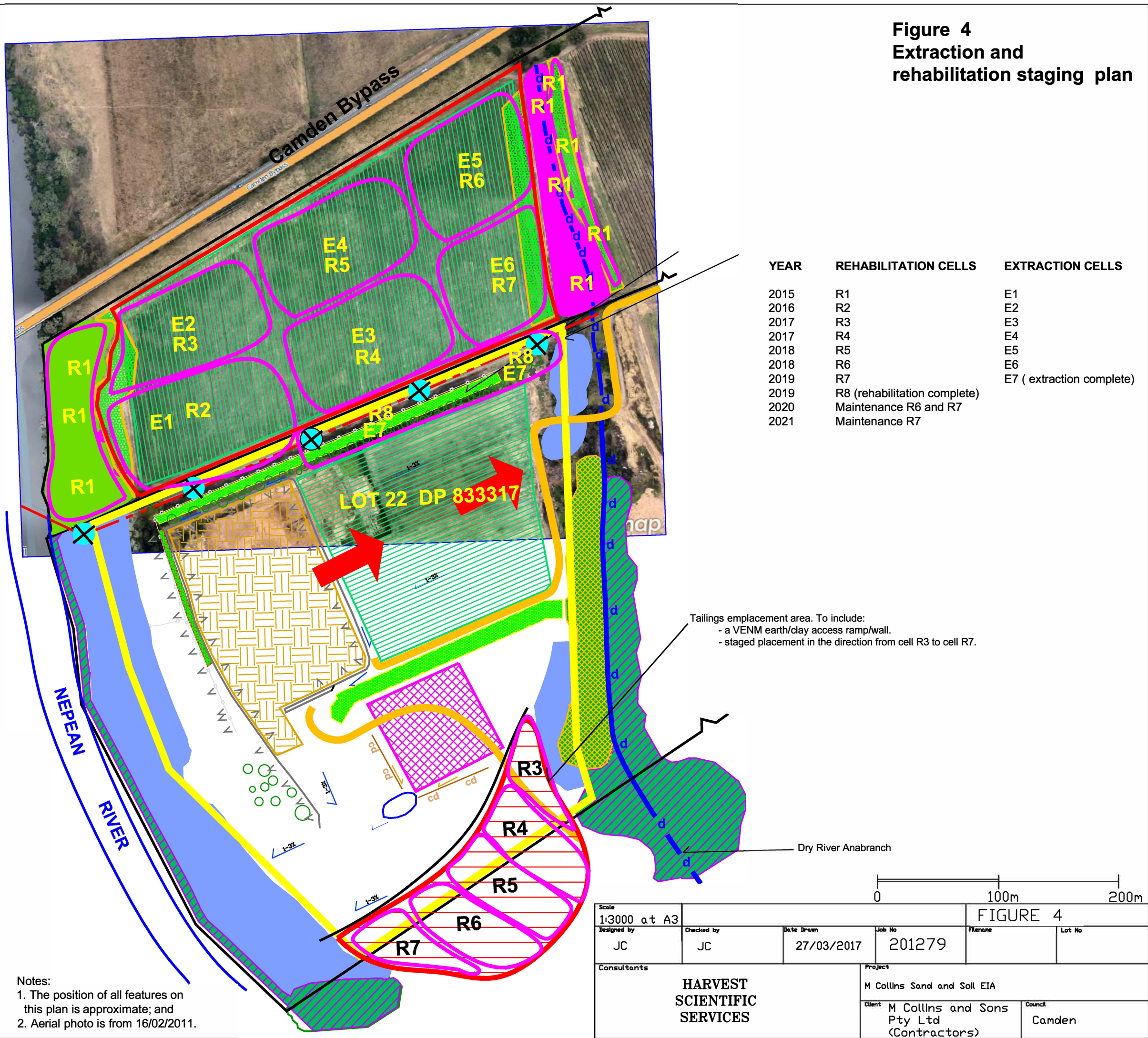
5.5.1. Site protection

Fencing

When establishing or recovering riparian vegetation to maintain land based ecosystems and to conserve biodiversity, an essential management method is to incorporate the protection of riparian vegetation. This requires some form of fencing or other means of controlling the access of heavy machinery, human influences and domestic stock.

Restoration zones 1 and 2 (Figure 3) all require protection during the quarry extraction process and for future access management. These areas are fenced with a 5 strand barbwire fence for the long term protection of the rehabilitated riparian areas. Gates and Cattle Ramps are installed as required for access to extraction areas. The protection of these areas with permanent fencing ensures the long term effective management of the rehabilitated and re-vegetated riparian habitat and its wildlife linkages.

Figure 4
Extraction and
rehabilitation staging plan



Permanent fencing provides conservation and protection to ameliorate threats such as grazing and human disturbance. On completion this will meet a number of priority actions listed as key strategies in EPA and the DEHWA recovery plans for the 'River Flat Eucalypt Forest on Coastal Floodplains'.

Signage is utilised as a tool to identify the restricted vegetation systems to staff, contractors and visitors. It is intended that fencing will not impact on bulk earthworks and extraction activities. All fencing allows for the extraction operation to continue outside these areas as part of the extraction process for some time.

5.5.2. Native and feral animal protection

Damage can occur to some or all of the species and can vary from mild to severe. There are several options to prevent the grazing or browsing of plantings. In the event that the revegetation is suppressed through herbivore activities the following methods will be utilised depending on the severity and type of pest problem.

Tree guards will be utilised as a standard procedure to protect young plants from browsing. The use of 1L milk carton, or equivalent to, tree guards generally gives protection from most herbivores during the plant establishment stage even though they may browse the tops of the plants. If the herbivores continue to suppress revegetation plants, very tall tree guards of rigid corrugated plastic will be used in some areas. Smaller guards are effective in stopping rabbits or hares from destroying young plants.

Reducing populations prior to planting - Rabbit and hare populations will be controlled in an attempt to reduce their numbers at the site prior to planting. Any rabbit burrows will be ripped and existing animals should be poisoned or shot. The Department of Primary Industries (DPI) can advise on effective and humane methods to control rabbits.

Deterrents - There are a number of options available to deter animals from entering a site, D-Ter is one product available for the protection of vegetation. This product is supplied in a powder form and is mixed with water and simply sprayed on plants. This product will be reapplied at regular intervals and after rain.

5.5.3. Litter removal

Currently the sound management of extraction operations has lead to a clean site with little to no litter polluting the natural areas and extraction sites.

During the rehabilitation process all litter is removed by hand systematically as part of the management of natural areas. Litter created in the process of revegetation is removed as an ongoing process and at completion of planting.

5.5.4 Bushfire Management

Ongoing management of undergrowth and removal of accumulated debris is conducted as a fire prevention measure. Suitable fire fighting and first aid equipment is available to respond to fires on site. These include fire hose reels, hoses, water access, pumps and fire extinguishers which are identified by means of installed signage. Bushfire management is integrated on site as part of Emergency Response procedures. In case of a bush fire or fire on site personnel are to assist fire services and emergency services as much as possible, when safe to do so.

5.5.5 Landscaping

Currently implemented measures to minimise visual impacts through landscaping, in addition to those mentioned in Section 2.1 include;

- Not removing vegetation or material from the river frontage;
- 45metre setback from Camden By-Pass to extraction hole top bund;
- No vegetation stripping until cells are activated;
- Working behind extraction face to limit bypass visibility;
- Lot 32 extraction to be 1Ha extraction to 1Ha rehabilitation;

- Landscape areas of native vegetation associated with both the Nepean River and the Dry River Anabranh;
- Landcape areas of existing native vegetation;
- Integrating ecological function and engineering design to achieve balanced landscape outcome and riparian function;
- Improving vegetation cover throughout the site and surrounds;
- Enhance visual screening by embellishment of the anabranh vegetation (as set out within vegetation tables 4 to 6);
- Staged retention of existing screening south of the extraction site where existing tree lines are maintained and coordinated within the extraction schedule;
- Staged retention of vegetation cover on areas not being extracted and progressive rehabilitation of extracted areas, with concurrent rehabilitation/extraction;
- Rehabilitation of the Nepean River riparian zone as per Figure 4;
- Construction of perimeter bunds as per ESCP ESP1 using site soil tailings and existing grass runners and additional seeding as required to minimise visual impact with additional 1 metre height and limiting site within the extraction cell;
- By-products from the extraction program including striping's, tailing, and rejects will be utilised in the rehabilitation and landscaping process, as is the current practice on adjoining land;
- Selection of denser understory as a screen minimizing visual impact;
- Selection of taller native species as a screen minimizing visual impact; and
- Selection and installation of recessive coloured fencing and fixed equipment applicable to the surrounds and area. Use of recessive coloured plant and equipment applicable to the surrounds to minimise visual impacts in conjunction with existing visually minimizing controls.

5.5.6 Final Landform

Achieving free draining and final landform levels with surrounding land uses will occur by following modelled final landform designs attached as Appendix F. Progressive surveyor levels are obtained during rehabilitation and landscaping to gauge accuracy with approved final level designs. The objective for Lot 32 is to rehabilitate approximately 5.9 ha of it to Class 1 Agricultural land use. The objective for Lot 22 on the other hand, is for the rehabilitation of the final landform to agricultural land use (not Class 1). Ongoing monitoring and annual review of achieved levels and progress are conducted to this LMP performance criteria.

5.6. Erosion control

At the completion of earthworks in and surrounding Restoration Zones 1 and 2, appropriate sediment control fencing will be installed as necessary and maintained throughout the duration of the extraction program. Installation will be in accordance with bulk earthworks 'Water Management and Erosion and Sediment Control Plan' (WM & ESCP) as prepared by Harvest Scientific Services .

5.6.1. Soil preparation

Zones 1b (Nepean River – proposed plantings), 2b (Dry Anabranh – proposed plantings) and 4 (Riparian Linkage) (Figure 3)

All battered re-vegetation areas are to be covered to a minimum depth of 500 mm with a clean weed free top soil. In non-battered areas, weeds are to be sprayed out and vegetation is to be planted directly into the natural top-soil horizon.

Ground preparation will consist of deep ripping to a depth of 300 to 400 mm, no further than 300 mm apart. The first stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross-rip is to be undertaken to reduce the chance of incisions after periods of rain and help

retain moisture on sloping surfaces. The fractured soil between rip lines eliminates glazing of the undisturbed soil interface and reduces air pockets and trench effects.

Following ripping, the soil surface may be rotary hoed, if necessary, to create a looser soil surface making it easier to plant tube-stock, encourage good root development and create a larger volume of soft soil which encourages rapid early growth.

Zone 3 (Figure 3) Agricultural production areas

At the completion of extraction within any given extraction cell that is to be utilised for future agricultural production (Zone 3 - Figure 3), the ground is to be prepared by ripping to a depth of 300 to 400 mm, no further than 300 mm apart. First stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross rip will reduce the chance of incisions after periods of rain, help retain moisture on sloping surfaces, fracture soil between rip lines, eliminate glazing of the undisturbed soil interface and reduce air pockets and trench effects.

The entire area is then to be covered to a minimum depth of 500 mm with stock-pilled top-soil (stored in the bunded mound around the extraction pit). Pasture grasses are then to be re-established by either natural re-generation from grass seed stored in the topsoil stock-pile or seeding with pasture species.

Zones 4 (Riparian Linkage) (Figure 3)

These lands comprise of batters and a ridge that is to be capped with at least a 2 metre depth of clean topsoil extracted from the approved extraction areas and including dry tailing soils that remain after the topsoil has been processed.

Ground preparation will consist of deep ripping to a depth of 300 to 400 mm, no further than 300 mm apart. The first stages of ripping will run down any batters or contours followed by a cross ripping along the contours. The cross-rip is to be undertaken to reduce the chance of incisions after periods of rain and help retain moisture on sloping surfaces. The fractured soil between rip lines eliminates glazing of the undisturbed soil interface and reduces air pockets and trench effects.

Following ripping, the soil surface may be rotary hoed, if necessary, to create a looser soil surface making it easier to plant tube-stock, encourage good root development and create a larger volume of soft soil which encourages rapid early growth.

5.7. Re-vegetation program

Zones 1 (Nepean River – proposed plantings) and 2 (Dry Anabranh – proposed plantings) (Figure 3)

To implement the LMP and achieve recommended targets, a combination of revegetation techniques will be employed throughout Restoration Zones 1 and 2 (Figure 3). Each of the techniques are described below, with Table 1 outlining which species are suited to each revegetation technique.

All revegetation tasks in post extraction areas will commence upon completion of final landform levels. Additional planting in past revegetation sites and bush regeneration areas will commence as soon a plant stocks are available.

The aim of revegetation in this LMP is to restore the natural species composition and structures, combining this with other principles in this report, a self-sustaining ecosystem should result - one that will require minimum human intervention to maintain over time.

Planting locations will generally mimic where species would have naturally grown. This means plant species will be matched with the site conditions. The desired revegetation structure is one that cannot be seen through, creating a natural effect with clumps of vegetation, small clearings which predominantly are planted with ground layer species, and different heights of vegetation species.

To achieve this planting structure, revegetation planting will provide a high composition of ground cover plantings, typically growing less than 1.5 m, making up 50% of the overall planting composition. These plant species will accentually stabilise soils and provide vegetative habitat, food and nesting material for fauna species over a short period. Planting of these plants will range from 4 to 8 plants per m².

This structural layer will then be complemented by planting of mid-canopy species. This layer will again provide a good source of habitat and stability to ground soils. Plants in this structural layer will be planted as a general cover plant and clumped close together for habitat purposes. Taking these principles into account, planting distances will range from 4 plants per m² to 1 plant every 2 m².

The canopy structural layer will be planted with Angophora, Casuarina and Eucalyptus species; this layer will develop with time to dominate the revegetation structure. Planting this layer of vegetation structure at a rate of 1 plant per 5 to 10 m² will allow for thinning revegetation at a later date if required.

Zone 3 (Figure 3) Agricultural production areas

In the areas that are to be used for future agricultural production (Zone 3 – Figure 3), pasture grasses are then to be re-established by direct seeding with pasture species.

Zone 4 (Figure 3) Riparian Linkage (Non-agricultural production area)

To implement the LMP and achieve recommended targets, a revegetation program is to be employed throughout Restoration Zone 4 (Figure 3). Each of the techniques are described below, with Table 1 outlining which species are suited to each revegetation technique.

All revegetation tasks will commence upon completion of final landform levels. Within this area it is intended to spread mulch and forest residues to stabilise soils and prevent erosion whilst the tree canopy matures.

The aim of revegetation in this LMP is to restore the natural species composition and structures, combining this with other principles in this report, a self-sustaining ecosystem should result - one that will require minimum human intervention to maintain over time.

Planting locations will generally mimic where species would have naturally grown. This means plant species will be matched with the site conditions. The desired revegetation structure is one that cannot be seen through, creating a natural effect with clumps of vegetation, small clearings which predominantly are planted with ground layer species, and different heights of vegetation species.

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The canopy structural layer will be planted with Angophora, Casuarina and Eucalyptus species; this layer will develop with time to dominate the revegetation structure. Planting this layer of vegetation structure at a rate of 1 plant per 5 to 10 m² will allow for thinning revegetation at a later date if required.

5.7.1. Seed collection

To allow for enough lead-in time for the propagation of local provenance species, seed collection will start as soon as practical. Experienced and qualified bush regeneration staff with a Section 132C Scientific Licence and Florabank seed collection training will perform seed collection activities. All seed collection, management, cleaning and storage will be in accordance with the *Florabank Seed Collection Guidelines* (prepared by Greening Australia and now accepted as industry best practice).

When collecting seed, priority will be placed on sourcing seeds from a site with the same physical characteristics as the site vegetation. Preferably a large population base which is geographically as close as possible to the proposed extraction site. Local genetic material is well adapted to local environmental conditions - including soil, slope, aspect, rainfall and wind. Thus the best long term survival will be achieved by using this local genetic material.

5.7.2. Plant propagation

Plant propagation refers to the germinating of collected seed and the 'growing on' of plants in enviro cells, hiko cells or forestry tubes. All plants will be produced from local provenance seed. This activity will be managed by experienced and qualified bush regeneration staff with a Section 132C Scientific Licence and Florabank seed collection training.

5.7.3. Installation of native tube stock

The vegetation to be restored on site will consist of appropriate mixes of canopy, mid-storey and groundcover species from the suggested plant species shown in Table 1. The general percentage structural composition of canopy to middle storey to groundcovers in these communities is approximately 20%: 30%: 50%.

Most plants will be planted as hiko, enviro cells or tube stock. All tree and shrub species will be suitably guarded to prevent herbivory and weed competition, and to encourage optimum growing conditions. Guards will comprise of a recycled 1 L milk carton tree guard and two bamboo stakes, or equivalent to.

All plants planted as part of the revegetation program will require mulching to approximately 75 to 100 mm in depth at a 400 mm radius from the centre of the plant. This will retain soil moisture, temperature, assist in controlling weed growth and reduce the off target killing of native species during weed controlling activities.

In general, autumn is the best season for planting as summer temperatures can be too high for young plants to establish and frosts in winter impede survival rates. Planting in early spring can be effective as long as a suitable watering regime is implemented. All plants will be installed by hand.

5.7.3.1 Hand installation

After immersion for half an hour in a bucket of water, each plant is planted into a hole that is a minimum of 25% larger than the planting container and its edges will be suitably 'roughed' prior to plant installation. A soil additive, such as Terracottom may be added to provide nutrient, water holding crystal, high cation exchange and root stimulators. This product will significantly increase the survival and establishment rate of plant species if applied at the recommended rate. Soil is then to be filled into the hole and firmed to bring the soil in contact with the plant root zone. An earth saucer is then shaped around each plant, large enough to hold 5 to 10 litres of water and then filled after planting.

All tree or shrub species extending from the tree guard after planting will be planted as deep as possible or until the plant leaves are protected by the tree guard. This will stop any herbivores from pulling the plants out of the ground when grazing on the plant. It is also recommended when planting larger specimens to add a grass species in the same hole and guard.

5.7.3.2 Hand broadcasting of native seed

In managing post extraction rehabilitation areas, the first aim is to establish and maintain a continuous indigenous groundcover, with enough vegetation to protect the soil surface from heavy rain and to provide a filtering capacity where this is required. Hand broadcasting seed is one method utilized to achieve this outcome.

In a bid to develop a robust and resilient groundcover, predominantly native grass seed mixed with seed of suitable species which are readily available and germinate easily (see Table 1) will be hand broadcast throughout the maintenance period of the restoration program. This will add further diversity to the site, particularly ground covers, and assist in achieving recommended targets for planting densities in 3A permit works when required.

5.7.4. Brush matting

This is the practice of laying cut stems/branches (containing ripe fruit) on the soil surface. This technique has two aims - to spread seed and to reduce erosion. This will be a useful technique when local native seed is in abundant supply. The most suitable species for brush matting are those that retain seed capsules on the plant but which shed seed when the branch dries, e.g. (*Leptospermum* spp.), (*Eucalyptus* spp.), She Oak (*Casuarina cunninghamiana*), (*Callistemon salignus*) and Broad-Leaved Apple (*Angophora subvelutina*).

This method of vegetation establishment will be utilised throughout the development of the vegetation in bushland areas and in revegetation. Stems and branches will be laid in thick patches rather than spreading materials thinly over large areas. This will help achieve the development of the micro climates needed for the establishment of seedlings, and in turn reducing high water velocities and the level of maintenance required around seeding areas. Areas which have been brush matted will predominantly be maintained by hand weeding. When placing the materials out the maintenance capacity of the program will be considered.

5.7.5 Rehabilitation/Re-Vegetation potential Risks and Mitigation Controls

Potential Risk	Mitigation Controls
• Native animals	Provide guarding
• Weed competition	Guarding, mulch, spraying
• Weather conditions	Increased watering, irrigation, mulching
• Failed plantings	Regular maintenance and monitoring, re-planting
• Damaged guarding	Regular monitoring, maintenance, replacement
• Final Levels	Regular surveying, review Design plans and progress

5.8. Species for use in re-vegetation activities

The species outlined in Table 1 are for use in the rehabilitation program (from Actinotus, 2012).

The list also includes which species suit the various techniques described to re-establish native vegetation.

