

LIDDELL COAL OPERATIONS

APPENDIX E

Submission on the Exhibited EIS for
the Liddell Mine Extension
(DA 305-11-01 Mod 5) -
OEH Submission and Umwelt Response

APPENDICES



**Office of
Environment
& Heritage**

Your reference: DA_305-11-01 MOD5
Our reference: DOC13-64715; FIL13/7989
Contact: David Paull, 4908 6837

Ms Alice Smith
Environmental Planning Officer, Mining Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Ms Smith

RE: SUBMISSION ON THE EXHIBITED EIS FOR THE LIDDELL MINE EXTENSION (DA_305-11-1_MOD5)

I refer to your email dated 20 September 2013 seeking advice on the exhibited Environmental Assessment (EA) for the Liddell Mine Extension, a Modification (DA 305-11-01 MOD5). The Office of Environment and Heritage (OEH) provides advice in relation to biodiversity, Aboriginal cultural heritage, flooding and surface water management.

OEH notes that the proposal will include the following features:

- extension of the South and Entrance Pits to the south-east, and upon completion of mining in these pits, an underground operation under the Mine Infrastructure Area (MIA) during which time the MIA will be relocated to temporary facilities. The extension of open cut mining activities will lead to an extension of the life of mine at from 2023 to 2028
- a tailings emplacement area will be constructed within the final void of the South Pit
- minor additional infrastructure including a new conveyor, powerlines, water management infrastructure and haul roads.

OEH has reviewed the Environmental Assessment (EA) and the relevant Appendices and notes that the proposed works will result in the removal of 125 hectares of remnant and regrowth woodland vegetation, including 58 hectares of 'Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions Endangered Ecological Community' (EEC) and 65 hectares of derived native grassland. The proponent has identified a potentially significant impact upon the Spotted-tailed Quoll, Brown Treecreeper, Grey-crowned Babbler, Hooded Robin and Speckled Warbler. OEH also notes that there will be direct impacts upon Aboriginal cultural heritage.

To mitigate and offset these impacts the proponent has proposed a range of mitigation measures including an extensive rehabilitation programme and an offset proposal which includes 65 hectares of remnant woodland and 93 hectares of derived native grassland.

Following a review of the EA and an assessment of its compliance with current OEH policy, legislation and the Director General's Requirements, OEH has determined that:

- Issues relating to Aboriginal cultural heritage and flooding have been adequately addressed.
- Issues relating to threatened biodiversity have not been adequately resolved (i.e. residual issues remain) and will need to be addressed within the conditions of approval.

A detailed analysis of the EA is provided in **Attachment 1**. Recommended conditions of approval are provided in **Attachment 2**.

If you require any further information regarding this matter please contact David Paull, Regional Biodiversity Conservation Officer, on 4908 6837.

Yours sincerely

A handwritten signature in black ink, appearing to read 'R Bath', with a long horizontal flourish extending to the right.

25 OCT 2013

RICHARD BATH
Senior Team Leader - Planning
Regional Operations

Enclosures: Attachments 1, & 2

ATTACHMENT 1: REVIEW OF ENVIRONMENTAL ASSESSMENT FOR PROPOSED MODIFICATION TO DA 305-11-01

ABORIGINAL CULTURAL HERITAGE ASSESSMENT

The Office of Environment and Heritage (OEH) provided a review and comments in relation to the adequacy of the proposed Aboriginal cultural heritage assessment and management recommendations that were proposed within the 'Draft' Environmental Assessment (EA) at the adequacy assessment stage of the approval process. This review of the Draft EA, including Sections 6.6, 7.6 and Appendix K entitled: '*Aboriginal and Historic Heritage Assessment – Liddell Coal Operations – Modification 5 to Development Consent DA 305-11-01*' (dated 27 June 2013) ('the AHHA') was undertaken by OEH to assess the potential impacts of the project on Aboriginal cultural heritage, in accordance with OEH's Aboriginal cultural heritage assessment guidelines and the requirements of Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act).

OEH has subsequently been given the opportunity to provide comments on the revised EA and on Liddell Coal Operations (LCO) response to the initial issues raised by OEH in relation to Aboriginal cultural heritage, and the adequacy of the proposed management strategies developed to deal with those issues.

OEH has reviewed the following documents:

1. '*Aboriginal and Historic Heritage Assessment – Liddell Coal Operations – Modification 5 to Development Consent DA 305-11-01*' (September 2013) OzArk Environmental & Heritage Management Pty Ltd for GSS Environmental on Behalf of Liddell Coal Operations Pty Limited; &
2. '*Aboriginal Test Excavations at LID 3 (#37-3-0452) and LID 34 (#37-3-1150), Liddell Coal Operations, Hunter Valley NSW*' (July 2012), Report prepared by OzArk Environmental & Heritage Pty Ltd for Liddell Coal Operations Pty Ltd.