Table 1: Plant schedule for revegetation program

Botanical Name	Common Name	Density	Revegetation Activity
Canopy:			
<i>Angophora subvelutina</i>	Broad-leaved apple	1 per 5m2	Planting/ brush matting/ broadcasting
<i>Casuarina cunninghamiana</i>	River-oak	1 per 5m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus amplifolia</i>	Cabbage gum	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus elata</i>	River peppermint	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Eucalyptus tereticornis</i>	Forest red gum	1 per 10m2	Planting/ brush matting/ broadcasting
<i>Melia azedarach</i>	White Ceder	1 per 10m2	Planting/ brush matting/ broadcasting
Middle Storey:			
<i>Acacia parramattensis</i>	Parramatta green wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Acacia floribunda</i>	Sally Wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Acacia decurrens</i>	Sydney Green Wattle	1 per 2m2	Planting/ brush matting/ broadcasting
<i>Backhousia myrtifolia</i>	Grey Myrtle	1 per m2	Planting
<i>Baeckea linifolia</i>		1 per m2	Planting/ brush matting /clumps
<i>Bursaria spinosa</i>	Black thorn	1 per m2	Planting/ brush matting /clumps
<i>Callistemon salignus</i>	Willow bottlebrush	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Commersonia fraseri</i>	Native Hemp	1 per 10m2	
<i>Dodonaea triquetra</i>	Hop Bush	1 per m2	Planting
<i>Ficus coronata</i>	Creek Sandpaper Fig	1 per 10m2	Planting close to river bank
<i>Hymenanthera dentata</i>	Tree violet	1 per 2m2	Planting/ clumps
<i>Kunzea ambigua</i>	Tickbush	1 per 2m2	Planting/ brush matting /clumps/ broadcasting
<i>Leptospermum morrisonii</i>	Tea-tree	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Leptospermum polygalifolium</i>	Lemon-scented tea-tree	1 per m2	Planting/ brush matting /clumps/ broadcasting
<i>Pomaderris ferruginea</i>	Rusty Pomaderris	1 per 2m2	Planting
<i>Prostanthera lasianthus</i>	Victorian Christmas bush	1 per 2m2	Planting
<i>Trema aspera</i>	Native Peach	1 per 5m2	Planting
Groundcovers:			
<i>Aristida ramosa</i>	Purple wiregrass	8 per m2	Planting/broadcasting
<i>Aristida vagans</i>	Blown Grass	8 per m2	Planting/broadcasting
<i>Austrostipa ramosissima</i>	Stout Bamboo Grass	4 per m2	Planting/broadcasting
<i>Clematis aristata</i>	Old man's beard	1 per m2	Planting
<i>Commelina cyanea</i>	Scurvy weed	4 per m2	Broadcasting (cuttings)
<i>Cymbopogon refractus</i>	Barbed wire grass	4 per m2	Planting/broadcasting
<i>Desmodium varians</i>		4 per m2	Planting
<i>Dichelachne crinata</i>	Longhaired plume grass	4 per m2	Planting/broadcasting
<i>Dichelachne micrantha</i>	Shorthair plumegrass	4 per m2	Hand broadcasting
<i>Dichondra repens</i>		4 per m2	Broadcasting (cuttings)
<i>Einadia hastata</i>		4 per m2	Planting
<i>Entolasia marginate</i>	Bordered panic grass	8 per m2	Planting/Broadcasting
<i>Eustrephus latifolius</i>	Wombat Berry	1 per m2	Planting
<i>Geranium homeanum</i>		4 per m2	Planting
<i>Glycine clandestina</i>	Twining glycine	2 per m2	Planting

Botanical Name	Common Name	Density	Revegetation Activity
<i>Hardenbergia violacea</i>	False sarsaparilla	1 per m2	Planting
<i>Hydrocotyle peduncularis</i>	Penny Wort	2 per m2	Planting
<i>Imperata cylindrica</i>	Blady Grass	4 per m2	Planting
<i>Lomandra longifolia</i>	Mat rush	4 per m2	Planting
<i>Microlaena stipoides</i>	Weeping meadow grass	4 per m2	Planting
<i>Opercularia aspera</i>	Course stink weed	1 per m2	Planting
<i>Oplismenus aemulus</i>		4 per m2	Planting (cuttings)
<i>Phyllanthus gunnii</i>		1 per m2	Planting
<i>Pratia purperescens</i>		4 per m2	Planting (cuttings)
<i>Poa labillardieri</i>	Large tussock grass	2 per m2	Planting/ broadcasting
<i>Pteridium esculentum</i>	Bracken	4 per m2	Planting (cuttings)
<i>Sigesbeckia orientalis</i>	Indian Weed	4 per m2	Planting
<i>Stellaria flaccida</i>	Forest starwort	4 per m2	Planting (cuttings)
<i>Stephania japonica</i>	Tape Vine	4 per m2	Planting
<i>Styandra glauca</i>	Nodding Blue Lily	4 per m2	Planting
<i>Themeda australis</i>	Kangaroo grass	4 per m2	Planting/ broadcasting
<i>Urtica incisa</i>	Scrub Nettle	2 per m2	Planting
<i>Viola hederacea</i>	Native violet	4 per m2	Planting
<i>Wahlenbergia gracilis</i>	Native bluebell	4 per m2	Planting

5.9. Maintenance program – re-vegetation

The completion of the revegetation (planting works) and target weed control activities will be considered the date of 'Practical Completion' for the restoration works and will signal the commencement of the two year plant maintenance program. The completion of the two year maintenance program will be considered as 'Final Completion' for the revegetation works. Maintenance activities will include such things as watering, herbicide spraying and general maintenance. Practical completion will occur on a staged basis and the maintenance period will commence as each stage reaches practical completion.

5.9.1. General maintenance

General maintenance activities will include repairing damaged tree guards, monitoring survival rates, installing replacement plants where required, weeding inside the tree guards and continued follow-up spot spraying. Over the first year all plant losses should be replaced and any remaining plants will be planted into the existing site as infill plantings to increase the density of the overall revegetation.

5.9.2. Watering

All plants will be 'watered in' on installation, with each plant receiving a minimum of five litres. All plantings will then receive a further three applications of water during the first 8 weeks, if required, to assist plant establishment. Should weather conditions remain dry for an extended period of time follow-up watering may be required. If so, discussion between client and contractor may be necessary to cover the cost of additional watering.

5.9.3. Maintenance spraying

To ensure the success of the revegetation activities it is essential to control weed infestation. Weeds compete with the newly installed plants for nutrients and water thereby limiting their survival and growth rates.

The revegetation will be continually maintained to a weed free state through a weed spraying program which is guided by the weather conditions, season and site monitoring. Generally the site should be monitored for weed growth after extended rain and at the start and the end of seasons.

Areas where revegetation activities are dominated by hand planting, spraying of Round-up® and Biactive herbicides will occur using 'back packs'. Suitably qualified bush regeneration contractors will carry out all spraying.

5.10. Bush regeneration and weed control

Bush regeneration of the riparian remnant will meet a number of priority actions listed as key strategies in EPA and the DEHWA recovery plans for the 'River Flat Eucalypt Forest on Coastal Floodplains' and 'Alluvial Woodlands on Coastal Floodplains'.

The greatest likelihood of colonisation by native understorey (woody and herbaceous) will be from adjacent remnant vegetation. The riparian areas range from healthy resilient sections to heavily impacted and degraded areas. Through a comprehensive bush regeneration program, working from resilient riparian forest areas to more degraded vegetation, native vegetation will be restored to a resilient and robust plant community. Rehabilitating the riparian forest will provide the revegetation with the source of native propagules it requires, enhancing genetic exchange between the existing remnant forest and revegetation.

To meet statutory obligations listed in the Noxious Weeds Act, a weed control program targeting noxious weeds will be implemented prior to any revegetation work and all remaining weeds will be included in the bush regeneration program. All weed control and bush regeneration activities are to be completed by a suitably qualified contractor.

The suitably qualified contractor will make monthly observations. Annual reporting will be supplied by the contractor (using the criteria outlined in Appendix B regarding bush regeneration practices and rehabilitation) as listed below;

- Re-vegetation Activities minimum survival rate criteria 85%. All re-vegetation observations less than 85% triggers replacement of vegetation; and
- Weed Re-Growth cover observations above 15% trigger implementation of appropriate weed control activities.

5.10.1. Improving habitat value

Different fauna species require different structures as habitat for living, nesting and roosting. places to hide from predators, food and water, protection from weather, and opportunities to find mates. Most of these elements that make up this habitat take a long time to develop in a revegetated site, such as tree branches, hollows, dense or open shrubs, a complex ground layer, a range of bark types, different litter and root types. While leaf litter is often present after one year, fallen logs may take decades to develop and tree hollows may not form for up to 100 years. Thus, the more of these structures that are present, the greater the diversity of fauna that can be supported. Many plant species are also dependent on having a range of fauna species for services such as seed dispersal, pollination and distribution of symbiotic organisms.

When implementing the restoration of the post extraction sites, strong emphasis will be placed on a range of plant species to provide structural diversity for the development of a resilient ecosystem, providing habitat for a range of species. Developing this habitat value increases the extent of the native vegetation and therefore adds to its value as habitat.

Revegetation may increase the viability of small flora and fauna populations and provide a buffer to existing remnants. In addition, the remnants will provide habitat features such as hollows and high roost sites, which will not be present in the revegetation site until it is much older (Ryan, 1999)

Although revegetation will be used as a basic building block for the development of ecosystem function and habitat, it alone cannot provide all required habitat values for one to a hundred years. Combining revegetation with the integration of logs, trunks, organic matter, artificial hollows and nesting boxes will significantly advance the ecological function of the site and the value of revegetation as habitat.

Plant species utilised in the revegetation program will offer a variable set of habitat establishment properties. Planting large quantities of forbs, grasses and scrambling plants will provide initial habitat for some ground dwelling fauna. Plantings of shrub species particularly the spiky Blackthorn (*Bursaria spinosa*) in dense thickets and clumps throughout the revegetation site will provide shelter opportunities for small bird species. Planting species which provide food and a source of nesting material will encourage the use of the revegetation site as a resource to fauna residing in adjacent remnants. (See Table 1)

Woody material including logs, trunks, branches and sticks are to be placed throughout the areas to be revegetated. Utilising these materials can possibly advance habitat value by many years. The logs will provide instant habitat and a source of nutrients. They will provide possible roosting sites, provide niches for the retention of moisture and shelter from sun, wind and frost. They will help retain soil and nutrients through periods of heavy rain and trap pockets of organic matter for the succession of soil organisms and invertebrates.

Any sterile dead woody weeds removed as part of the bush regeneration are to be placed as stacks of timber or layered across the contours of the vegetation sites. All trees removed from the property or debris of trees after storms or alternatively, trunks and branches from off-site tree removal can be brought to the site and dispersed a minimum of 5 metres into the revegetated areas. Once large trees, branches or trunks are dispersed into the revegetated areas, suitable plants are to be planted to strengthen the habitat potential of the material. To allow enough lead time for the collection of suitable materials, companies involved in tree removal and site clearing are contacted and stock piles of large trees, branches or trunks will be accumulated.

All plantings are to be mulched with recycled greenwaste. A minimum of one barrow load or a radius of 500mm around plants will provide the usual mulch benefits and support the advancement of many soil organisms and invertebrates by providing a source of food and shelter. The developments of these organisms will in turn provide benefits to the environment and the fauna species which interact with it.

5.10.1.1 Nesting Boxes

The installation of nesting boxes for fauna habitat will be one method utilised as compensation for lack of habitat availability in the revegetation. Nesting boxes in the revegetation will target arboreal marsupials as some members of this group can recolonise revegetation areas if hollows are present or provided. This group of fauna are considerably less mobile than other species (Birds, Bats, and Macropods) placing a greater reliance on localised habitat availability. The boxes will artificially increase the amount of locally available hollows for these arboreal marsupials, increasing the value of revegetation as a habitat resource. (Cunningham *et al*, 2007).

Nest Box Location

The location of the nesting box can be critical. A north-east to south-east aspect appears to be preferred by most species. Various orientations and exposure may need to be trialled. The entrance is to face away from prevailing winds and rain. Boxes are to be at a height to meet the species needs, and out of reach of human hands, to avoid vandalism, and potential predators, such as cats (Platt, 1999).

10 nesting boxes are to be placed in revegetation areas adjoining remnant riparian forest. The boxes will be located a minimum of 6m into vegetation in amongst areas of placed logs, trunks and branches with dense vegetation planted around. The boxes will be fixed to a 3600 mm x 200 mm treated pine pole. The poles will be placed 1000 mm into the ground and the earth will be rammed around the base firmly. The boxes will then be attached from 200 mm to 2600 mm above ground level.

Table 2: Inside dimensions of nest boxes for some species that will use the general nest box design*

	A (height)	B (depth)	C (width)	D (entrance)
Brushtail Possum (also suits ducks)	500	250	290	100-120
Ringtail Possum	400	240	200	70-80
Feather-Tailed Glider	400	240	200	32-35/ 35-40
Rosellas	400	240	200	70
*Note: All measurements are in mm and all depths are minimum				

5.10.2. Targeted weed control

This component of the restoration program refers to the control of listed noxious weeds such as Alligator Weed, Green Cestrum, African Box Thorn, Small-leaved Privet, Large-leaved Privet, Blackberry Complex

and Bridal Creeper. This program requires specialised equipment and chemicals and will be managed by appropriately trained and experienced staff. Appendix A provides a summary of the most appropriate weed treatments. Control of these plants usually requires several treatments and is most effective during summer.

5.10.3. Noxious weeds

The *Noxious Weeds Act 1993* provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land.

The study area contains six species declared as noxious weeds in Camden LGA as shown in Table 3, below.

Table 3: Noxious weeds recorded in the Camden LGA area

Common name	Scientific name	Control category*
Green Cestrum	<i>Cestrum parqui</i>	3
Alligator Weed	<i>Alternanthera philoxeroides</i>	3
African Box Thorn	<i>Lycium ferocissimum</i>	4
Small-leaved Privet	<i>Ligustrum sinense</i>	4
Large-leaved Privet	<i>Ligustrum lucidum</i>	4
Blackberry complex	<i>Rubus fruticosus</i> sp. agg.	4
Bridal Creeper	<i>Asparagus asparagoides</i>	5

*Summary of responsibilities for treatment:

- For Category 3 'the plant must be fully and continuously suppressed and destroyed'.
- For Category 4 'the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority'; and
- For Category 5 'the requirements in the *Noxious Weeds Act 1993* for a notifiable weed must be complied with'.

5.11. Bush regeneration program

Restoration zones 1a and 2a (Figure 4) will be subjected to a comprehensive bush regeneration program. All bush regeneration will start after completion of the extensive weeding program in line with the extraction and concurrent rehabilitation program set out in Figures 3 and 4. All rehabilitation targets are set annually and reported within the AEMR. The site has scattered specimens of woody weeds which will be strategically controlled at the discretion of the bush regenerator. Weeds to be targeted include large woody weeds such as Southern Nettle Tree (*Celtis australis*), Large-leaved Privet (*Ligustrum lucidum*) and Small-leaved Privet (*Ligustrum sinensis*), Honey Locust (*Gladitsia triacanthus*) and a variety of other environmental and noxious weeds.

The bush regeneration program will first work to recover resilient areas which are supporting a diversity of native plant species which demonstrate structural complexities characteristic of riparian forest. Work will then graduate from these areas to assist limits of riparian forest which are in a state of decline. Working in this manner will allow the program to utilise the local ecosystem functions as a fundamental tool to stimulate natural resilience, eventually providing the necessary recovery mechanisms required for the colonisation of adjacent revegetation areas with remnant flora and fauna.

The bush regeneration program will run the entire length of the overall restoration program. 4 The primary bush regeneration sessions will occur in the 24 months covering all areas. This will allow for an average 7 visits in each site over the first 24 months. Following the 24 month establishment period there will be 14

visits scheduled per year for all areas. It is anticipated that beyond the 2 year restoration program the number of visits will eventually reduce to 6 maintenance visits per year for the whole site.

A 2 year maintenance program will run concurrently with the bush regeneration program. Tables 4 to 6 below indicates the specific restoration actions to be incorporated into zones 1, 2 and 4, with Table 7 outlining specific performance criteria. All work sessions are based on a two person team.

Table 4: Specific Restoration Actions for Zone 1 Nepean River – refer to Figure 3

Item	Description of Rehabilitation Actions - Zone 1(a) – 0.79 ha	No. Required (indicative)
1.	Target Weed control	2 days
2.	Bush regeneration program	
2.1.	Primary bush regeneration works	12 sessions first 2 years
2.2.	Secondary bush regeneration program	12 sessions remaining 2 years
3.	Monitoring and reporting program throughout two year maintenance period	2 reports
Item	Description of Rehabilitation Actions - Zone 1(b) – 0.26 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(a) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	1,600
4.	Installation of plants	
4.1.	Hand Installation	1,600
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	14 visits (all tasks)
8.	Broadcast seeding	1 days

Table 5: Specific Restoration Actions for Zone 2 Dry River Anabranh - refer to Figure 3

Item	Description of Rehabilitation Actions – Zone 2(a) – 0.51 ha	No. required (indicative)
1.	Target Weed control	1 days
2.	Bush regeneration program	
2.1.	Primary bush regeneration works	12 sessions first 2 years
2.2.	Secondary bush regeneration program	12 sessions remaining 2 years
3.	Monitoring and reporting program throughout two year maintenance period	2 reports
Item	Description of Rehabilitation Actions - Zone 2(b) – 0.55 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(b) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	12,400
4.	Installation of plants	
4.1.	Hand Installation	12,400
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	20 visits (all tasks)

Table 6: Specific Restoration Actions for Zone 4 Riparian Linkage
non-agricultural production area - refer to Figure 3

Item	Description of Rehabilitation Actions – Zone 2(a) – ~2.0 ha	No. required (indicative)
1.	Installation of protective fencing surrounding Zone 1(b) and litter removal	As required
2.	Seed collection, cleaning and storage	9 days
3.	Plant propagation	12,400
4.	Installation of plants	
4.1.	Hand Installation	12,400
5.	Brush Matting	1 days
6.	Report at practical completion	1 report
7.	Commence maintenance program	20 visits (all tasks)

Table 7: Performance completion criteria

Performance Criteria and reference	
Final Landform	Appendix F – progressive and final surveyor levels
Class 1 Agricultural land use – approximately 5.9 Ha on Lot 32 (Ground cover for pasture/future agricultural area)	NSW Agricultural Land Suitability Classification System. Figure 3 Zone 3 - Minimum 80% - ground cover for pasture grasses to ensure Zone 3 is re-established as a viable future agriculture area Appendix F
Agricultural riparian lands – Lot 22 and the balance of Lot 32	Figure 3 Appendix F
Plantings	Minimum 85% survival rate for tubestock Appendix B
Weed control	Triggered at 15% weed regrowth – Section 5.10 Appendix A Appendix B

5.12. Monitoring and reporting

In order to accurately evaluate the progress and performance success of the rehabilitation and restoration works to the LMP performance criteria and objectives, an initial report will be prepared at 'Practical Completion' and then progress summary reports be prepared every twelve months throughout the two year maintenance period and rehabilitation phase. These reports will be brief, approximately one page, and include a copy of the field monitoring sheet (or similar) in Appendix B. These reports will be provided to the client and Camden Council.

The monitoring and evaluation program will address the following:

- Plant growth, percentage cover and survival rates;
- Plant losses through herbivory, disease, vandalism, storm damage or other factors;
- Weed regrowth and control measures;
- Plant replacement;
- Achieved extraction, rehabilitation and levels;
- Guard repair and weeding inside guards; and
- Maintenance watering regime.

The above items will be monitored and evaluated through the establishment of one representative quadrant in each of the major vegetation communities at the practical completion stage. It is also essential to keep regular accurate photo-records of the progress of the restoration works by setting up an appropriate number of representative fixed photo-points across all restoration zones. Photos will be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations will be clearly marked on site and mapped by GPS.

Initial implementation ongoing monitoring and review are the responsibility of the EMR. The Landscape Contractor will provide monthly rehabilitation, maintenance and progress observation reports, to ensure compliance with the LMP performance criteria, which include photo evidence pre and post works. The monthly observation reports are provided to the client EMR for internal progress monitoring, review and project management to ensure compliance with the performance objectives and criteria within this LMP. The observation reports also contain recommendations by the Landscape Contractor to the client in regard to issues affecting the ongoing success, or otherwise, of the rehabilitation and restoration works, and the possible need for additional activities that may be required outside the normal maintenance program. It is the responsibility of the General Manager for monitoring, reviewing and ongoing implementation of the LMP in consultation with the EMR and Landscape Contractor on a monthly and annual basis. The Landscape Contractor will also complete an annual report outlining rehabilitation completed, where the next annual schedule will be prepared. Although these recommendations are to be on the annual report, these recommendations will be noted by the contractor as and when applicable.

6. POST EXTRACTION LAND-USE AND AGRICULTURAL CLASSIFICATION

6.1. Existing agricultural classification

Based on the NSW Agriculture (2002) Land Classification System, the flat open paddock area of the subject site Lot 32 is currently classified as 'Class 1' agricultural land. This land within Lot 32, is suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent. There is currently 6.8 hectares of agricultural land.

6.2. Post extraction land-use and agricultural classification

Post-extraction, there will be approximately 5.9 hectares of Class 1 agricultural land on Lot 32 (as per NSW Agricultural Land Suitability Classification system). The reduction in total production area was due to a portion of the site being replanted as either riparian vegetation associated with the Nepean River or the Dry River Anabranche. This loss of land will only marginally reduce the total agricultural productivity of the site but will have significant environmental benefits.

It is noted that DGRs for the proposed modification were issued on 23 December 2010 and as part of the consultation process for the Environmental Assessment, the NSW Department of Trade & Investment, Regional Infrastructure & Services (DT&IRIS, 2011) made the following comments in relation to the post extraction agricultural landform:

'Agriculture issues

'The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops 1 market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil.'

The Landscape Management Plan is adequate for the restoration for agricultural uses. Environmental Risk Assessment - There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level.'

As a response to the above correspondence, Harvest Scientific Services Pty Ltd was engaged by MCS Pty Ltd to prepare an Agricultural Assessment for a portion of the M Collins and Sons (Contractors) Pty Ltd site that has been subject to similar land-forming and rehabilitation controls to those proposed as part of the current sand and soil extension proposal.

The agricultural assessment by Harvest Scientific Services Pty Ltd (2011) concluded that the re-instated rehabilitated landform was classified as 'Class 1' agricultural land.

A copy of this assessment is appended as Appendix D.

6.3. Conclusion

Based on an assessment of the protocols for the re-instatement of areas for agricultural land on Lot 32 and an assessment of a comparable site whereby comparable protocols have been implemented, the controls will result in the re-establishment of 'Class 1' Agricultural land on 5.9ha of land within Lot 32. The balance of Lot 32 and Lot 22 will be retained as agricultural riparian lands as per Figure 3.

7. LIMITATIONS TO THIS REPORT

This report has been prepared subject to a number of limitations. These include:

- The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, the occurrence of earthquakes of any magnitude, extreme rainfall events or the effects of climate change have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose;
- The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points;
- In preparing this report, Harvest Scientific Services Pty Ltd has relied upon certain verbal information and documentation provided by the client and/or third parties. Harvest Scientific Services Pty Ltd did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Harvest Scientific Services Pty Ltd assume no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Harvest Scientific Services; and
- This report is not to be relied upon for any purpose other than that defined in this report

8. CONCLUSION

Providing the rehabilitation protocols outlined in this report are implemented, it concluded that:

- This LMP provides MCS, contractors, Council and relevant Government Authorities with a common document that clearly sets out the performance targets, restoration principles, monitoring and maintenance procedures required for the long term sustainable management of the ecological plantings and their surrounding environment; and
- Open paddock areas on Lot 32 will have the capacity for use as 'Class 1' Agricultural land up to 5.9ha.

Importantly, implementation of this LMP will produce a sustainable post-extraction landscape, including enhanced biodiversity outcomes beyond those directly occasioned by extraction activities. Such landscapes will ultimately be little different to distant observers in a visual sense to that prevailing.

The LMP also provides guidance on the plant species, planting techniques, revegetation methods and maintenance requirements for the site. Implementation of the LMP will:

- Revegetate large areas of native vegetation associated with the riparian zones of both the Nepean River (Zone 1 – Figure 3), Dry River Anabanch (Zone 2 – Figure 3) and Riparian Linkage (Zone 4 – Figure 3);
- Allow for continued use of zone 3 (Figure 3) for an agricultural land-use;
- Improve the condition of areas of existing native vegetation, through bush regeneration;
- Improve vegetation cover and connectivity throughout the site and surrounds;
- Remove heavy weed infestations throughout Dry River Anabanch (Zone 2 – Figure 3) and the eastern 'bank' of the Nepean River (Zone 1 – Figure 3); and
- Improve water quality leaving the development site and entering Nepean Catchment.

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APPENDIX A

Summary of Weed Control Techniques

HARVEST SCIENTIFIC SERVICES PTY LTD

Common Name	Botanical Name	Status	Removal Techniques
African love grass	<i>Eragrostis curvula</i>	Environmental Weed	Slash or mow before it sets seed along roads and in highly disturbed areas. Spot spray with diluted 1:100 Roundup. Hand remove isolated plants.
Dodder	<i>Cuscata sp.</i>	Environmental Weed	Hand remove.
Blackberry	<i>Rubus fruticosus agg. Spp.</i>	Noxious Weed W2	Cut and paint crown/lignotuber with undiluted Roundup or Garlon and diesel immediately for isolated plants. Slash large populations and spray re-growth with selective herbicide Garlon, Grazon or Brushoff at flowering/fruiting stage.
Bridal Creeper	<i>Myrsiphyllum asparagoides</i>	Environmental Weed	Hand remove (i.e. by crowning with a knife) isolated plants after removing and bagging fruit. Spray large populations with Brushoff at flowering stage.
Cobblers peg	<i>Bidens pilosa</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed. Hand remove isolated plants.
Crofton weed	<i>Ageratina adenophora</i>	Environmental Weed	Hand remove or spray with 1:100 Roundup.
Fireweed	<i>Senecio madagascariensis</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed. Hand remove isolated plants.
Fleabane	<i>Conyza spp.</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed. Hand remove isolated plants.
Green cestrum	<i>Cestrum parqui</i>	Noxious Weed W2	Stem scrape and paint with Garlon and diesel (i.e. both sides of stem) immediately at flowering stage. Remove and bag fruit.
Inkweed	<i>Phytolacca octandra</i>	Environmental Weed	Hand remove or cut and paint base with undiluted Roundup after removing and bagging fruit.
Kikuyu	<i>Pennisetum clandestinum</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup.
Lantana	<i>Lantana camara</i>	Noxious Weed W2	Cut and paint base of trunks with undiluted Roundup immediately. Slash Lantana stems into 2x2 metre piles. Treatment of re-growth may be necessary as layering stems may re-shoot. Hand remove seedlings.
Large leaf privet	<i>Ligustrum lucidum</i>	Environmental Weed	Cut and paint base of trunk or drill/chisel trunk (>10cm diameter) and inject with undiluted Roundup immediately before fruiting stage. Hand remove or spot spray seedlings with 1:100 Roundup.
Madiera winter cherry	<i>Solanum pseudocapsicum</i>	Environmental Weed	Stem scrape and paint with Garlon and diesel (i.e. both sides of stem) immediately at flowering stage. Remove and bag fruit.
Moth plant	<i>Arauja sericifolia</i>	Environmental Weed	Hand remove or cut and paint base of stems with undiluted Roundup after removing and bagging fruit.
Paddy's lucerne	<i>Sida rhombifolia</i>	Environmental Weed	Hand remove or cut and paint base with undiluted Roundup. Slash large populations and spray re-growth with 1:100 Roundup.
Pampas grass	<i>Cortaderia spp.</i>	Noxious Weed W2	Spot spray with diluted 1:70 Roundup after removing and bagging fruit/flowering stems.
Paspalum	<i>Paspalum dilatatum</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup.
Prickly pear	<i>Opuntia spp.</i>	Noxious Weed W4f	Mattock/hand remove all parts of plant.

HARVEST SCIENTIFIC SERVICES PTY LTD

Common Name	Botanical Name	Status	Removal Techniques
Boneseed	<i>Chrysanthemoides monilifera</i>	Environmental Weed	Spray actively growing plants, spray to wet all foliage. Spray Roundup at a ratio of 1:100.
Scotch thistle	<i>Onopordum acanthium</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed. Hand remove isolated plants.
Broom	<i>Spp.</i>	Environmental Weed	Spray with Garlon 600 Herbicide.
Silky oak	<i>Grevillea robusta</i>	Environmental Weed	Cut and paint base of trunk or drill/chisel trunk (>10cm diameter) and inject with undiluted Roundup immediately. Hand remove seedlings.
Small leaf privet	<i>Ligustrum sinense</i>	Environmental Weed	Cut and paint base of trunk or drill/chisel trunk (>10cm diameter) and inject with undiluted Roundup immediately before fruiting stage. Hand remove or spot spray seedlings with 1:100 Roundup. Treatment of re-growth may be necessary as the plant has the ability to sucker from roots.
Sowthistle	<i>Sonchus oleraceus</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed. Hand remove isolated plants.
Verbena	<i>Verbena spp.</i>	Environmental Weed	Spot spray with diluted 1:100 Roundup. Best done before it sets seed.
Wandering jew	<i>Tradescantia fluminensis</i>	Environmental Weed	Spot spray with 1:50 Roundup or Starane. It is photo-inhibited so should be treated on overcast days after rain. Rake and hand remove all stem fragments in small populations amongst native species.
Mother of millions	<i>Kalanchoe tubiflora</i>	Environmental Weed	Remove by hand, bag all plant material and dispose of in appropriate manner.

Note: Not all weeds listed in the above table are currently found on-site. Weeds in the above table are found in the locality and the information regarding their treatment will assist those involved in future management of the site should infestation occur.

APPENDIX B

Example Field Monitoring Sheet

Landscape Management Plan Monitoring Field Sheet

Project: _____

Date: _____

Quadrat: _____

Recorder: _____

Measure	Observation				Comments/Actions Required	Responsibility	Completion Date
Plant Growth (cm):							
Trees	0-5	5-20	20-50	50+			
Understorey	0-5	5-10	10-30	30+			
Ground cover	0-5	5-10	10-20	20+			
Percentage Cover (%):							
Trees	0-10	10-50	50-85	85+			
Understorey	0-10	10-50	50-85	85+			
Ground cover	0-10	10-50	50-85	85+			
Survival Rates (%):							
Trees (Minimum 85%)	0-10	10-50	50-85	85+			
Understorey (Minimum 85%)	0-10	10-50	50-85	85+			
Ground cover (below 85%)	0-10	10-50	50-85	85+			
Plant replacement required/Ha							
Trees	0-5	5-20	20-50	50+			
Understorey	0-5	5-20	20-50	50+			
Ground cover	0-5	5-50	50-100	100+			
Weed regrowth (% cover below 15%)	0-10	10-50	50-85	85+			
Condition of Tree Guards	Poor	Ok	Good				
Watering required	Yes	Some	No				
Stream bank erosion	Stable	Slight	Mod.	Severe			
Photographs:							

Number

Location

Direction

Comments: _____

Site Plan

APPENDIX C

DPIW - Controlled Activity Approval



Department of
Primary Industries
Office of Water

Contact: Mohammed Ismail
Phone: 02 8838 7535
Fax: 02 9895 7501
Email: mohammed.ismail@water.nsw.gov.au

Matt Collins
PO Box 55
MILPERRA NSW 2214

Our ref: 10 ERM2013/0830
File No: 9056802
Your Ref: 2604, DA75/256 Mod3

Attention:

13 November 2013

Dear

Re: Controlled activity approval number: – 10 ERM2013/0830
Described as: Sand and Soil Extraction
Being carried out at: Spring Farm and Nesbitt Site at Macarthur Road, ELDERSLIE
Date of Issue 8 October 2013 : Date of Expiry 8 October 2018.

The Office of Water is currently processing your request to return of a security it holds for the above approval as exchange bond amount has been received.

Please be advised the original Bank Guarantee for \$43,850.00 will be sent directly to you from our Finance unit.

If you do not receive this cheque or transfer within the next 28 working days, please contact me by phone **02 8838 7535**, or email mohammed.ismail@water.nsw.gov.au, so the matter can be followed up on your behalf.

Yours sincerely

Mohammed Ismail
Water Regulation Officer
NSW Office of Water
Water Regulatory Operations Sydney

Date: 15 October, 2013

Subject: NSW Office of Water - Controlled Activity Approval 10ERM 2013/830

Land:

Nesbitt Property	Lot 22 DP833317
Spring Farm Property	Lo1 1 DP587631
Penman Property	Lot 32 DP635271

Security:

*Nesbitt Property	Lot 22	5 June 2002	\$ 43,850
Spring Farm Property	Lot 1	5 June 2002	\$45,200
Penman Property	Lot 32	21 June 2013	\$43,850

* It is agreed this security is to be returned by NOW as it is replaced by Penman's security

Summary: The Company's extractive industry operations are now covered by one controlled activity approved 10ERM 2013/830.

Formerly it was regulated by the following permits:

Spring Farm Approval	04/4720
Nesbitt Approval	04/4722

As a result the new permit has consolidated the previously approved drawings, limits of extraction, regeneration and also incorporated the new requirements for the Penman Property.

The Register of Documents and plans that apply to the new approval 10ERM 2013/830 are:

1. Notice of Determination NOW 8 October, 2013 Pages 1 & 2
2. NOW Statement of Approval 8 October, 2013 Pages 1 to 7
3. Schedule 1 - Site Water and Sediment Run Off Management Page 1
4. Attachment 2 - Site Rehabilitation Pages 2, 3 & 4
5. Vegetation Management Plan (Gordon Limburg) Feb 1996 Pages 1 to 53
6. Harvest Scientific Services - Landscape Management Plan 24 April, 2013
7. SMEC Urban Approval Plans:

Plan No	Sheet	Date
77310.01.P08	1	Feb 2012
77310.01.P09	2	Feb 2012
77310.01.P16	3	Feb 2012
77310.01.P11	4	Feb 2012
77310.01.P13	6	Feb 2012
77310.01.P12	5	Feb 2012
77310.01.P04	1	13/10/2011
77310.01.P05	2	13/10/2011
77310.01.P06	3	13/10/2011

8. Johnstone Environmental Technology Approval Plans:

Plan No	Drawing	Issue	Date
JET 0989	2	4	30/04/01
JET 0989	3	4	11/04/01
JET 0989	4	4	11/04/01
JET 0989	7	2	15/10/01
JET 0989	8	1	11/04/01
JET 0989	9	0	30/04/01
JET 0989	10	0	30/04/01
JET 0328	11	3	29/02/96
JET 0328	12	2	29/02/96
JET 0328	13	2	29/02/96
JET 0328	14	2	29/02/96
JET 0328	15	2	29/02/96
JET 0328	16	2	29/02/96

9. Final Landform and Rehabilitation Management Plan Figure 3 No. 201279
4 September, 2012

10. Haulage Routes to Spring Farm Quarry

EXPIRY DATE: 8 October, 2018 and an application to extend the approval must be made at least one month prior to the expiry date.

File Electronic: R/managing director/judy/M Collins & Sons Holdings Pty Ltd ABN 28 000
521 871/Consent File/NOW CAA 10ERM 2013 830

HARD COPY: NOW Controlled Activity Approval 10ERM 2013/830

Approved Plans: Storage Room/NOW/Controlled Activity Approval 10 ERM 2013/830



Department of
Primary Industries
Office of Water

Contact: Mohammed Ismail
Phone: 02 8838 7535
Fax: 02 9895 7501
Email: mohammed.ismail@water.nsw.gov.au

Matt Collins
PO Box 55
MILPERRA NSW 2214

Our ref: 10 ERM2013/830
Previous Ref: ERM10/523 (ERM04/4720)
ERM10/210 (ERM04/4722)
File No: 9056802
Related Files: 0410826; 0151208
Development Ref: 75/256 Mod3; L & E 10409\1995
Other Related Approvals: DA252/93; 2604 (dated
27-1-89); Planning 75/256 (13-10-88)

Attention: Matthew J. Collins

8 October 2013

Dear Sir

Re: Controlled activity approval – 10 ERM2013/830
For activity described as: Spring Farm Sand and Soil Extraction,
To be carried out at: 186 MacArthur Road, Elderslie
Date of Issue 8 October 2013; Date of Expiry 8 October 2018.

I refer to your application for a controlled activity approval under the *Water Management Act 2000* which was received at this office. Receipt of your application fee of \$2141 (\$864+\$854+\$423) is also acknowledged.

1. Controlled activity approval

The Office of Water has determined to grant you a controlled activity approval. Please find enclosed the **Notice of Determination** together with your **Statement of Approval**.

Please read carefully the conditions of the approval and seek clarification from the Office of Water for any condition not fully understood.

A **copy** of this approval and any annotated documentation should be **provided to council**, your **certifier** and to all **contractors** engaged in the implementation of this controlled activity or the Vegetation Management Plan (VMP) to ensure they are also aware of the conditions.

The controlled activity approval must be kept **current until** the controlled activity has been **completed**. Applications for **extending the approval** should be made to the Office of Water, in writing, at least **one month** prior to the expiry date on the approval.

2. Security (bond or bank guarantee)

The Office of Water acknowledges receipt of your security as follows:

Number	Provider	Value
1	M Collins and Sons Holdings PL	\$43,850.00
2	M Collins and Sons Holdings PL	\$45,200.00

The security will be held by the Office of Water until such time as the works, rehabilitation and any specified maintenance period related to this controlled activity approval are complete and the reporting requirements and conditions of the approval have been met.

If the controlled activity approval is amended or the scope of the controlled activity is changed, the Office of Water may also alter or vary the amount of the security.

Please also note that a security release fee will apply to the release, replacement or exchange of a security held by the Office of Water.

3. Inspections and fees

As the approval holder, you are required to notify the Office of Water on completion of the controlled activity. A site inspection may be needed to confirm that all of your obligations under the controlled activity approval have been carried out.

Costs associated with a single inspection may be covered by the application fee. However, if extra inspections or significant reassessment is required then additional fees will be incurred.

Fees will also apply to any amendments requested or any extension of this approval. The current fee schedule is available at:

www.water.nsw.gov.au [Water licensing](#) > [Approvals](#) > [Controlled activities](#)

4. Other approvals may be required

Subject to the conditions of the attached Statement of Approval, the approval holder is only authorised to carry out the controlled activity described at the location specified.

The attached Statement of Approval does not relieve the approval holder of any obligation which may exist to also obtain permission / approval / consent from any other agency who may have some form of control over the site or the proposed development.

In the event that there is an inconsistency between the drawings, other documentation and the conditions herein, the interpretation that will result in the best outcome for the stabilisation of the Site and the subsequent rehabilitation and maintenance of the Site and protected land and any river, is to prevail. Such interpretation is to be applied in consultation with, and with the approval of the Office of Water.

You need to implement all practicable measures to prevent or minimise any harm to the environment that may result from the operation you intend to carry out according to this Controlled Activity Approval and rehabilitate the site.

Any questions regarding this correspondence should be directed to Mohammed Ismail, mohammed.ismail@water.nsw.gov.au.

Yours sincerely



Mohammed Ismail
Water Regulation Officer
NSW Office of Water

Enc:
Notice of Determination; Statement of Approval

Notice of Determination

issued under the Water Management Act 2000

Application details

Approval Number 10 ERM2013/0830

First applicant Mr

Last Name Collins

First Name Matt

Address PO Box 55

MILPERRA NSW 2214

Contact 0297741544

Fax:

Email matt@mcollins.com.au

Second applicant (if applicable)

Last Name

First Name

Address

Town:

State:

P/Code:

Contact

Ph:

Fax:

Email

Determination

Application type

Controlled Activity Approval

to be issued under Part 3, Chapter 3 of the *Water Management Act 2000* - for matters assessed as integrated development under Part 4 of the *Environmental Planning & Assessment Act 1979*

Determination

☒ Granted (subject to conditions)

☐ Refused

Date of Determination

8 October 2013

Reasons for Determination

see Attachment 1

Date of Expiry

8 October 2018

Location

Spring Farm and Nesbitt Site at Macarthur Road, ELDERSLIE

Description of activity

Sand and Soil Extraction

Determining Officer

Signature



Name

Mohammed Ismail

by delegation from the Minister administering the
Water Management Act 2000

Right of Appeal: Section 368 of the *Water Management Act 2000* gives a right of appeal in certain circumstances. As this application has been assessed as integrated development it will not be subject to any third party rights of appeal under the *Water Management Act 2000*. This does not affect any right of appeal an objector may be entitled to under section 98 of the *Environmental Planning and Assessment Act, 1979*.