Seven key issues previously raised by OEH in relation to the inadequacies of the Draft AHHA. OEH has reviewed final AHHA and examined the previously noted inadequacies which are documented below.

- OEH refers to Table 2 Appendix 2 of the AHHA – the results of the AHIMS search were not provided by the proponent. OEH requested that this issue be addressed and that AHIMS results be publicly exhibited in the final AHHA. OEH notes that this issue has been addressed and the AHIMS results are now included in Appendix 2 of the AHHA.
- OEH refers to Section 6.6 of the Draft AHHA. OEH noted that the dates documented in the Draft AHHA for both the field works and test excavation program were incorrect. OEH recommended that these dates be corrected by the proponent prior to the finalisation of the AHHA. OEH notes that the dates have been corrected.
- OEH notes low ground surface visibility and the need to develop management strategies to cover the possible location of unknown artefacts. OEH notes that the proponent has developed an 'Unanticipated Finds Protocol' which was included in Section 7.3 of the AHHA. OEH supports the development and inclusion of the 'Unanticipated Finds Protocol' and acknowledges that this satisfies the previous request for the development of a management strategy to deal with this potential Aboriginal cultural heritage management issue.
- Impact Assessment. OEH recommended that due to the likelihood for harm to Aboriginal objects and sites, that the proponent develops a culturally appropriate management strategy to deal the likely impact in consultation with the 17 registered Aboriginal parties (RAP's). OEH concurs that this has occurred and the additional community consultation is documented in Section 3 of the AHHA the relevant management strategies that were developed are documented in Sections 7 (Management and Mitigation: Aboriginal Heritage) & 11 (Recommendations).

- OEH noted inadequacies in relation to the consultation process, in particular OEH noted comments from Wanaruah Local Aboriginal Land Council, Wonn 1, and Tocomwall in the Draft AHHA. These comments identified a number of important Aboriginal cultural heritage matters and issues for consideration by the proponent. OEH noted that within the Draft AHHA, the proponent did not separately respond to or address these matters. OEH also noted that it would expect that the proponent detail any contrary or differing positions provided by the RAP's, in particular if there was disagreement regarding specific details, outcomes and management strategies for the assessment process.

OEH recommended that the proponent provide additional detailed commentary in a publically exhibited documentation in response to the views presented by the RAP's in response to the Draft AHHA, to form a complete and transparent submission.

OEH notes that this additional information has been added to Section 3.3 of the final AHHA and is OEH is now satisfied that this appropriately documents the differing opinions from all RAP's, specifically Wanaruah Local Aboriginal Land Council, Wonn 1, and Tocomwall.

- OEH recommended that the proponent maintain continuous consultation process with the community for the entire life of the project. OEH noted that a gap of more than six months is not considered to be continuous consultation.

OEH notes that the proponent has agreed to ensure that continuous consultation will occur for the life of the project. The proponent will be engaging with all RAP's in the Aboriginal Heritage Impact Permit (AHIP) application process. OEH is satisfied that the proponent is engaging in continuous consultation and that this is occurring at regular and appropriate intervals.

OEH has no further concerns in relation to Aboriginal cultural heritage in regards to the environmental assessment undertaken for the LCO – Modification to DA 305-11-01. The proponent has addressed the Aboriginal cultural heritage issues raised in OEH's initial comments on the Draft AHHA, and the additional management strategies proposed in the final AHHA are considered adequate by OEH. Recommended conditions of approval for the long term ongoing management of Aboriginal cultural heritage within the proposed extension area are provided in **Attachment 2**.

THREATENED BIODIVERSITY

OEH has reviewed Appendix H: Ecological Assessment and Appendix S: Rehabilitation Strategy prepared by Umwelt Australia and the summaries in the main body of the Environmental Assessment (EA) and notes that the proposed works will result in the removal of 125 hectares (ha) of remnant and regrowth woodland vegetation (including 58 ha of the *Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions Endangered Ecological Community* (EEC)); and 65 ha of derived native grassland. The proponent has identified a potentially significant impact upon the Spotted-tailed Quoll, Brown Treecreeper, Grey-crowned Babbler, Hooded Robin and Speckled Warbler.

The Director General's Requirements for this project state that, "a description of the measures that would be implemented to maintain or improve the biodiversity values of the surrounding region in the medium to long term". To mitigate and offset these impacts the proponent has proposed a range of mitigation measures including reducing the original limit of the open cut mining; changing the mine planning to avoid disturbance of an established rehabilitation area due to its biodiversity values and a range of other strategies as detailed in the Liddell Landscape Management Plan (LMP) including weed and feral animal control, fencing and access control, bushfire management, rehabilitation, habitat enhancement measures, and tree felling procedure to limit impacts on hollow-dependent threatened species.