Notice of Determination

issued under the Water Management Act 2000

ATTACHMENT 1

Reason for determination

Approval Number: 10 ERM2013/0830

Reason: This controlled activity approval is granted on the basis that the NSW Office of Water is satisfied the proposed development has adequate arrangements in place to ensure that no more than minimal harm will be done to waterfront land at this site as a consequence of carrying out the proposed controlled activity.

This controlled activity approval is subject to the attached conditions.

Schedule 1 - Approval holder(s)

Holder's name(1): Matt Collins**Postal Address:** PO Box 55

Town/City MILPERRA

State NSW

P/Code 2214

Holder's name(2):**Postal Address:**

Town/City

State

P/Code

Company Name: M Collins & Sons Holdings Pty Ltd**ACN (if applicable):** 000521871**Office Address:** 17 Fitzpatrick Street

Town/City REVERSBY

State NSW

P/Code 2212

Property/land owner's details

Name of Owner/s (1) Matt Collins**Postal Address:** PO Box 55

Town/City MILPERRA

State NSW

P/Code 2214

Name of Owner/s (2) Gregory Penman**Postal Address:** 172 Macarthur Road

Town/City Spring Farm

State NSW

P/Code 2570

IMPORTANT NOTICE – Change of approval holder or landholder or contact person.

Please advise the Office of Water in the event of any of the following as soon as practicable:

- If there is a change in the ownership or occupation of the land benefited by this approval (see Schedule 2). Under the *Water Management Act 2000*, an approval is typically held by the owner or lawful occupier of the benefited land. Consequently, a change in ownership may cause a change in your legal obligations as an approval holder. *
- If there is a change to the contact person or their contact details. You will be required to lodge a written statement signed by all the approval holders. *
- If there is a change in the mailing address for the nominated contact person. This should be done by the contact person in writing.

* An updated Statement of Approval reflecting these changes will be issued free of charge.

Statement of Approval

Water Management Act 2000

Approval details

Approval No: **10 ERM2013/0830**

File No: 9056802

Previous Ref: ERM10/523 (ERM04/4720)
ERM10/210 (ERM04/4722)

Status: CURRENT *

Approval type: Controlled Activity Approval

Water sharing plan: not applicable

Period of Approval

Date of effect: 8 October 2013

Expiry date: 8 October 2018

Approval holder(s): Schedule 1

Description of activity: Schedule 2

Conditions: Schedule 3

Contact for service of documents

Name: Matt Collins

Address: PO Box 55, MILPERRA, NSW, 2214

* NOTE: An approval has effect for such period as is specified in the approval, or if the period is extended under section 105 of the *Water Management Act 2000*, that extended period. If an application for extension of an approval is lodged before the approval expires, the term of the expiring approval is extended until either the date of the final decision on the application, or a date fixed by the Minister for the approval, whichever is the later date. An approval which has expired can be the subject of an application to extend it but it needs to be accompanied by a statutory declaration of the reasons for the delay in making the application. If the Minister accepts these reasons the term of the approval is taken to have been extended, and the application may be dealt with, as if the application had been made before the approval expired.

It is an offence under the *Water Management Act 2000* to breach a term or condition of the approval or to construct or carry out a controlled activity to which the approval does not relate, or if the approval has expired, been surrendered or cancelled.

Schedule 2 – Controlled activity**Authorised Controlled Activity**

Subject to the conditions of this approval, in relation to the controlled activity described, the holders of this approval are authorised to construct and carry out the controlled activity at the location specified:

Controlled activity: Sand and Soil Extraction,

Property Name:

Site address: 186 Macarthur Road, Spring Farm NSW 2570

Lot 1	DP 587631	Parish	County
Lot 22	DP 833317	Parish	County
Lot 32	DP 635271	Parish	County

Local Council: Camden Council

Development

Reference: 75/256 Mod3; L&E 10409/1995; (DA252/93)
(if applicable)

Name of watercourse: Nepean River

Catchment name: Hawkesbury Nepean

Security Details (if applicable)

Number	Provider	Value
1	M Collins and Sons Holdings PL	\$43,850.00
2	M Collins and Sons Holdings PL	\$45,200.00

1

Application fees

Fee: \$ 2,141.00 has been paid exclusive of GST

Receipt No: PAR13-06933; PAR13-693, PAR13-815

Approval issued by

Officer's name: Mohammed Ismail

Schedule 3 Conditions:

In relation to the controlled activity described in Schedule 2, the holders of this approval are authorised to construct and carry out the controlled activity at the location specified subject to the conditions listed:

Number	Condition
Plans, standards and guidelines	
1	This Controlled Activity Approval number 10 ERM2013/0830 only applies to the controlled activity carried out at the location marked on the Aerial Site Photo as approved by the NSW Office of Water and stamped on 8 October 2013. This Controlled Activity Approval does not permit controlled activities at any other site.
2	The approval holder must not transfer this Controlled Activity Approval 10 ERM2013/0830 without the written approval of the NSW Office of Water.
3	The approval holder must keep a copy of the current Controlled Activity Approval 10 ERM2013/0830 on site at all times and make this approval available to officers from the NSW Office of Water on request.
4	If the controlled activities described in this Controlled Activity Approval 10 ERM2013/0830, have not commenced or been completed within the period of this approval, the approval holder must apply to the NSW Office of Water for a new approval or seek an extension prior to the lapsing of the consent.
5	The approval holder must notify the NSW Office of Water in writing within 14 calendar days of any change in (i) site management; (ii) land ownership; (iii) land occupation.
6	The approval holder must comply with the requirements of each of the plans approved by the NSW Office of Water and stamped on 8 October 2013 (or as indicated) as follows: i. Plan No. 77310.01.P08, Original Surface Contours (1983) by SMEC Urban ii. Plan No. 77310.01.P09, Current Surface Contours (2008) by SMEC Urban iii. Plan no. 77310.01.P16, Design Final Surface Contours by SMEC Urban. iv. Plans Nos. 77310.01.P04, 77310.01.P05, 77310.01.P06, 77310.01.P11, 77310.01.P12 & 77310.01.P13, Sand Mining Cross Sections by SMEC Urban. v. Plans No JET0328 drawing Nos 11 (issue 3) and 12 to 16 (inclusive all issue 2) by Johnstone Environmental Technology as indorsed by Department Land & Water (now office of Water) and department of Planning. vi. Plans No JET0989 drawing 2 to 4 inclusive and 7 to 10 inclusive.
7	The approval holder must carry out all vegetation management, erosion and sediment control and rehabilitation activities in accordance with the plans and schedules approved by the NSW Office of Water and stamped on 8 August 2013 as follows: i. Landscape Management Plan dated 24 April 2013 by Harvest Scientific Services Pty Ltd ii. Figure 3 Final Landform and Rehabilitation Management Plan No 201279 dated 4 September 2012 by Harvest Scientific Services iii. Attachment 1 to this CAA, Site drainage and erosion control measures. iv. Attachment 2 to this CAA, Site Rehabilitation v. Vegetation Management Plan (VMP), The Knoll, Spring Farm, Elderslie NSW date February 2002
8	The approval holder must submit for approval, by the NSW Office of Water, any amendments to a plan listed in Condition 6 (six) prior to carrying out any works in relation to the approved controlled activity.
9	The approval holder must clearly mark on the ground, the boundaries of the areas where the controlled activity is to be carried out before commencement of the controlled activity, and maintain the markings until the works are completed.

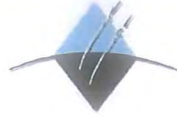
Number	Condition
10	Before commencing any extractive or deposition works on waterfront land the approval holder must engage a suitably qualified person to locate the benchmarks (cross-sections) as shown on Plan No 77310.01.P11, 77310.01.P12 & 77310.01.P13, Sand Mining Cross Sections by SMEC Urban, approved by the NSW Office of Water and clearly mark these cross sections with stakes using a GPS with an agreed coordinate system.
11	The approval holder must comply with the requirements of the approved Vegetation Management Plan VMP dated February 2002 to the extent that it relates to the carrying out of the rehabilitation activities on the site which is the subject of this controlled activity approval.
12 - 15	N/A
16	The approval holder must maintain the approved controlled activity on waterfront land for a period of two (2) years from the date of completion of the controlled activity works.
17	The approval holder must complete a maintenance period of two (2) years after final planting for all areas described in the Vegetation Management Plans (VMP) approved by the NSW Office of Water.
18	The approval holder must reinstate land in the manner and to the extent described in the rehabilitation plan/s stated in condition 7, approved by the NSW Office of Water and stamped on 8 August 2013.
19	N/A.
20	The approval holder must submit survey plans to a professional standard of work as executed, and any other information required by the NSW Office of Water within 14 days of completion of the controlled activities.
21	At practical completion and/or at the end of the maintenance period, the approval holder must provide a final written report to the NSW Office of Water evidencing completion of the approved controlled activity.
22	The approval holder must provide a report on the implementation of the vegetation management plan (VMP) to the NSW Office of Water at the completion of the revegetation works at every twelve (12) months up to the end of the maintenance period that must include: (i) a schedule and map showing the vegetation species, number and location of initial and any replacement plantings and propagation materials, and (ii) the date of planting of vegetation, and (iii) the percentage cover of groundcover, shrubs, trees and weeds, and (iv) any problems that impacted on the survival rates of plants including climatic, fire, flooding and vandalism, and (v) a map of the location of any staged activities, and (vi) photographs showing the revegetation works during the reporting period.
23	The approval holder must provide the NSW Office of Water with a certificate of completion of approved activities and also a certificate of completion of maintenance to best practice provided by persons suitably experienced and/or qualified in such certification at the completion of the maintenance period.
24	The approval holder must provide a progress report to the NSW Office of Water every twelve (12) months.
25	The approval holder must notify the NSW Office of Water in writing within seven (7) days if the controlled activity (i) ceases for a period of more than 30 calendar days; or (ii) is terminated before its full completion, or (iii) is resumed.
Security deposits	
26	The approval holder must provide security of \$ 45,200 and \$43,850 by way of bank guarantee to the NSW Office of Water prior to commencing the controlled activity work. The security deposit will be held until such time as the controlled activity, together with any rehabilitation or revegetation works, have been completed in accordance with the conditions of this approval. The approval holder must certify compliance with the conditions of this Controlled Activity Approval (certificate of compliance) prior to the release of any security being held for the controlled activity.

Number	Condition
27 - 34	N/A
Disposal	
35	The approval holder must relocate any unused or excess materials at least 40 metres from the river and/or outside the designated riparian corridor.
36	The approval holder must not leave materials which could obstruct the flow of water or damage river banks on waterfront land at any time.
37	The approval holder must remove surplus material when operations cease and the controlled activity is completed.
38	The approval holder must not put materials in the drainage line or river or in any area that has existing native vegetation and/or that is identified as part of the riparian corridor.
Drainage and Stormwater	
39	The approval holder must establish all drainage control works in accordance with any Plan submitted and approved by the NSW Office of Water.
40 - 41	N/A
Erosion control	
42	The approval holder must establish erosion and sediment control works in accordance with Plans submitted and approved by the NSW Office of Water prior to the commencement of any other works on the site.
43	The approval holder must not locate permanent basins within 40 meters of the highest bank of the river.
44	The approval holder must use only biodegradable materials for any erosion control matting in the riparian corridor.
45	The approval holder must decommission all erosion and sediment control works using a suitably qualified person.
46	The approval holder must (i) implement erosion and sediment control measures in accordance with the requirements of the Managing Urban Stormwater Manual, Volume 1, Soils and Construction (Landcom, 4th Edition, March 2004) prior to any works commencing at the site; and (ii) maintain the control measures for the duration of the approval to prevent sediment and dirty water entering the waterway.
47 - 48	N/A
Excavation	
49	The approval holder must not excavate beyond a depth of 3 metres above the normal flow water level (taken as R55.63).
50	The approval holder must not excavate beyond: i. The depth shown on Plans No. 77310.01.P04, 77310.01.P05, 77310.01.P06, 77310.01.P11, 77310.01.P12 & 77310.01.P13, Sand Mining Cross Sections by SMEC Urban approved by the NSW Office of Water and stamped on 8 October, 2013. ii. The approval holder must not excavate below the depth shown on plans JET0328 Drawing 12, 13, 14, & 15 (all issue 2) prepared by Johnstone Environmental technology Stamped on 30 April, 1996. iii. The approval holder must not excavate below the depth shown on plans JET0.989 drawings 8 issues 1, drawing 9 issues 0 and drawing 10 issues 0.
51 - 52	N/A
53	The approval holder must not allow machinery to enter or work in the Nepean River at any time.
54	N/A
Maintaining river	
55	The approval holder must not reduce river width, divert or realign the river from its existing alignment otherwise than in accordance with a Plan approved by the NSW Office of Water.

Number	Condition
56	N/A
River bed and bank protection	
57	The approval holder must grade the surfaces of river banks to a grade no flatter than 1 vertical to 50 horizontal, and no steeper than 1 vertical to 3 horizontal and grade them smooth and free from holes and ridges.
58 - 65	N/A
66	The approval holder must maintain and protect vegetation growing along the toe and face of the river bank and 3 metres above normal flow level of the river.
67	N/A
Vegetation management and riparian corridor	
68	The approval holder must delineate, protect and maintain a riparian corridor with a width of 40 metres measured horizontally landward from the top of the river bank, otherwise than in accordance with a Plan approved by the NSW Office of Water.
69 - 70	N/A
71	The approval holder must not remove or damage vegetation on waterfront land otherwise than in accordance with a Plan approved by the NSW Office of Water.
72	The approval holder must not compromise the implementation of the Vegetation Management Plan (VMP) for any work and/or controlled activity at the site.
73	N/A
74	The approval holder must only use virgin excavated natural material (VENM) that does not contain exotic weed plants or seeds as fill within the tailings emplacement area.
75	N/A
END OF CONDITIONS	

APPENDIX D

Agricultural Assessment – Reconstructed Agricultural Landform



Harvest Scientific Services Pty Ltd
Geotechnical Environmental & Resource Consultants
ABN 43 132 363 289

AGRICULTURAL ASSESSMENT

RECONSTRUCTED AGRICULTURAL LANDFORM

Macarthur Road, Spring Farm

Prepared for:

M Collins and Sons (Contractors) Pty Ltd

**Job reference: 201279
14 December 2011**

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All Correspondence to: PO Box 427 Narellan NSW 2567
Unit 4, 20 Somerset Avenue NARELLAN NSW 2567
www.harvestscientific.com.au
Email: narellan@harvestscientific.com.au
Tel: 02 4647 6177 • Fax: 02 4647 7332

Revisions register

Version	Date	Details
1	30/11/2011	Draft report for comment
2	14/12/2011	Report finalised. Minor typographical changes.

Executive summary

Introduction and background

M Collins and Sons (Contractors) Pty Ltd (MCS Pty Ltd) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 MCS Pty Ltd was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

MCS Pty Ltd is currently seeking a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land within Lot 32 DP 635271. The extension of extraction activities are proposed to consist of the following features:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Dry screening of sand and soil within the quarry floor;
- Active extraction within a 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land;
- Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019); and
- Rehabilitation maintenance activities are proposed to occur over an additional 2 year period.

Agricultural production areas are proposed to be rehabilitated subject to the following controls:

- At the completion of extraction within any given extraction cell that is to be utilised for future agricultural production (Zone 3 - Figure 3), the ground is to be prepared by ripping to a depth of 300 to 400 mm, no further than 300 mm apart. First stages of ripping should run down any batters or contours followed by a cross ripping along the contours. The cross rip will reduce the chance of incisions after periods of rain, help retain moisture on sloping surfaces, fracture soil between rip lines, eliminate glazing of the undisturbed soil interface and reduce air pockets and trench effects.
- The entire area is then to be covered to a minimum depth of 500 mm with stock-piled top-soil (stored in the bunded mound around the extraction pit). Pasture grasses are then to be re-established by either natural re-generation from grass seed stored in the topsoil stock-pile or seeding with pasture species.

Director General Requirements for the proposed modification were issued on 23 December 2010. As part of the consultation process for the Environmental Assessment, the NSW Department of Trade & Investment, Regional Infrastructure & Services (**DT&IRI&S, 2011**) made the following comments in relation to the post extraction agricultural landform:

'Agriculture issues

'The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops 1 market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil.

The Landscape Management Plan is adequate for the restoration for agricultural uses. Environmental Risk Assessment - There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural

land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level.'

In response to the above correspondence, Harvest Scientific Services Pty Ltd has been engaged by MSC Pty Ltd to prepare an Agricultural Assessment for a portion of the M Collins and Sons (Contractors) Pty Ltd site that has been subject to similar land-forming and rehabilitation controls to those proposed as part of the current sand and soil extension proposal.

Aims and objectives

This Agricultural Assessment aims to:

- Describe the soil and agricultural conditions of a portion of the subject site that has previously been subject to land-forming activities and subsequent profile re-construction; and
- Classify the agricultural capacity of the re-habilitated landform.

Methodology

This assessment was subject to the following methodology:

- A visual site inspection;
- Excavation of a soil test-pit; and
- Classification of the agricultural capacity of the subject land with reference to the classification system outlined in the Agricultural Classification Atlas (**NSW Agriculture, 1991**).

Results

At the time of the site inspection, the investigation area was intensively cropped with turf farming (**Plate 1**) and had been continuously intensively cropped since the land was re-habilitated. No surficial constraints to agricultural production were evident.

The soil profile (**Plate 2**) consisted of approximately 450mm of brown sandy loam with a weak to massive structure. Some soil compaction was noted in the zone of approximately 100 to 300mm below ground level. Located immediately below the topsoil horizon was a loose friable moderately structured red sandy clay sub-soil.

Whilst some compaction was noted in the zone of approximately 100 to 300mm below ground level, this constraint is minor and consistent with adjacent areas of alluvial 'Class 1' agricultural lands. Soil compaction in the turf farming environments result from a combination of intensive management (and associated vehicle movements), organic matter depletion (due harvesting of the organic rich layer with the product) and sodicity.

Soil compaction on Class 1 Agricultural lands is routinely managed by ripping to the depth of compaction, addition of gypsum and organic matter as required.

Conclusion

Based on the findings of this assessment it was found that the re-constructed soil profile and associated soil landscape was consistent with the 'Class 1' Agricultural land. The proposed method of profile re-construction is therefore considered appropriate to return the subject land to 'Class 1' agricultural land.

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Plate 2 View of the re-constructed soil profile

1. INTRODUCTION

M Collins and Sons (Contractors) Pty Ltd (MCS Pty Ltd) owns and operates the Spring Farm Quarry located at Lot 22 DP833317 at Spring Farm, in the Camden Local Government Area (LGA). Development consent (DA 75/256) for the extraction and processing of sand and soil was originally granted by the Minister for Planning in 1988 and the consent was modified in 1998 to extend the quarry's life. The site is a major source of products for the Sydney region and comprises part of the regionally significant resource identified in the Sydney Regional Environmental Plan No 9 (Extractive Industry).

On the 22 May 2009 Collins was granted a further Section 96(2) Modification for the Continuation of Operations by the Department of Planning for extraction within an 8 hectare portion of the subject site and for the continued processing of extracted materials onsite. That approval was to allow operations to continue for a further 10 year period until 2019.

MCS Pty Ltd is currently seeking a further modification under Section 75W of the Environmental Planning and Assessment Act (1979) (NSW) to extend sand and soil extraction activities onto an adjacent portion of land within Lot 32 DP 635271. The extension of extraction activities are proposed to consist of the following features:

- Extraction of sand and soil within a 6.8 hectare (approximate) portion of land within Lot 32 DP 635271.
- Dry screening of sand and soil within the quarry floor;
- Active extraction within a 1 hectare portion of land at a time and concurrent rehabilitation works within an additional 1 hectare portion of land;
- Extraction and rehabilitation works are proposed to occur in concert over an 8 year period (completion in 2019); and
- Rehabilitation maintenance activities are proposed to occur over an additional 2 year period.

Agricultural production areas are proposed to be rehabilitated subject to the following controls:

- At the completion of extraction within any given extraction cell that is to be utilised for future agricultural production (Zone 3 - Figure 3), the ground is to be prepared by ripping to a depth of 300 to 400 mm, no further than 300 mm apart. First stages of ripping should run down any batters or contours followed by a cross ripping along the contours. The cross rip will reduce the chance of incisions after periods of rain, help retain moisture on sloping surfaces, fracture soil between rip lines, eliminate glazing of the undisturbed soil interface and reduce air pockets and trench effects.
- The entire area is then to be covered to a minimum depth of 500 mm with stock-piled top-soil (stored in the bunded mound around the extraction pit). Pasture grasses are then to be re-established by either natural re-generation from grass seed stored in the topsoil stock-pile or seeding with pasture species.

Director General Requirements for the proposed modification were issued on 23 December 2010. As part of the consultation process for the Environmental Assessment, the NSW Department of Trade & Investment, Regional Infrastructure & Services (**DT&IRI&S, 2011**) made the following comments in relation to the post extraction agricultural landform:

'Agriculture issues

'The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops 1 market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil.

The Landscape Management Plan is adequate for the restoration for agricultural uses. Environmental Risk Assessment - There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level.

In response to the above correspondence, Harvest Scientific Services Pty Ltd has been engaged by MSC Pty Ltd to prepare an Agricultural Assessment for a portion of the M Collins and Sons (Contractors) Pty Ltd site that has been subject to similar land-forming and rehabilitation controls to those proposed as part of the current sand and soil extension proposal.

2. AIMS AND OBJECTIVES

The Agricultural Assessment aims to:

- Describe the soil and agricultural conditions of a portion of the subject site that has previously been subject to land-forming activities and subsequent profile re-construction; and
- Classify the agricultural capacity of the re-habilitated landform.

3. METHODOLOGY

This assessment was subject to the following methodology:

- A visual site inspection;
- Excavated a soil test-pit; and
- Classification of the agricultural capacity of the subject land with reference to the classification system outlined in the Agricultural Classification Atlas (**NSW Agriculture, 1991**).

4. AGRICULTURAL CLASSIFICATION SYSTEM

Knowledge of the relative suitability of land for agriculture is required to enable the development of strategic plans which protect land highly suited to agriculture and allow identification of land more suited to non-agricultural activities. This process requires that land be evaluated based upon generally accepted practices.

The Agricultural Land Classification method, as presented by **NSW Agriculture, (2002)** considers the various factors that influence land use in a different manner (NSW Agriculture, 2002). A brief summary of agricultural classification definitions relied upon by this method are outlined in **Table 1**.

Table 1. Summary of the five agricultural classes as described by NSW Agriculture, (2002)

Class	Definition
1	Arable land suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent.
2	Arable land suitable for regular cultivation for crops but not suited to continuous cultivation. It has moderate to high suitability for agriculture, but edaphic (soil factors) or environmental constraints reduce the overall level of production and may limit the cropping phase to a rotation with sown pastures.
3	Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture. The overall production level is moderate because of edaphic or environmental constraints. Erosion hazard, soil structural breakdown and other factors including climate may limit the capacity for cultivation; and soil conservation or drainage works may be required.
4	Land suitable for grazing but not cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.
5	Land suitable for agriculture or at best suited to only light grazing. Agricultural production is very low to zero as a result of severe constraints, including economic factors, which preclude land improvement.

5. SITE DESCRIPTION

5.1. Site location

The site of the former land-forming area is located immediately to the south of Lot 22 and is delineated as the investigation area (in red) on **Figure 1**.

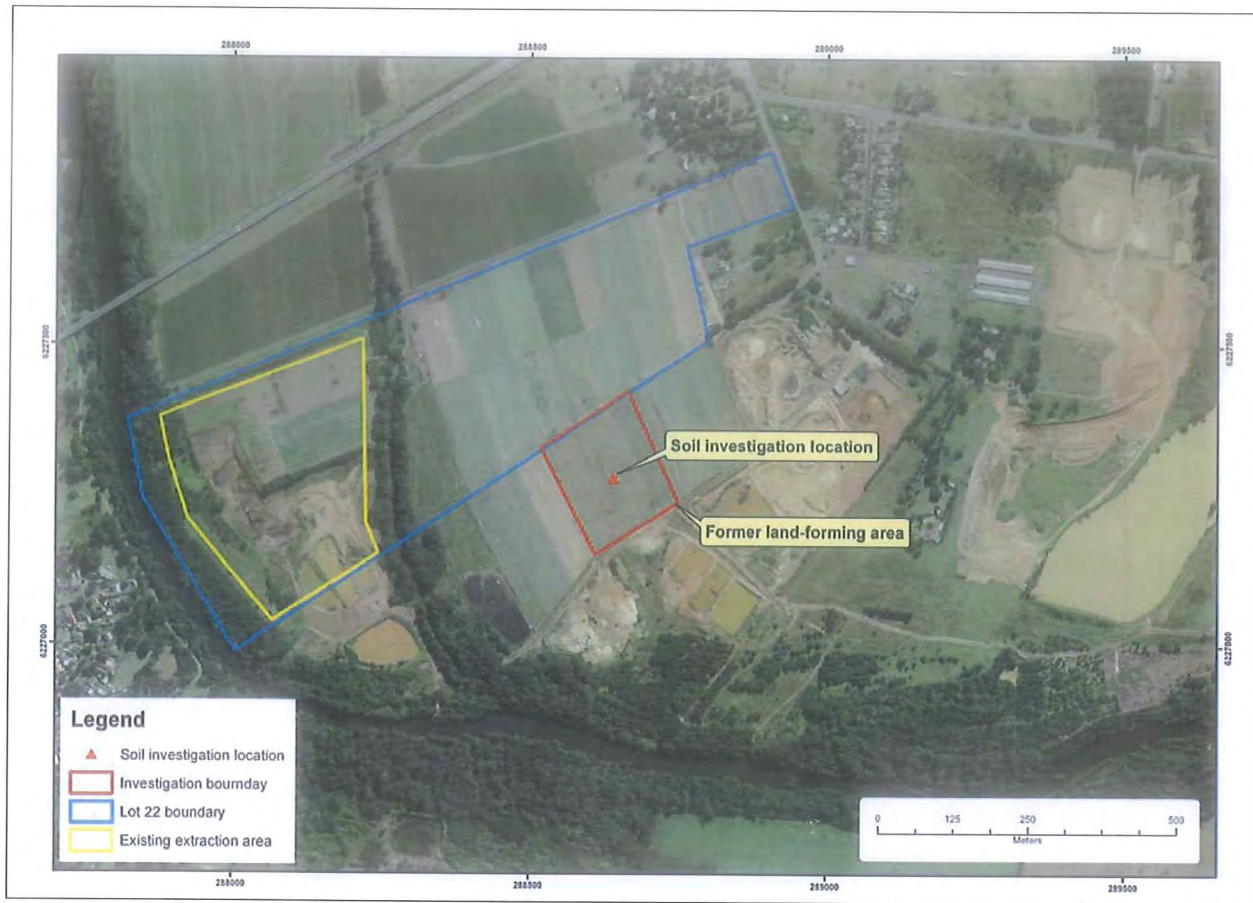


Figure 1. Site location (Lot 22 DP833317). Source: Department of Lands circa 2008.

5.2. Land-forming history

The investigation area of was subject to land-forming and profile re-constructive activities approximately 8 years ago. At that time, the profile was reconstructed by the following protocols:

- Forming of the desired subsoil landform with onsite derived sandy clay and clayey sand sub-soil;
- Preparing the reconstructed sub-soil horizon by ripping to approximately 300mm; and
- Importing of approximately 300-500mm of onsite derived sandy loam top-soil onto the finished re-constructed profile.

5.3. Land-use

The investigation area has been used for turf farming continuously since the profile was re-constructed.

6. RESULTS

6.1. Visual assessment

At the time of the site inspection, the investigation area was intensively cropped with turf farming (**Plate 1**) and had been continuously intensively cropped since the land was re-habilitated.

No surficial constraints to agricultural production were evident.

6.2. Soils

The soil profile (**Plate 2**) consisted of approximately 450mm of brown sandy loam with a weak to massive structure. Some soil compaction was noted in the zone of approximately 100 to 300mm below ground level.

Located immediately below the topsoil horizon was a loose friable moderately structured red sandy clay sub-soil.

Whilst some compaction was noted in the zone of approximately 100 to 300mm below ground level, this constraint is minor and consistent with adjacent areas of alluvial 'Class 1' agricultural lands. Soil compaction in the turf farming environments result from a combination of intensive management (and associated vehicle movements), organic matter depletion (due harvesting of the organic rich layer with the product) and sodicity.

Soil compaction on Class 1 Agricultural lands is routinely managed by ripping to the depth of compaction, addition of gypsum and organic matter as required.

6.3. Agricultural classification

Based on the **NSW Agriculture (2002)** Land Classification System, the re-constructed profile and surrounding landscape is considered to be 'Class 1' agricultural land. This land is suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent.

This finding is supported by the continued use of the subject land for intensive turf-farming operations since the profile was reconstructed.

7. LIMITATIONS OF THIS REPORT

This report has been prepared subject to a number of limitations. These include:

- The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, the occurrence of earthquakes of any magnitude, extreme rainfall events or the effects of climate change have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose;
- The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points;
- In preparing this report, Harvest Scientific Services Pty Ltd has relied upon certain verbal information and documentation provided by the client and/or third parties. Harvest Scientific Services Pty Ltd did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Harvest Scientific Services Pty Ltd assume no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Harvest Scientific Services Pty Ltd; and

- This report is not to be relied upon for any purpose other than that defined in this report.

8. CONCLUSION

Based on the findings of this assessment it was found that the re-constructed soil profile and associated soil landscape was consistent with the 'Class 1' Agricultural land. The proposed method of profile re-construction is therefore considered appropriate to return the subject land to 'Class 1' agricultural land.

Prepared by

A handwritten signature in black ink, appearing to read 'Jim Cupitt', written in a cursive style.

Jim Cupitt BSc Agr (Hons)
Senior Environmental Scientist

REFERENCES

- Charman, P.E.V. & Murphy, B.W. (2000) Soils: their Properties and Management (Second Edition). Oxford University Press, Melbourne.
- Hazelton, P.A. & Tille, P.J. (1990) Soil Landscapes of the Wollongong to Port Hacking 1:100,000 Sheet. Soil Conservation Service of NSW, Sydney.
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- NSW Agriculture, 2002. Agricultural Land Classification, AgFact AC.25. NSW Agriculture.
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PLATES



Plate 1 View of the re-constructed agricultural landform – currently utilised for turf farming



Plate 2 View of the re-constructed soil profile. Note: Scale is 1 metre in length.

APPENDIX E

Consultation and Approval Correspondence with Governing Authorities



Planning & Environment

Planning Services
Resource Assessments & Compliance
Contact: Lauren Evans
Phone: 9274 6311
Email: lauren.evans@planning.nsw.gov.au

Nicole Pearce
Compliance Manager
Collins Group
PO Box 378
Narellan NSW 2567

Dear Ms Pearce

Spring Farm Quarry (DA 75/256) **Approval of Experts**

I refer to your letter dated 21 March 2017, seeking the Secretary's approval of nominated experts to prepare the Landscape Management Plan for Spring Farm Quarry in accordance with condition 17 of Schedule 3 of the development consent.

The Department has reviewed the qualifications and experience of the nominated experts and the Secretary has approved the appointment of Mart Rampe and Cheyne Hudson of Harvest Scientific Services Pty Ltd.

The Department notes that you have also nominated experts to prepare the various other management plans required in accordance with the development consent. Please be advised that the Secretary's approval is not required for these appointments under the conditions of DA 75/256.

If you require any further information, please contact Lauren Evans at the details above.

Yours sincerely

Howard Reed 30.3.17
Director Resource Assessments
As nominee of the Secretary

Nicole Pearce

From: Steven Palmer [steven.palmer@industry.nsw.gov.au]
Sent: Tuesday, March 28, 2017 8:43 AM
To: Nicole Pearce
Cc: Jason Lewis; Craig Bagnall; Lauren Evans
Subject: RE: Collins Spring Farm Quarry (DA 75/256) Landscape Management Plan

Hi Nicole,

I've reviewed our records for this matter and can confirm that DRE were consulted on the Spring Farm Quarry Landscape Management Plan. I can also confirm that DRE assessed the Plan as adequate.

Feel free to give me a call or email if I can be of any further assistance.

Cheers

Steven Palmer | Senior Geologist | Land Use Assessment | Geological Survey of NSW
NSW Department of Industry | Division of Resources & Energy
516 High St | Maitland | NSW 2320 | PO Box 344 | Hunter Region Mail Centre | NSW 2310
T: 02 4931 6591 | E: steven.palmer@industry.nsw.gov.au
W: www.resourcesandenergy.nsw.gov.au



The new
state of
business

\$1.3b 
NSW mining royalties for 2012/13
helped fund infrastructure and services.

Number of NSW households &
small businesses using solar
241K+ 

From: Nicole Pearce [mailto:npearce@mcollins.com.au]
Sent: Tuesday, 28 March 2017 7:14 AM
To: steven.palmer@industry.nsw.gov.au
Cc: 'Jason Lewis'; 'Craig Bagnall'; 'Lauren Evans'
Subject: FW: Collins Spring Farm Quarry (DA 75/256) Landscape Management Plan
Importance: High

Hi Steven,

Due to Cressida being on annual leave, could you please address the below email on her behalf.

Many thanks

Regards,
Nicole Pearce
Compliance Officer



COLLINS GROUP

PO Box 378, NARELLAN NSW 2567
Mobile: 0419 297 107
Email: npearce@mcollins.com.au
Landline: (02) 4658 1666
Fax: (02) 4658 1846
Web: www.mcollins.com.au

From: Nicole Pearce [mailto:npearce@mcollins.com.au]
Sent: Monday, March 27, 2017 5:58 PM
To: 'cressida.gilmore@industry.nsw.gov.au'
Cc: 'Jason Lewis'; 'Craig Bagnall'; 'Lauren Evans'

Subject: Collins Spring Farm Quarry (DA 75/256) Landscape Management Plan

Importance: High

Good afternoon Cressida,

We recently took part in a Department of Planning and Environment Audit campaign.

One item arising from the audit is consent condition 17, Schedule 3 which states that the Spring Farm Quarry Landscape Management Plan must be prepared in consultation with DRE.

Could you please confirm that you were consulted in preparation of the Collins Spring Farm Quarry Landscape Management Plan? I have only been able to track down two evidences of consultation with DRE during the Mod 3 Consent application (please see attached). Grahame from Pascoe Planning and Jim Cupitt from Harvest Scientific Services were the consultants Collins appointed at the time.

Alternatively, I have attached the Landscape Management Plan for your review, comment and approval.

No other changes have been made to the Landscape Management Plan other than the recommendations arising from the DPE Audit as noted within the LMP Index.

Your prompt response in this matter would be greatly appreciated.

Many thanks in advance, await your reply.

Regards,
Nicole Pearce



COLLINS GROUP

PO Box 378, NARELLAN NSW 2567

Mobile: 0419 297 107

Email: npearce@mcollins.com.au

Landline: (02) 4658 1666

Fax: (02) 4658 1846

Web: www.mcollins.com.au

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

Nicole Pearce

From: Nicole Pearce [npearce@mcollins.com.au]
Sent: Tuesday, March 28, 2017 7:14 AM
To: 'steven.palmer@industry.nsw.gov.au'
Cc: 'Jason Lewis'; 'Craig Bagnall'; 'Lauren Evans'
Subject: FW: Collins Spring Farm Quarry (DA 75/256) Landscape Management Plan
Attachments: Mineral Resources response - Planning & Infrastructure - Spring Farm Qua....pdf; DRE consultation table Pascoe Planning.JPG; 201279 LMP Main 281016 Final.pdf

Importance: High

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Compliance Officer



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Nicole Pearce



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Fax: (02) 4658 1846

Web: www.mcollins.com.au

Matt Collins

From: Graham Pascoe [graham@pascoeplanning.com.au]
Sent: Tuesday, 15 May 2012 1:37 PM
To: Irene Gowans
Cc: matt@mcollins.com.au
Subject: Re: MEETING WITH NICOLE MAGURREN ON 21 MAY - 8.30AM

Thanks

Graham Pascoe
Principal
Pascoe Planning Solutions Pty Ltd
Mobile: 0431519128
PO Box 774, Camden NSW 2570
www.pascoeplanning.com.au

On 15/05/2012, at 12:49 PM, Irene Gowans <irene.gowans@camden.nsw.gov.au> wrote:

Hi Graham

The meeting is confirmed and Chris Lalor will also be in attendance. Both Nicole and Chris have a meeting which commences at 9.00am, so it will have to finish on time.

Any problems, please ring.

Regards

Irene Gowans
PA to Director, Development & Health Division

Camden Council | PO Box 183, Camden NSW 2570

P: 02 4654 7830 | **Email:** irene.gowans@camden.nsw.gov.au | www.camden.nsw.gov.au

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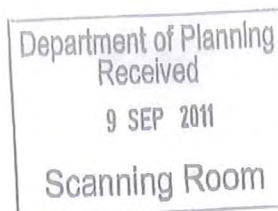


Camden Council
37 John Street, Camden NSW 2570 DX 25807
PO Box 183, Camden 2570 ABN: 31 117 341 764
Telephone: 02 4654 7777 Fax: 02 4654 7829
Email: mail@camden.nsw.gov.au



6 September 2011

Department of Planning & Infrastructure
Att: Mr George Mobayed
GPO Box 39
SYDNEY NSW 2011



Dear George,

RE: Spring Farm Quarry (DA 75/256 MOD 3) Adequacy Review

**PROPERTY: 186 Macarthur Road, SPRING FARM 2570
DP 833317 Lot 22**

I refer to your letter dated 3 August, 2011, regarding the Spring Farm Quarry Adequacy Review. I understand you are requesting Council to review the draft Environmental Assessment (EA) with a view to commenting on the adequacy of the information for public exhibition purposes. Council would like to thank the Department for this opportunity.

A review has been undertaken of the EA and below is our comment on the document:

Salinity

Council believes that the recommendations in the Salinity Management Plan that involve specific and general construction and management advice and the adoption of groundwater management protocols (produced by Harvest Scientific Services) be adopted and applied to the site.

Contamination

Council does not accept the report's recommendation that consent or approval be issued with conditions for further detailed contamination soil assessment for identified Areas of Environmental Concern (AEC's).

Council's Management of Contaminated Lands policy requires a Phase 2 - detailed investigation to be undertaken for all AEC's identified as part of a Phase 1 investigation prior to any approval being issued for the proposal.

Where contamination is identified after the Phase 2, a remediation Action Plan (RAP) would also be required to be provided to Council for approval. Only after acceptance



Trade & Investment, Regional Infrastructure & Services

OUT11/15577
24/08/2011

David Kitto
NSW Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Mr Kitto

Re: Spring Farm Quarry (DA 75/256 MOD 3) Adequacy Review

Thank you for the opportunity to provide advice on the above matter.

The NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) is one of four principal departments of the NSW Government. DTIRIS incorporates a number of divisions and authorities of the former NSW Department of Industry and Investment (I&I NSW), including, among others, Primary Industries, Minerals and Energy, and Forests NSW. This is a response from Resources and Energy – Mineral Resources (DTIRIS – MR) and Primary Industries – Agriculture and Fisheries. There are no issues relevant to the interests of Forests NSW.

Minerals issues

DTIRIS – MR considers the Environmental Assessment adequate for public exhibition. It should be noted that Figure 15 on page 28 appears to be a regional location map ie Figure 2 *Site location (subregional context)* rather than an image showing *Indicative Sequential Extraction and Rehabilitation* which seems to be depicted on Figure 2 which is on page 15. The two figures need to be swapped.

For further information regarding minerals issues please contact Cressida Gilmore – A/ Team Leader Land Use on 4931 6537 or email cressida.gilmore@industry.nsw.gov.au.

Agriculture Issues

The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops / market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil.

The Landscape Management Plan is adequate for the restoration for agricultural uses.

Environmental Risk Assessment - There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level.

For further information regarding agriculture issues please contact Andrew Docking – Resource Management Officer NSW DPI on 4588 2128 or email andrew.docking@industry.nsw.gov.au.

Fisheries issues

Primary Industries – Fisheries has reviewed the documentation and considers the EA adequate for public exhibition.