Mitigation measures also include a proposed an extensive rehabilitation strategy that, "...the nominated end land use for the LCO is predominately grazing, with habitat corridors consisting of trees, shrubs and

groundcover. The rehabilitation strategy aims to emulate the pre-mining grazing areas, enhance local and regional ecological linkages and provide for sustainable land use options." While such an approach is consistent with existing land-use, it offers limited value for biodiversity if the intent is also to use these lands as offsets.

One offset site containing remnant vegetation is proposed, the Mountain Block Offset Area. The EA states that the Glencore strategic offset approach is to target offsets around the Mt Manobalai and Mt Owen areas. However, these offset priorities do not appear to be factored into the Liddell offset strategy.

1. Review of Impact Assessment

OEH has reviewed the methodologies used to inform the ecological assessment and considers these to be generally consistent with OEH survey and assessment guidelines (DEC 2004; DECC 2007). However, there were a number of deficiencies in the impact assessment procedure undertaken by the proponent.

Direct and Indirect Impacts

Ecological impact assessments usually consider the direct and indirect impact on the extent and condition of the ecological communities and species. This area is defined as the 'study area'. There is no systematic way in which this issue has been addressed in the EA. The proponent has not mapped or indicated the likely area of expected indirect impact (noise, dust, light pollution) as a result of the modification. Consequently an assessment of the potential indirect impacts upon the ecological communities and species known or expected to occur in the area, is deficient. Particularly in relation to the location of the pit extension and Bowmans Creek, a known habitat corridor for the Spotted tailed Quoll. Section 5.3 of Appendix H states that:

"The proposed extension of the open cut mining ... will be extending closer to a portion of Bowmans Creek (but) existing mining operations at Liddell have been undertaken for many years in parallel with the Creek, and the proposed extension is a continuation of this ..."

This type of analysis omits that the Entrance Pit will be only 160 m from Bowman's Creek and will be a lot closer to the creek than older pit workings have been for many years. Therefore indirect impacts are likely to have a higher impact than previously. This is particularly pertinent during the construction phase for the pit. In this case this may be a significant effect in the use of the Bowman's Creek corridor, particularly for the dispersal and use of the area as a den site by Spotted-tailed Quolls. While the proposed stream rehabilitation will go some way mitigate this impact over time, the key area of the closest point of the creek and the pit extension will not be rehabilitated.

Significance of impacts

When considering direct impacts, Appendix H only provides an analysis of the impact upon the extent of vegetation communities within the context of the broader Upper Hunter Region, and while an important aspect, does overlook impacts upon ecological communities at the local level (study area). No study area is identified in the EA, though usually it may be considered to be the area occupied by the DA boundary or area of indirect impact.

Despite this, OEH concurs that the project is expected to have a significant impact (as defined by s5A of the EP&A Act) on the following matters listed under the TSC Act:

- *Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions*
- Spotted-tailed Quoll
- Brown Treecreeper
- Grey-crowned Babbler

- Hooded Robin
- Speckled Warbler.

Provision of an adequate avoidance and mitigation measures and an offset strategy are required to alleviate these 'residual' impacts. These are dealt with below.

2. Review of Mitigation Measures

OEH acknowledges that the range of mitigating measures that are currently undertaken by the proponent:

- rehabilitation of post-mined and other disturbed areas to vegetation communities consistent with extant vegetation communities
- use of native species of suitable local provenance (wherever possible) in rehabilitation works, and planning for the linkage and integration of rehabilitation areas with existing vegetated areas to improve ecological function and provide appropriate fauna habitat
- ongoing monitoring and maintenance of all revegetation works and habitat enhancement activities
- a comprehensive tree-felling procedure to minimise impacts of clearing on native fauna and flora
- fencing and access control
- weed control and feral animal control in accordance with existing practices across the LCO holdings
- ensuring appropriate erosion and sediment controls are implemented to ensure minimal impact on remnant vegetation and aquatic habitats
- inclusion of an adaptive management approach if a previously unrecorded or assessed threatened species is identified in the Proposed Modification Area during operations
- ecological monitoring programs.

These measures are intended to minimise impacts upon threatened matters. These actions are to be updated within the existing Liddell Coal Landscape Management Plan (Umwelt 2008) where new measures are proposed for this project. Particular attention is given to the corridor establishment, habitat enhancement and the rehabilitation activities connected with this objective for this project. OEH in general supports land rehabilitation activities that have ecological value, particularly where strategic connections can be made between areas of remnant vegetation. The proponent has identified a key area of the LCO lands, Bowman' Creek, as having a high existing ecological value and one which can be enhanced to both improve its connectivity value with adjacent areas of remnant vegetation to the north.