For queries relating to fisheries issues please contact Carla Ganassin – Conservation Manager, Aquatic Habitat Protection Unit on 9527 8552 or email carla.ganassin@industry.nsw.gov.au.

NSW Department of Trade and Investment, Regional Infrastructure and Services

Example: Level 6, 201 Elizabeth Street, Sydney NSW 2000

Tel: 02 8289 3999 Fax: 02 9286 3208

www.dtiris.nsw.gov.au

C Gilmore

Cressida Gilmore

A/ Team Leader Land Use



Office of Water

Mining and Industry Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

c: Rohan Macdonald
t: 02 4904 2642
f: 02 4904 2503
e: rohan.macdonald@water.nsw.gov.au

Our ref : ER 21533
Your ref: DA 75/256 MOD 3

23 August 2011

Attention: George Mobayed

Dear George

Adequacy Review of the Environmental Assessment Spring Farm Quarry (DA 75/256 MOD 3)

I refer to your letter of 3 August 2011 regarding the adequacy review of the Environmental Assessment (EA) for the modification proposal.

The NSW Office of Water (NOW) has reviewed the EA and recommends that the following requires addressing prior to its public exhibition:

Relevant legislation

The EA is required to take into account the requirements of the following legislation (administered by NOW), as applicable:

- *Water Act 1912*
- *Water Management Act 2000* (WMA 2000)

In particular, proposals and management plans should be consistent with the Objects (s3) and Water Management Principles (s5) of the WMA 2000. Section 5.3 of the EA, which details relevant legislation to be considered for the proposal, should be amended to include the above NSW water legislation..

Water licensing and approvals

On 1 July 2011, the Water Sharing Plans (WSPs) for the *Greater Metropolitan Region Groundwater Sources* (WSPGMRGS) and the *Greater Metropolitan Region Unregulated River Water Sources* (WSPGMRURWS) commenced, giving effect to the licensing provisions of the WMA 2000 in the plan areas. The proposal falls within the Sydney Basin Central Groundwater Source, for the WSPGMRGS, and the Camden Weir Management Zone and Mid Nepean River Catchment Management Zone, for the WSPGMRURWS.

The two licences identified in the EA have converted to Water Access Licences and Water Management Works and/or Water Use Approvals under the WMA 2000 (Table 1), and subsequently, are subject to the rules outlined in the WSPGMRURWS. Similarly, any interception and/or extraction of groundwater as part of the proposed operations will require licensing/approval from NOW. The licensing status of the bore used for groundwater monitoring should be clarified in the EA. In addition, an aquifer interference

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approval may be required under section 91 of the WMA 2000 for activities which intercept groundwater, in accordance with any provisions of the forthcoming aquifer interference policy.

Table 1. Converted surface water licences.

Water Act 1912 licence	Water Management Act 2000 Water Access Licence (WAL)	Water Management Act 2000 Approval
10SL043202	10AL116863	10CA116864
10SL045039	10AL116886	10WA116887

Harvestable Rights (HR) provisions of the WMA 2000 give landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. HR provisions have been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). Any capacity of the total of all the dams on the property greater than the MHRDC may require a licence.

HR provisions contain exemptions for dams for a number of specific purposes, including dams to contain effluent and sediment. With respect to the proposed development, the sediment basins and sedimentation terminal pond may be deemed exempt during the operational phase of the proposal. Clarification and justification of the sizing and the reasons for retention of the terminal pond, including any proposed use of water captured by the pond, is required in order to determine whether it would remain exempt upon completion of extraction and rehabilitation. Calculation of the MHRDC is required to determine whether the proposed dam capacity exceeds HR and consequently whether, a Water Access Licence is required for the excess capacity.

Site water balance

The current site water balance in Section 8.12.3 is too limited to allow analysis of the water management system for the proposal. Greater detail is required, including:

- a breakdown of current use,
- expected requirements for the proposal,
- available sources of water and the licensing status of each (with reference to the provisions of the applicable WSP),
- projected volumes to be extracted from each source, and
- an examination of the reliability of water supply to the proposal, including alternatives to site rainfall runoff harvesting in the event of drought.

The water balance should also demonstrate effective reuse of operational water and runoff to minimise reliance on valuable water resources.

Should you require further information or clarification of the points above, please contact Rohan Macdonald on (02) 4904 2642 at the Newcastle office.

Yours sincerely



Mark Mignanelli
Manager Major Projects, Mines and Assessment



Trade & Investment, Regional Infrastructure & Services

OUT11/11523
Container: 08/7688

30/06/2011

Graham Pascoe
Pascoe Planning Solutions
PO Box 774
Camden NSW 2570

Dear Mr Pascoe

Re: Proposed Sand and Soil Extraction Lot 32 DP 635271 Macarthur Road, Elderslie (Spring Farm)

Thank you for the opportunity to provide advice on the preparation of an Environmental Assessment for the above extraction proposal.

The NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) is one of four principal departments of the NSW Government. DTIRIS incorporates a number of divisions and authorities of the former NSW Department of Industry and Investment (I&I NSW), including, among others, Primary Industries, Minerals and Energy, and Forests NSW. This is a coordinated response from Primary Industries – Agriculture and Fisheries, and Resources and Energy – Mineral Resources. There are no issues relevant to the interests of Forests NSW.

Minerals

Sand and soil are not prescribed minerals under the Mining Act, 1992. Therefore, DTIRIS - MR has no statutory role in authorising or regulating the extraction of this commodity, apart from its role under the Occupation Health & Safety Act 2000 and the Mine Health and Safety Act 2004 and associated regulations, for ensuring the safe operations of mines and quarries.

The key mineral resource issue that needs to be addressed in the EA is to document the size and quality of the resource. The proponent should demonstrate that the size and quality of the resource have been adequately assessed and provide details of the methods used to assess the resource and its suitability for the intended applications.

DTIRIS - MR collects data on the quantity and value of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. The statistical data thus collected is of great value to Government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions. In order to assist in the collection of construction material production data, it is requested that the proponent makes a commitment to provide annual production data to DTIRIS - MR.

For further information regarding mineral issues please contact Cressida Gilmore Senior Geologist Land Use on 02 4931 6537 or email cressida.gilmore@industry.nsw.gov.au.

Agriculture

The EA needs to address the necessity to extract prime agricultural land in a regional planning context and substantiate the ability to rehabilitate any extracted area to the existing quality of agricultural land.

Please refer to the extractive industries and agricultural land classification guidelines.

<http://www.dpi.nsw.gov.au/environment/landuse-planning/agriculture/extractive-industries>
<http://www.dpi.nsw.gov.au/environment/landuse-planning/agriculture/agricultural>

For further information regarding agriculture issues please contact Andrew Docking – Resource Management Officer on 02 4588 2128 or email andrew.docking@industry.nsw.gov.au.

Fisheries

The Nepean River is considered to be important key fish habitat. DPI - Fisheries is responsible for ensuring that fish stocks are conserved and that there is "no net loss" of key fish habitats upon which they depend.

DPI - Fisheries preference is that extraction does not occur within a 50 m buffer area from the edge of the river and that native vegetation is not cleared within this area. This is aligned with the Department's *Policy and Guidelines: Aquatic Habitat Management and Fish Conservation 1999*. It is important that riverbank erosion is not increased from this extraction activity. Potential sedimentation and water quality impacts to the Nepean River during extraction are to be managed. Details of the sequencing and type of revegetation activities following extraction are to be provided with the impact assessment. It is important that this is sequenced to minimise the risk of potential sedimentation during flood events.

For further information regarding fisheries issues please contact Carla Ganassin – Conservation Manager on 02 9527 8552 or email carla.ganassin@industry.nsw.gov.au.

Yours sincerely



Iain Paterson
Team Leader Land Use

From: Ryan Pritchard <Ryan.Pritchard@camden.nsw.gov.au>
Date: Wed, Jun 22, 2011 at 6:13 PM
Subject: RE: Update on Development Matters
To: Graham Pascoe <graham@pascoeplanning.com.au>

Hi Graham,

We've reviewed the DG requirements and recommend that the following matters are addressed in the submission of the Section 96 Modification:

Environmental

Key Issues: Soil & Water - Consideration of how salinity in soils and groundwater and river water may be affected by the extraction of sand and changes to the landscape.

Policies Guidelines & Plans - Soil and Water - SEPP55 - Remediation of Lands.

Lands Policy. Camden Council's Management of Contaminated

DECCW's - Publications for Salinity.

Landscaping

Suitable landscaping for the site to ensure that it is appropriately softened and screened.

Heritage

Consideration of:

the potential heritage items on the site;

the existing heritage items in the surrounding area;

the potential for any aboriginal relics to be present on the site and affected by the works; and

the existing heritage view lines in the area as detailed in Figure B9 and Table B5 of Camden Development Control Plan 2011.

Regards,

Ryan

Spring Farm Mod 3

2 messages

George Mobayed< George.Mobayed@planning.nsw.gov.au>Thu, Mar 22, 2012 at
12:56 PM

To: graham@pascoeplanning.com.au, matt@mcollins.com.au

Cc: Kane Winwood <Kane.Winwood@planning.nsw.gov.au>

Hi Graham,

I have completed a review of the adequacy of the revised EA and I am satisfied that all issues raised by the Department and other agencies have been adequately addressed.

Although, further elaboration and assessment is required on the new addition to the proposal for a tailings emplacement area at the southern boundary of Lot 22. The following issues need to be addressed in a revised EA:

- details of the emplacement area - location, size/capacity, footprint, capping (including permeability of capping) (footprint should also be clearly delineated in a figure);
- final landform at southern boundary of Lot 22; and
- potential soil, groundwater quality and flooding impacts; and
- potential dust and noise impacts.

Please assess any other potential impacts from the deposition of tailings in this area I have not already mentioned.

Please call me to discuss or direct me to the location of the above information.

Regards,

George

George Mobayed | Planning Officer**Mining & Industry** | Major Projects Assessment | NSW Department of Planning & Infrastructure

23-33 Bridge Street SYDNEY 2000 | GPO Box 39 SYDNEY 2001

P: 02 9228 6467 | **F:** 02 9228 6466 | **E:** george.mobayed@planning.nsw.gov.au**Planning &
Infrastructure**

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Harvest Scientific Services Pty Ltd

Geotechnical Environmental & Resource Consultants

ABN 43 132 363 289

19 December 2011

Our ref: 201279

Mr G Pascoe
Pascoe Planning Solutions Pty Ltd
PO Box 774
Camden NSW 2570

Dear Graham,

Re: M Collins and Sons Pty Ltd – Spring Farm Quarry extension – DA 75/256 Mod 3 – EA Adequacy review

Further to your request and correspondence from the NSW Department of Planning and Infrastructure (DPI dated 06 October 2011, the purpose of this correspondence is to provide a summary of DPI matters addressed by Harvest Scientific Services Pty Ltd.

In this regard, please note the following:

- All matters addressed or to be by Harvest Scientific Services Pty Ltd are summarised in the included **Table 1 (Appendix 1)**; and
- Word documents that have been amended have been subjected to 'track changes'. Copies of the track changed word documents will be provided once complete.
- **Appendix 2** is a table of all Harvest reports and the date of the most recent version. All reports cited as complete are in the 'Pascoe' > '201279 M Collins ...' > 'Revised reports....' dropbox folder, not the folder shared with M Collins and Sons.
- Hard copies of all of the reports stated to be 'finalised' are in the Harvest office and are available. If you need them.

Should you have any further questions about this matter please do not hesitate to contact me.

Yours faithfully,

Jim Cupitt BSc Agr (Hons)
Senior Environmental Scientist

All Correspondence to: PO Box 427 Narellan NSW 2567
Unit 4, 20 Somerset Avenue NARELLAN NSW 2567
www.harvestscientific.com.au
Email: narellan@harvestscientific.com.au
Tel: 02 4647 6177 • Fax: 02 4647 7332

ANNEXURE 1

Table 1. Summary of environmental aspects addressed by Harvest Scientific Services Pty Ltd.

Entity	Aspect	Where addressed	Comments	Status
NSW Department of Planning and Infrastructure (DPI).	Correspondence dated 06 October 2011. 'Soil and Water' <i>The EA must include:</i> <i>adequate information on the perched aquifers and potential impacts thereon, including:</i> • lateral extent and depth; • whether they have been previously impacted by sand extraction on the adjoining lots; • impact of their proposed removal on the regional aquifer; and • details of their users; • a detailed description of the main alluvial groundwater aquifer and any potential impacts from the proposed modification;	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	3 sets of paired piezometers were installed to a depth of 9 metres along the northern boundary of the investigation area. The main alluvial groundwater aquifer was found to be below the proposed depth of extraction. No non-anthropogenic perched water tables were found within 9 metres of the soil surface and no impact on the natural groundwater levels is anticipated. A saturated area of soil was identified to be below the north-eastern corner of the investigation area. This area of saturation was attributed to a broken irrigation pipe. This finding is based on the following site features: • Groundwater depth decreased (i.e. fell to further below the soil surface) after a prolonged period of heavy rain when the irrigation system was turned off. The opposite would have been anticipated if this was a natural feature; and • There was a hydraulic gradient of approximately 2 vertical metres within a 10 metre horizontal distance within the same geological strata. This magnitude of hydraulic gradient is not considered to be a natural phenomenon.	Complete.
	'Soil and Water' <i>The EA must include:</i> <i>... a detailed contaminated soil assessment of identified Areas of Environmental Concern (AECs).</i>	Phase 2 Contamination Assessment by Harvest Scientific Services Pty Ltd.	N/A	Complete.
	'Noise' <i>The EA must include:</i> • details of what 'bush regeneration/ecological conservation and general passive rehabilitation activities' (proposed to be undertaken outside of the standard extraction hours) include, and explanation on their audibility at sensitive noise receivers; and • a plan which clearly identifies existing and proposed noise monitoring locations.	1. Revised Landscape Management Plan. 2. Prepared revised plan.	No noise generating bush regeneration activities are proposed to be undertaken outside of standard hours of extraction. Existing locations: N1 to 5. Proposed additional locations: N6 Added plan to Dropbox folder.	Complete
	Air Quality <i>The EA must include a plan which clearly identifies existing and proposed air quality monitoring locations.</i>	Revised plan.	Existing locations: DP 1 TSP 1 Proposed additional locations: DP 2 TSP 2 Added plan to Dropbox folder.	Complete
	Traffic Transport <i>The EA must include:</i> • ...; and	Revised plan.	Bullet point one to be address by MC. Haulage route plan prepared and added to Dropbox folder.	Complete

Entity	Aspect	Where addressed	Comments	Status
	a map delineating the various haulage routes to and from the quarry site.			
	Miscellaneous The EA must include: ... relative level of wet weather high groundwater...	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	There is no groundwater within the investigation area for the proposed depth of impact. Refer to Figure 6 of Groundwater Assessment for summary plan.	Complete.
Camden Council	Correspondence dated 06 September 2011. <i>'Contamination. Council does not accept the reports recommendation that consent or approval be issued with conditions of for further detailed contamination soil assessment for identified Areas of Environmental Concern (AEC's).</i> <i>Council's Management of Contaminated Lands policy required a Phase 2 – detailed investigation to be undertaken for all AEC's identified as part of the Phase 1 investigation prior to any approval being issued for the proposal.</i> <i>Where contamination is identified after the Phase 2, a Remediation Action Plan (RAP) would also be required to be provided to Council for approval. Only after acceptance of a RPA by Council would Council then place suitable conditions on a consent for remediation.</i>	Phase 2 Contamination Assessment by Harvest Scientific Services Pty Ltd.	All soil contaminant levels were within an appropriate range for the proposed end land-use. Asbestos was noted within 21 fibre cement access pits which are to be managed in accordance with the protocols outlined in the Phase 2 Assessment. There is no need for a RAP.	Complete.
DECCW	Air Quality Dust emissions were identified as a medium risk activity from the premises. Modelling based on data from the OEH monitor at Macarthur undertaken by Parson Brinckerhoff predicted generally satisfactory outcomes. The extraction area is approaching areas of high visual exposure (Camden Bypass) and dust suppression will be critical for both this area and the residential area to the west. The predominant winds (north east! east for the 3pm data set) have the potential to carry dust from the project site to residents to the west unless carefully managed. Parson Brinckerhoff has concluded the adoption of the recommended mitigation and management practices and updating the existing Dust Management Plan to include the proposed project extraction area would ensure that all air quality goals are achieved. As part of the dust management plan the Company should consider undertaking dust monitoring at or near sensitive receivers. This dust monitoring would inform and validate the modeling undertaken by its air consultants and demonstrate the effectiveness of the dust control measures.	Revised plan.	Existing locations: DP 1 TSP 1 Proposed additional locations: DP 2 TSP 2 Added plan to dropbox folder.	Complete
Department of Trade & Investment , Regional Infrastructure and Services.	<u>Agriculture issues</u> The Cultural Landscape & Visual Assessment report seems to lack the historical context of the agricultural landscape association between the land proposed for sand and soil extraction and the broader Camden agricultural heritage. The Aboriginal Archaeological Assessment notes that the land was most likely cleared for agriculture in the 1830s and able to be cultivated for crops & market gardens and growing grapes which demonstrate the versatility and robust nature of farming on class 1 agricultural soil. The Landscape Management Plan is adequate for the restoration for agricultural uses. Environmental Risk Assessment -	Agricultural Classification assessment prepared.	Separate document to assess agricultural capacity of rehabilitated landform prepared. Can be included as an appendix to the Landscape Management Plan.	Complete

Entity	Aspect	Where addressed	Comments	Status												
	There is a risk that the rehabilitation does not return the extracted area to class 1 agricultural land. Demonstration of successful rehabilitation and return to agricultural suitability on previously extracted areas may assist in determining the risk level. For further information regarding agriculture issues please contact Andrew Docking - Resource Management Officer NSW DPI on 4588 2128 or email andrew.docking@industry.nsw.gov.au.															
NSW Office of Water	I refer to your letter of 3 August 2011 regarding the adequacy review of the Environmental Assessment (EA) for the modification proposal. The NSW Office of Water (NOW) has reviewed the EA and recommends that the following requires addressing prior to its public exhibition: Relevant legislation The EA is required to take into account the requirements of the following legislation (administered by NOW), as applicable: • <i>Water Act 1912</i> • <i>Water Management Act 2000</i> (WMA 2000) In particular, proposals and management plans should be consistent with the Objects (53) and Water Management Principles (s5) of the WMA 2000. Section 5.3 of the EA, which details relevant legislation to be considered for the proposal, should be amended to include the above NSW water legislation ..	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	Advice from NOW is that site is and will be operating under 1912 conditions until 2000 WMA conditions are drawn up. There is no current timeline for change over to 2000 conditions. Legislation to be added to the WM & ESCP report for site.	Complete.												
	Water licensing and approvals On 1 July 2011, the Water Sharing Plans (WSPs) for <i>the Greater Metropolitan Region Groundwater Sources</i> (WSPGMRGS) and <i>the Greater Metropolitan Region Unregulated River Water Sources</i> (WSPGMRURWS) commenced, giving effect to the licensing provisions of the WMA 2000 in the plan areas. The proposal falls within the Sydney Basin Central Groundwater Source, for the WSPGMRGS, and the Camden Weir Management Zone and Mid Nepean River Catchment Management Zone, for the WSPGMRURWS. The two licences identified in the EA have converted to Water Access Licences and Water Management Works and/or Water Use Approvals under the WMA 2000 (Table 1), and subsequently, are subject to the rules outlined in the WSPGMRURWS. Similarly, any interception and/or extraction of groundwater as part of the proposed operations will require licensing/approval from NOW. The licensing status of the bore used for groundwater monitoring should be clarified in the EA. In addition, an aquifer interference approval may be required under section 91 of the WMA 2000,for activities which intercept groundwater, in accordance with any provisions of the forthcoming aquifer interference policy.	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	As above. Also note that the WSPGMRURWS rules look bazaar and complicated. Groundwater will not be intercepted. Need to clarify current status of monitoring bore.	Complete.												
	<table><tr><td colspan="3">Table 1. Converted surface water licences.</td></tr><tr><td>Water Act licence</td><td>Water Water</td><td>Water Approval</td></tr><tr><td>10SL04320</td><td>10AL</td><td>10CA116864</td></tr><tr><td>10SL04503</td><td>10AL</td><td>10WA110887</td></tr></table>	Table 1. Converted surface water licences.			Water Act licence	Water Water	Water Approval	10SL04320	10AL	10CA116864	10SL04503	10AL	10WA110887	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	Table being updated based on advice from M Collins and Sons. Additional water approvals noted. See water balance notes.	Complete.
Table 1. Converted surface water licences.																
Water Act licence	Water Water	Water Approval														
10SL04320	10AL	10CA116864														
10SL04503	10AL	10WA110887														
	Harvestable Rights (HR) provisions of the WMA 2000 give landholders the right to	Addressed in revised Water Management (inc	Sediment basin limited to 1.3ML as per the MHRDC requirement.	Complete.												

Entity	Aspect	Where addressed	Comments	Status
	capture and use for any purpose 10 % of the average annual runoff from their property. HR provisions have been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). Any capacity of the total of all the dams on the property greater than the MHRDC may require a licence.	groundwater) and Erosion and Sediment Control Plan.	Stormwater modelling report also updated to reflect HR restrictions.	
	HR provisions contain exemptions for dams for a number of specific purposes, including dams to contain effluent and sediment. With respect to the proposed development, the sediment basins and sedimentation terminal pond may be deemed exempt during the operational phase of the proposal. Clarification and justification of the sizing and the reasons for retention of the terminal pond including any proposed use of water captured by the pond is required in order to determine whether it would remain exempt upon completion of extraction and rehabilitation. Calculation of the MHRDC is required to determine whether the proposed dam capacity exceeds HR and consequently whether, a Water Access Licence is required for the excess capacity,	As above.	As above.	Complete.
	Site water balance The current site water balance in Section 8.12.3 is too limited to allow analysis of the water management system for the proposal. Greater detail is required, including: • a breakdown of current use; • expected requirements for the proposal; • available sources of water and the licensing status of each (with reference to the provisions of the applicable WSP); • projected volumes to be extracted from each source, and • an examination of the reliability of water supply to the proposal including alternatives to site rainfall runoff harvesting in the event of drought.	Addressed in revised Water Management (inc groundwater) and Erosion and Sediment Control Plan.	Need clarification from M Collins on: • All available water sources. Need a copy of license restrictions. • All current needs. • All projected future needs. • Reliability of water sources in context of current Camden Weir Management Zone and Mid Nepean River Catchment Management Zone conditions. In particular we need to understand what the Environmental Flow Protection Rules (EFPR) limits mean for water availability to end-users.	Complete.
	The water balance should also demonstrate effective reuse of operational water and runoff to minimise reliance on valuable water resources.	As above.	As above.	Complete.

ANNEXURE 2

Table 2. Summary of revised reports by Harvest Scientific Services Pty Ltd.

Document/s	Date of most recent version	Revisions	Status
Agricultural Assessment	14 December 2011	New document. Report finalised. Minor typographical revisions.	Finalised
Contamination Assessment (Phase 1).	13 December 2011	Minor typographic changes only. Not track changed.	Finalised
Contamination Assessment (Phase 2).	13 December 2011	New document. Pascoe typographical changes included.	Finalised
Environmental and Risk Assessment Summary	14 December 2011	Revisions in progress Environmental monitoring plan added and updated. Added comment that groundwater monitoring is to be at location GW 1 until bore pump is installed and then moved to location GW 3.	Finalised
Environmental Monitoring Location Plan	14 December 2011	Environmental monitoring location plan	Finalised
Haulage route plan	14 December 2011	Haulage routes plan for EIA main document	Finalised
Landscape Management Plan	14 December 2011	Minor revisions to address comments by NSW Department of Planning and Infrastructure dated 06 October 2011.	Finalised
Salinity Assessment	14 December 2011	Report revised to include: • Various typographical changes. • Updated Figure 3.	Finalised
Site constraints plan and sub-regional plans	08 September 2011	Removed figure labels – as per Judy Hennings request.	Finalised
Stormwater Quality Modelling Report	14 December 2011	Report revised to include: • Revised sediment basin calculations limiting size the MHRDC to 1.3 ML. • To include re-use of dam water for agricultural and/or extraction related (i.e. dust suppression etc) activities. • Updated relevant tables and diagrams. • Updated Figure 5. Revisions resulted in no change to report conclusion/s.	Finalised
Water Management (inc groundwater) and Erosion and Sediment Control Plan.	19 December 2011.	See comments in Appendix 1.	Finalised

Table 17: Adequacy Review Response (DOP&I)

MATTER	RESPONSE
Soil and Water - EA to include adequate information on perched aquifers and potential impacts. - A detailed description of main alluvial groundwater aquifer and potential impacts from proposed modification. - A detailed soil contamination assessment of Areas of Environmental Concern (AEC).	The Report produced as Appendix "W" was amplified. Additional localised piezometre installation revealed local groundwater conditions (refer to Section 8.13.4 of EA and Figure 40). Refer to above. A Phase 2 Investigation was undertaken and is contained in Appendix "U" and detailed at Section 8.12 in the EA. It arrived at a relevant management strategy and a conclusion that a Remediation Action Plan was not required. It further concluded that, provided the management strategy was followed, the soil contamination levels are within an appropriate range for the proposed end use.
Noise - Details of noise impacts of "out of hours" bush regeneration/ecological conservation and general passive rehabilitation impacts to be included in the EA. - A plan clearly showing existing and proposed noise monitoring locations is to be provided.	No "out of hours" regeneration/conservation/rehabilitation activities are proposed. Plan provided (refer to Appendix "F" and Figure 28 in EA).
Air Quality A plan clearly show existing and proposed air quality monitoring locations.	Plan provided (refer to Appendix "F" and Figure 28 in EA).

MATTER	RESPONSE
Traffic/Transport • An assessment of potential impacts of proposed increase in heavy vehicle movements during seasonable product demand. • A map delineating the various haulage routes to and from the quarry.	Seasonality influences are limited in nature. Heavy vehicle movements will remain within current approval limits. Diminution in current activities on Lot 22 will be matched with commensurate increase in vehicle movements on Lot 32. Refer to amendments in Appendix "Q" and related cover letter, together with amendments to Section 8.8.3 and Figure 29 of the EA. Map provided (refer to Appendix "F" and Figures 17 and 30 in EA.).
Rehabilitation • Measures to ensure sufficient financial resources to implement the proposed rehabilitation strategy. • Justification for the proposed final landform.	The proponent Company has a history of completing rehabilitation schemes to the highest order and would commit to the same in the Statement of Commitments. Additionally, the Company has indicated a preparedness to extend the current bond with the Water Ministerial Corporation to include Lot 32. Refer to Section 9.2.5. The final landform seeks to integrate with the existing approved final profiles for the adjoining sites and present a self draining landform. The landform includes appropriate setbacks to preserve the integrity of sensitive areas and major physical infrastructure and is supported by flood modelling and geotechnical reporting. It also seeks to optimise the resource without impacting prevailing groundwater (refer to Appendix "Z3" and Sections 3.2.1 and 3.2.6 of the EA).
Miscellaneous • Clarification of whether extraction would be undertaken simultaneously across the three lots within the quarry site. • Proposed average yearly extraction rate for the entire site.	Extraction would occur over the three lots within the quarry sites, at variable rates so as to ensure the required product mix is achieved. The proposed average yearly extraction rate for the entire site is estimated to be 200,000 tonnes or approximately 133,000m³. (Refer to Section 3.2.6 of the EA).

MATTER	RESPONSE
• Comprehensive N-S and E-W cross sections showing: - Proposed final landform - Pre-extraction levels - Approved extraction depths - Current extraction depths - Proposed maximum extraction depths - Relative level of wet weather high groundwater. • Correct images for Figures 2 and 15 in the EA. • Elaboration and assessment of tailings emplacement.	Amended and expanded set of plans contained in the Plan Portfolio at Appendix "F". Rectification of images addressed in amended EA. The proposed modification of the tailings emplacement area is referenced in Section 3.2.1 of the EA and Appendices "F" (Plan), "P", "W" and "Z4". It is concluded that the proposed modification and attendant environmental management practices will produce an acceptable environmental outcome.

Table 18: Adequacy Review Response (Authorities/Agencies)

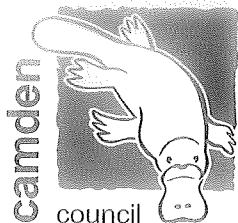
AGENCY	AUTHOR	MATTER	RESPONSE
Roads and Maritime Services (formerly RTA)	Stella Qu	• Cross sections of proposed extraction area	• Additional Plans provided. Refer to Appendix "F"
		• Plans showing Bridge Pier Locations	• Additional Plan. Refer to Appendix "F" and Appendix "Z1"
		• Geotechnical Investigation Report	• Refer to Section 8.7 of EA and Appendix "Z1"
Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water)	Peter Bloem	• General	• Change in name of Agency noted. EA amended to reflect name change.
		• Acoustic Amenity.	• Acoustic Assessment Report amended (refer to Appendix "S").
		Need to demonstrate potential noise impacts on receiving environment minimised at all times and compliant with licence.	• Plant and Equipment modified. • Further modelling undertaken. • Additional monitoring locations (immediate Camden and Spring Farm communities nominated).
		• Air Quality.	• Refer to Section 8.4 of EA.
		Dust monitoring at or near sensitive receivers should be considered as part of Dust Management Plan.	• Additional monitoring locations DP2 and TSP2 added to existing monitoring locations DP1 and TSP1. (Refer to Appendix "F" and Figure 28).
		• Threatened Species. Need to outline why two River Pepperminits need to be removed.	• Aborist Report commissioned (refer to Appendix "Z") which justifies removal. Also noted in amendment to Flora and Fauna Assessment (refer to Appendix "R"). Also addressed in Section 8.1.3 of EA.

AGENCY	AUTHOR	MATTER	RESPONSE
Office of Environment and Heritage (continued)		Removal of screen planting on interface of Lots 22/32 to be subject to ecological assessment. Clarification of removals/plantings for biodiversity and/or screen planting purposes.	- Flora and Fauna Assessment embellished (refer to Appendix "R" and Section 8.1.3 of the EA). The commentary at Section 8.1.3 refers to limited diversity, lack of stratified structure and non-local derivation. - All conservation initiatives attached to the Nepean River banks and anabranch are principally for biodiversity reasons. They also will have a limited screening impact as they mature and supplement retained vegetation. (Refer to Appendix "R").
Department of Trade and Investment, Regional Infrastructure and Services	Cressicia Gilmore	- Minerals. EA considered adequate for public exhibition but for Figures 2 and 5 which are transposed. - Agricultural Issues. Cultural and visual assessment lack historical context of evolutionary agricultural landscape association. Landscape Management Plan is adequate for restoration for agricultural uses. Risks exist that land will not be returned to Class 1 agricultural land. - Fisheries issues. EA considered adequate for public exhibition.	- Arrangement of Figures attended to in amended EA. - Addressed in Section 8.9.2 of EA. Evolution of European agricultural landscape mentioned. - Noted. - Post extractive landuse on adjoining property reviewed and prospects detailed in Appendix "4" of Appendix "P" and Section 8.10.5 of EA. - Noted

AGENCY	AUTHOR	MATTER	RESPONSE
Office of Water (NSW)	Mark Mignanelli	Relevant legislation.	EA amended at Section 8.13.3.
		Need to address Water Management Act, 1912 and Water Management Act, 2000. In particular, should be consistent with Objects (53) and Water Management Principles (SS) of WMA 2000.	- Specialist Reports produced as Appendix "W" amended to address relevant legislation. - Addressed in revised Appendix "W". - NOW advised site will be operating under Water Act, 1912 conditions until new conditions drafted. No timeline is advanced for change to WM Act, 2000 conditions (refer to Appendix "W" and Section 8.13.3 of EA).
		Water Sharing Plans for groundwater sources and unregulated river sources have commenced giving effect to licensing provisions of WMA 2000.	Site will remain operating under "1912" conditions as outlined above. Groundwater will not be intercepted. Addressed in revised Appendix "W" and Section 8.13.4 of EA and Figure 36.
		Two licences identified in EA converted under WMA, 2000.	Refer above.
		Any interception and/or extraction of groundwater will require NSW licensing.	No interception of groundwater will occur. Addressed in Section 8.13.4 of EA and Appendix "W".
Office of Water (NSW) (Continued)		Licensing status of bore used for groundwater monitoring should be clarified in EA.	Bore is licensed (Lic. No. 10BL603832). Refer to Section 8.13.3 of EA and Appendix "W".
		An aquifer interference approval may be required.	Aquifer will not be intercepted. Refer to Section 8.13.4 of EA.
		Capacity of total onsite items may require a licence in terms of Harvestable Rights provisions of WMA, 2000.	Sediment basin limited to 1.3 ML remaining below Maximum Harvestable Right Dam Capacity (refer to Appendix "W" and Appendix "V".)

AGENCY	AUTHOR	MATTER	RESPONSE
Camden Council	Jasmina Djuric	Certain exemptions in respect of Harvestable Rights exist.	Sediment basin remains below the "trigger" threshold. (Refer to Appendix "W".)
		Water site balance at Section 8.12.3 is too limited to allow analysis of the proposed water management system.	Site water balance is addressed in more detail in Appendix "W" at Section 8.13.3 in the EA. In summary, 390.3mL per annum is available and the annual requirement is 271mL.
		Water Balance should also demonstrate effective reuse.	Measures to minimise water usage are outlined in Appendix "W" and at Section 8.13.3 in the EA.
		Salinity Management Plan and Groundwater protocols should be adopted.	Noted
		Phase 2 contamination investigation required and potentially preparation of a Remediation Action Plan (RAP).	- Phase 2 investigation undertaken. All soil contaminant levels were within an appropriate range for the proposed end landuse. (Refer to Section 8.12.3 of EA and Appendix "U".) - Asbestos is to be managed in accordance with the Phase 2 investigation (refer to Appendix "U" and Section 8.12.4 of EA).
		Agrees air quality particulates will need to be monitored.	Noted.
		Post extractive landuse needs to be addressed, including future compatibility with nearby urban development.	Noted. Addressed in EA Sections 6.3 and 8.10.5 and Appendix "P".
		Need for expansion of the extraction operation needs to be justified.	Quarry operation can be completed within

AGENCY	AUTHOR	MATTER	RESPONSE
			approved timeframe of 2019 without adverse environmental impacts. This will provide significant social and economic benefits to Macarthur and beyond by providing access to a valuable resource which may otherwise be sterilised.

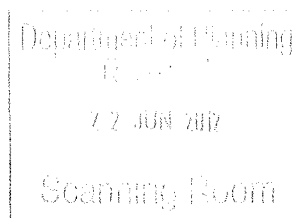


Camden Council
37 John Street, Camden NSW 2570 DX 25807
PO Box 183, Camden 2570 ABN: 31 117 341 764
Telephone: 02 4654 7777 Fax: 02 4654 7829
Email: mail@camden.nsw.gov.au



20 June 2012

Attention: Mr Kane Winwood
Major Development Assessment
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001



Dear Sir,

RE: SPRING FARM QUARRY EXTENSION (DA 75/253 MOD 3)

PROPERTY: Macarthur Road, Spring Farm
LOT: 32 DP: 635271 and LOT: 22 DP 833317

I refer to the Department's letter dated 22 May 2012 regarding the proposed modification of the existing Spring Farm Quarry consent, which seeks approval for the further extraction of approximately 400,000 cubic metres of sand/soil at the above site.

Thank you for inviting Council to comment on this proposal. A review has been undertaken of the Environmental Assessment (EA) and the supporting reports provided and Council is generally supportive of the proposal. Below are our comments in relation to the proposal:

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The recommendations of the acoustic report are considered acceptable and should be adopted in any modified development consent.

The proposed extension of quarrying activity must adopt the following operational constraints in-order to comply with adopted noise criterion:

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- A maximum of one power screen machine operating continuously.

Salinity

Council believes that the recommendations in the Salinity Management Plan that involve specific and general construction and management advice and the adoption of groundwater management protocols (produced by Harvest Scientific Services) be adopted and applied to the site.

English

"This information is important. If you need help understanding this document please call the Translating and Interpreting Service (TIS) on 131 450 and ask them to contact Council on 02 4654-7777 on your behalf."

Arabic

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Croatian

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Greek

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Spanish

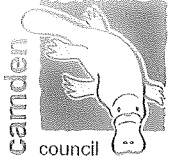
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Contamination

Council does not accept the report's recommendation that consent or approval be issued with conditions for further detailed contamination soil assessment for identified Areas of Environmental Concern (AEC's).

Council's Management of Contaminated Lands policy requires a Phase 2 - detailed investigation to be undertaken for all AEC's identified as part of a Phase 1 investigation prior to any approval / consent being issued for a development proposal.

Where contamination is identified after the Phase 2, a Remediation Action Plan (RAP) would also be required to be provided (to Council) for approval. Only after acceptance of a RAP (by Council) would suitable conditions be placed on a consent for remediation.

Stormwater

The MUSIC modelling results in the report prepared by Harvest Scientific Services Pty Ltd, ref 201279, dated 15 February 2012, should be reviewed and assessed by a person with suitable knowledge and/or expertise at the Department of Planning and Infrastructure, to confirm that the data, methodology adopted and outcomes are acceptable.

Groundwater

Council is satisfied with the outcomes of the groundwater assessment. The recommendations of the report should be adopted in any modified development consent.

Environmental Monitoring

Council agrees with the recommendation of the Annual Environmental Monitoring Report that air quality particulates will need to be monitored to ensure that Total Suspended Particles and PM10 are compliant.

Flora and Fauna

Council has reviewed the revised Flora and Fauna Assessment prepared by Actinous Environmental Consultants, February 2012 and makes the following comments regarding Part 3.4.1.3 "Tracts of contiguous natural vegetation":

In relation to no works occurring within the drip-line of any natural community, it is recommended that a condition of consent require the drip-line area be clearly labelled and marked on corresponding maps of the site – ensuring that works do not occur within this area. The drip-line of the vegetation community should be determined by a person with suitable knowledge and/or expertise.

Landscape

Council has reviewed the Landscape Management Plan (LMP) prepared by Harvest Scientific Services Pty Ltd, February 2012 (HSS) and makes the following comments in relation to Part (a) "Water Management Act 2000 and Controlled Activity Approval":

The current Controlled Activity Approval (CAA) from the NSW Office of Water expires on 8 April 2013 and will not reflect the proposed works. As such, it is recommended that a condition of consent require an amended CAA for the period of works and that the applicant provide Council with an amended CAA prior to works commencing. Further, that all conditions listed in the amended CAA be strictly adhered to.

Council makes the following comments in relation to Part 5.7 "Revegetation program":

In regards to the restoration zones known as Zone 1 the Nepean River and Zone 2 Dry River Anabranch, it is recommended that a condition of consent require the applicant to follow the processes and techniques as specified by HSS in their LMP to ensure that the Office of Environment and Heritage's targets as outlined in *How to Prepare a Vegetation Management Plan, Version 6* are achieved, and that these areas will provide over the longer term a greater diversity of habitats suitable for flora and fauna, thus increasing the overall biodiversity of the area.

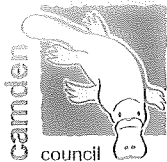
Council makes the following comments in relation to Part 5.10.1 "Improving habitat value":

HSS have specified in their report that all plantings are to be mulched with recycled green waste. It is recommended that a condition of consent require that any recycled green waste that is used for this purpose be free from weed seeds and pathogens. Ideally it should come from a reputable source. If weeds do germinate in the green waste, they need to be appropriately treated as soon as possible to reduce the potential for further spread of weeds resulting in the degradation of habitat areas.

Traffic and Engineering

The contractors provided a Statement of Commitments for Spring Farm Quarry to the Department of Planning in April 2009, in which they committed to record and maintain comprehensive logs of truck movements. The daily truck movements data provided by the contractors for 2010-2011 clearly demonstrates that the recent truck movements to the adjacent public roads from the quarry is 12 per day (when averaged over any working week) or a maximum of 54 on any working day (refer page 79 of the Environmental Assessment). The number of truck movements from the quarry to Macarthur/Springs Road reflected in the graphical presentation for 2010-2011 is tolerable and acceptable.

Heavy vehicle movements in Macarthur Road will have a significant impact on Council's proposed Spring Farm residential development frontage to Macarthur Road. Any increase from current trend of truck use (average 12 per day or maximum of 54 on any working day) in Macarthur/Springs Road is not supported by Council.



The proposal has not assessed or commented on the safety of the current design of the Macarthur Road/Springs Road intersection. The performance of the intersection needs to be re-assessed, considering the anticipated traffic from the Spring Farm residential area adjacent to the quarry, as this area is gradually (and fully) developed in the future.

The NSW Roads and Maritime Service should be consulted further about the above aspects of the proposal.

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It is recommended that conditions of consent which appropriately protect potential Aboriginal archaeology found within the subsurface of the subject site be adopted.

Similarly, conditions of consent which require that upon the conclusion of the excavation operations, the final landform be reinstated to complement the landscape vista of the Nepean River Alluvial Flats.

Strategic Planning Comments

Council considers that the amended EA has now adequately addressed the vital role that the resource plays on the local, regional and metropolitan level; the lifecycle of the site; and that the EA appropriately details the post extractive land use as reinstating the final landform as Class 1 agricultural land.

The proposal is consistent with the strategy for resource recovery and is generally compatible with the staged rollout of the residential development throughout the Spring Farm Urban Release area in a strategic land use context (subject to the comments made above in this correspondence).

Should you have any enquiries in relation to this matter, please do not hesitate to contact the undersigned on (02) 4654 7774.

Yours sincerely,

Ms A M Jones
TOWN PLANNER
(Development Branch)



M. COLLINS & SONS HOLDINGS PTY LTD

ACN: 000 521 871

P.O. Box 55, MILPERRA NSW 2214
17 Fitzpatrick Street, REVESBY NSW 2212

Phone: (02) 9774 1544
Facsimile: (02) 9792 1532
Website: www.mcollins.com.au

31st January, 2013.

Mr. Jeremy Swan,
Acting Director Development and Environment,
Camden Council,
P O Box 183,
CAMDEN NSW 2570

Dear Jeremy,

RE: s75W Modification of Development Consent granted by the Minister of Planning (DOPI) for the Spring Farm Quarry at 186 Macarthur Road, Spring Farm NSW 2570

On 25 October, 2012 the abovementioned consent was issued to carry out extractive industry operations on the adjoining property Lot 32 DP635271 at 172 Macarthur Road, Spring Farm in accordance with the Environmental Assessment titled Modification of Spring Farm Quarry Consent (DA75/2056) prepared by Pascoe Planning Solutions dated April 2012 including the response to submissions titled Review of Exhibition/Consultation Submissions, Part 1 August, 2012 and Part 2 dated September, 2012.

The DOPI has instructed that we consult with Council in relation to the updated management plans that incorporate the additional scope of works that will occur at Lot 32 DP635271.

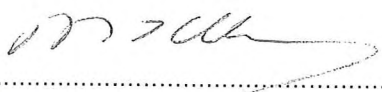
Accordingly we are pleased to attach copies of the following plans for your review.

- Waste Management Plan prepared by Harvest Scientific Services (201279) dated 20 April, 2012
- Landscape & Management Plan including the Rehabilitation Management Plan prepared by Harvest Scientific Services (201279) dated 20 April, 2012..

We will contact you in the near future to arrange a meeting to discuss any further information you may require in relation to the abovementioned plans.

Yours faithfully,

M. COLLINS & SONS HOLDINGS PTY LTD


.....
Matthew J. Collins
Managing Director



Camden Council
37 John Street, Camden NSW 2570 DX 25807
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20 June 2012

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Major Development Assessment
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

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Yours sincerely,

Ms A M Jones
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Jim Cupitt

From: Dominic Bruszewski [dominic.bruszewski@camden.nsw.gov.au]
Sent: Tuesday, 17 November 2009 2:33 PM
To: Jim Cupitt
Subject: RE: Landscape Management Plan - M Collins site - Lot 22 DP 833317

Jim,
The Landscape Management Plan is satisfactory and also complies with Controlled Activity Approval for the site.
I should also mention that DWE the Dept of Water & Energy has recently been name changed to NOW the NSW Office of Water.
regards

Dominic (Nick) Bruszewski
Landscape Development Officer

Camden Council | PO Box 183, Camden NSW 2570
P: 02 4654 7742 M: 0419 628 975 | Email: dominic.bruszewski@camden.nsw.gov.au |
www.camden.nsw.gov.au

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From: Jim Cupitt [mailto:jimcupitt@harvestscientific.com.au]
Sent: Tuesday, 17 November 2009 8:53 AM
To: Dominic Bruszewski
Cc: 'Mart Rampe'
Subject: Landscape Management Plan - M Collins site - Lot 22 DP 833317

Dear Nick,

Further to our conversation today, please find appended hereto:

- 1) A copy of the draft Landscape Management Plan (LMP) for the M Collins Spring Farm site (Lot 22 DP 833317); and
- 2) A copy of the Department of Planning (DoP) 'Notice of Determination' for your reference.

The LMP has been provided to allow Camden Council the opportunity to comment on the recommendations outlined in that document – as per the DoP recommendations.

Should you have any further questions please do not hesitate to contact me.

Regards

Jim Cupitt
Senior Environmental Scientist

Harvest Scientific Services
Tel: 02 4647 6177
Fax: 02 4647 7332
Email: jimcupitt@harvestscientific.com.au



Think of the environment, please don't print this e-mail or any attachments unless you really need to.

17/11/2009



Harvest Scientific Services Pty Ltd
Geotechnical Environmental & Resource Consultants
ABN 43 132 363 289

LANDSCAPE MANAGEMENT PLAN **(Including Quarry Closure, Rehabilitation and Post** **Extraction Land-use)**

PROPOSED EXTENSION OF EXISTING SAND AND **SOIL EXTRACTION OPERATIONS**

Lot 32 DP 635271 Macarthur Road, Spring Farm

Prepared for:

M Collins and Sons Holdings Pty Ltd

Job reference: 201279
24 April 2013

This plan including amendments
and subject to permit conditions

8 OCT 2013

meets the requirements of the
NSW Office of Water

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All Correspondence to: PO Box 427 Narellan NSW 2567
Unit 4, 20 Somerset Avenue NARELLAN NSW 2567
www.harvestscientific.com.au
Email: narellan@harvestscientific.com.au
Tel: 02 4647 6177 Fax: 02 4647 7000

Our reference: LIC07/128-03:DOC09/54622:CK
Contact: Chris Kelly, (02) 4224 4100

Mr J Cupitt
Harvest Scientific Services
Unit 4a 20 Somerset Avenue
NARELLAN NSW 2567

Dear Sir

**M COLLINS & SONS – LICENCE 4093
DRAFT AIR QUALITY MONITORING PROGRAM
LANDSCAPE MANAGEMENT PLAN
WATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL PLAN**

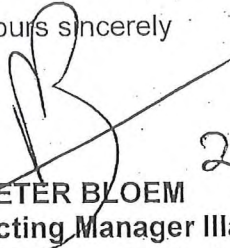
Thank you for forwarding the above Landscape Management Plan; Air Quality Monitoring Program; and Water Management and Erosion and Sediment Control Plan for our records. The Department of Environment, Climate Change and Water (DECCW) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives.

Whilst DECCW does not review these documents, as our role is to set environmental objectives for environmental/conservation management and not to be directly involved in the development of strategies to achieve those objectives, the plans should be peer reviewed by a suitably qualified consultant.

DECCW will, however, review the M Collins and Sons Environment Protection Licence Number 4093 to take into account the revised Department of Planning consent conditions, the proposals by Harvest Scientific, and to ensure conditions appropriate to the site activities are in place. A draft Notice containing the variations will be provided to M Collins and Sons for comment early in the New Year.

Should you have any questions please phone Chris Kelly on 4224 4100.

Yours sincerely


24/12/09
PETER BLOEM
Acting Manager Illawarra
Environment Protection and Regulation

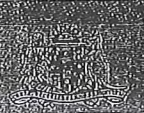
cc. M Collins and Sons
PO Box 55
Milperra NSW 2214

[N:\EPRG\CK\2009\CAMDEN\HARVEST SCIENTIFIC EMP.DOC]

The Department of Environment and Climate Change is now known as the Department of Environment, Climate Change and Water

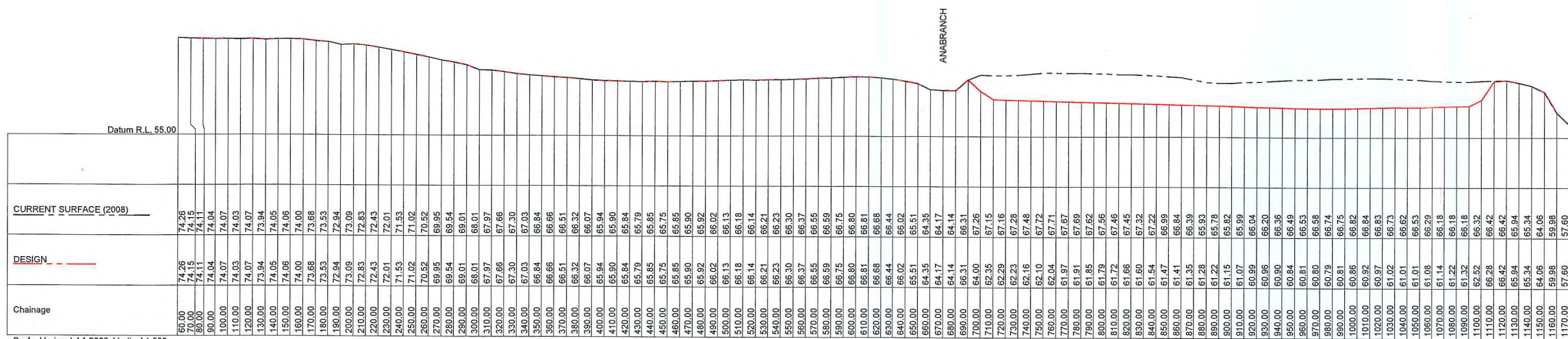
PO Box 513 Wollongong NSW 2520
Level 3, 84 Crown Street Wollongong NSW
Tel: (02) 4224 4100 Fax: (02) 4224 4110
ABN 30 841 387 271
www.environment.nsw.gov.au

Department of **Environment and Climate Change** NSW



APPENDIX F

Final Landform Design



NOTES

1. ORIGINAL SURFACE DATA EXTRACTED FROM ORTHOPHOTO MAPPING(1983), FIELD SURVEY(2005) & LIDAR(2008)
2. CURRENT SURFACE DATA EXTRACTED FROM LIDAR (2008)
3. DESIGN SURFACE DATA EXTRACTED FROM JOHNSTONE ENVIRONMENTAL TECHNOLOGY Pty. Ltd., Plan No. JET0328 Drawings 1-16 Issue 4 Dated 11/04/2001 & SMEC URBAN Plan No. 77310.01.P04-P07 Dated 13/10/2011

REVISION	DATE	DES/DT	APPD
A REVISE SHEET LAYOUT	2/12	MS	

Principal
M.COLLINS & SONS Pty. Ltd
17 Patrick St.
REVEBY, NSW. 2212

Designed
D.Morison
Drawn
D.Morison
Checked
D.Morison
Authorised
P.McNamara
Date
Feb. 2012

Scale @ A1
Hor. 1:2000 Ver. 1:500

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consulting group

Smec Urban
Level 1, 14 Dumaresq Street, Campbelltown, NSW, 2560
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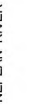
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Brisbane	+61 7 3831 0988	Melbourne	+61 3 9659 0800
Canberra	+61 2 6126 1900	Perth	+61 8 9323 5900
Geelong	+61 3 5228 3100	Traralgon	+61 3 5173 0100

SPRING FARM
MACARTHUR ROAD
Department of Planning and Infrastructure
Sand Mining Cross Sections

Drawing No. 77310.01.P11
Sheet No. 4 of 6

Rev A

Subject to Approval
Not to be used for construction



1. ORIGINAL SURFACE DATA EXTRACTED FROM ORTHOPHOTO MAPPING(1983), FIELD SURVEY(2005) & LIDAR(2008)
2. CURRENT SURFACE DATA EXTRACTED FROM LIDAR (2008)
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Principal
M. COLLINS & SONS Pty. Ltd
17 Patrick St.
REVESBY, NSW. 2212

Scale @ A1
Hor. 1:2000 Ver. 1:500

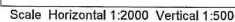


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Brisbane	+61 7 3831 8988	Melbourne	+61 3 9869 0800
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Geelong	+61 3 5228 3100	Traralgon	+61 3 5173 0100



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NOTES

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Plan No. JET0328 Drawings -1 to 6 Issue 4 Dated 11/04/2001 & SMIEC URBAN Plan No. 77310.01.P04-P07 Dated 13/10/2011

A	REVISE SHEET LAYOUT	2/12	MS	
REVISION		DATE	DESIGN	APPROV.

Principal
M. COLLINS & SONS Pty. Ltd.
17 Patrick St.
REVESBY, NSW. 2212

Designed
D.Morison

Drawn
D.Morison

Checked
D.Morison

Authorised
P.McNamara

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Feb. 2012

Scale @ A1
Hor. 1:2000 Ver. 1:500

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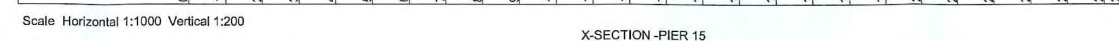
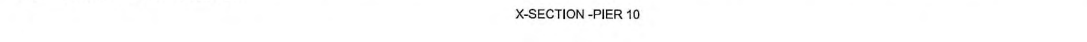
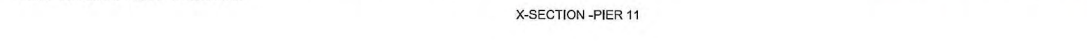
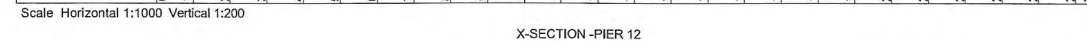
SPRING FARM
MACARTHUR ROAD
Department of Planning and Infrastructure
Sand Mining Cross Sections

Drawing No. 77310.01.P13
Sheet No. 6 of 6

Rev A

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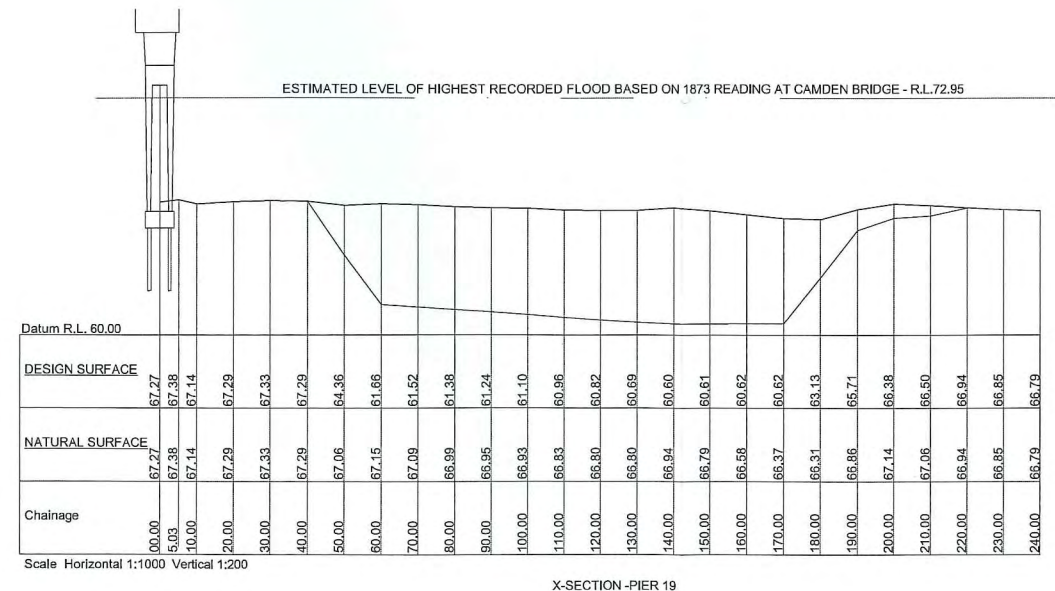
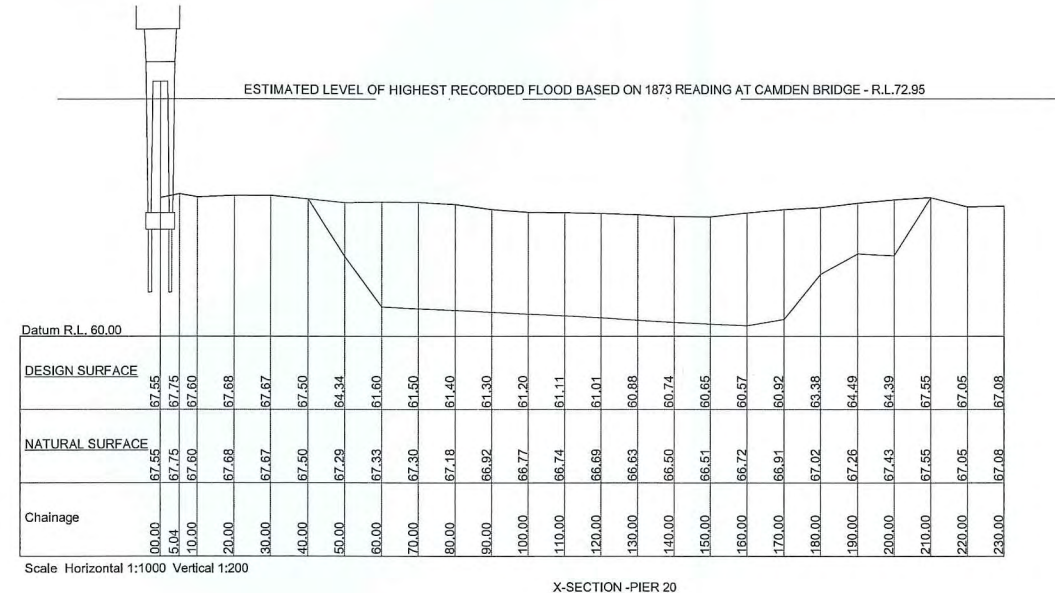
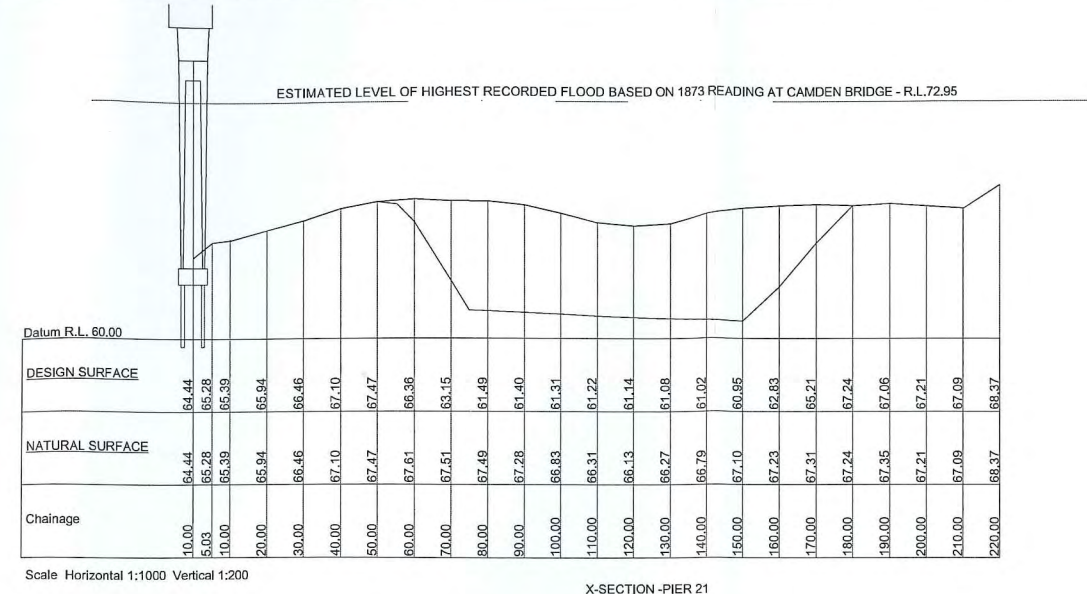


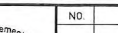
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MACARTHUR ROAD CROSS SECTIONS OF PROPOSED SAND EXTRACTION AREA					
DATE	DRAWN	SHEET	OF	AMENDMENT	DRAWING No
13.10.2011	DGM	2	3		77310.01.P05



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