While commendable, there are a number of issues which detract from this overall approach in terms OEH's ability to make an assessment of the adequacy of the proposed measures:

(a) While connection is intended to be made with remnant vegetation within the Mountain Block Offset Area (see comments below) this proposed 'native woodland' connection spans an area of largely disturbed grassland which will require a long-term commitment to realise a functioning 'corridor', at the moment, the EA only identifies preliminary completion criteria, no work schedules are provided.

(b) The amount of River Oak and ironbark-box forest to be planted in the 'riparian corridor' is not clear.

(c) According to Figures 6.1 and 6.2 of Appendix H, no enhancement of this 'corridor' is to occur south of where the 'Entrance Pit' is to be located. This is the area where the creek is at its closest location to the new pit extension (160m) and is the area which would require supplementary planting to mitigate indirect impacts from the mine the most.

Appendix S: Rehabilitation Strategy was reviewed by OEH but did not contain any more detailed information with regards to these issues as did Appendix H.

3. Review of Compensatory Package

Offset package

One aim of the Offset strategy is to “ensure that there are no residual net impacts on key threatened species and ecological communities in the long term...” However, OEH has a number of concerns about the suitability of the offset package in terms of it being able to remove any residual impact upon threatened biodiversity.

OEH notes the revised offset package being proposed for this project. The proponent has used a number of measures to evaluate the adequacy of the offset strategy proposed in the EA including OEH's *Principles for the use of Biodiversity Offsetting Guidelines* (DECC 2008) and OEH's Interim Biodiversity Offset Policy (2011). OEH requested that the proponent choose one pathway to evaluate their offset proposals and that the proponent use the BioBanking Assessment Methodology (BBAM) to quantify the biodiversity loss and gain. The use of the methodology has gain been enshrined in the new Offset Principles (OEH 2013) which considers use of the BBAM as ‘best practice’. There is no quantification of residual impact (in terms of biodiversity gain or loss) presented in the proponent's ecological impact assessment that would satisfy Principle 9 of the old principles “*Offsets must be quantifiable – the impacts and benefits must be reliably estimated*” or Principle 2 of the new principles “*Offset requirements should be based on a reliable and transparent assessment of losses and gains*” (OEH 2013).

In the absence of this analysis and the conditions under the Tier requirements of the Interim Offset Policy (s4.2) have been used to evaluate the adequacy of offsets proposed here. Under the Interim Offset Policy, three scenarios are indicated:

- Tier 1: ‘Improve or Maintain’ outcome (Retention of Red Flags; Retirement of all biodiversity credits);
- Tier 2 ‘No Net Loss’ outcome (Loss of Red Flags but all biodiversity credits are retired); or a
- Tier 3 ‘Mitigated Net Loss’ outcome.

The offset package indicates that a Tier 1 ‘Improve or Maintain’ outcome is not possible due to the removal ‘Red Flags’ which would be the areas of the Central Hunter Grey Box Ironbark Woodland. A Tier 2 outcome may be possible under this scenario, but the retirement of credits has not been demonstrated as the BBAM has not been used. Given the quantum of offset areas proposed (Table 1), this is unlikely.

Table 1. Adequacy of offset strategy to achieve a 2:1 area ratio

Vegetation Community (Keith Formation)	Study Area Total	Impact (ha)	Mountain Block Offset Area (ha)	Ratio (x:1)	Tier 3 (2:1)
Central Hunter Grey Box Ironbark Woodland and Central Hunter Bulloak Forest (Grassy Woodland)*	?	120	22	0.2	No
Central Hunter Spotted Gum Ironbark – Grey Box Forest (Dry Sclerophyll Forest)	?	0	35	0	-
Central Hunter Swamp Oak (Forested Wetland)	?	5	0	0	No
Dry Rainforest (Rainforest)		0	8	0	-
Derived Grassland (Grassland)	?	65	93	1.4	No
Woodland Birds and S-T Quoll	?	125	65	0.5	No

*As per Appendix H of the EA, there are three communities in this Keith Formation; Central Hunter Grey Box Ironbark Woodland, Ironbark Bulloak Woodland and Central Hunter Bulloak Forest. All are regarded as being Grassy Woodland, while only the first two may be regarded as being the TEC.

OEH's Interim Offset Policy (Appendix B) states that a minimum requirement for establishing a 'mitigated loss' is that an offset to clearing ratio of at least 2:1 for vegetated to cleared hectares must be achieved. OEH acknowledges the steps taken by the proponent to minimise the loss of remnant vegetation, particularly the changes to lessen indirect impact upon Bowman's Creek and the removal of the tailings dam. Even if the two Central Hunter communities were added together across formation this gives an offset ratio of 0.5:1. It is apparent that without the consideration of the rehabilitation strategy, the offset package does not meet the requirements of a Tier 3 outcome.

Use of rehabilitation as an offset

The proponent has proposed an extensive rehabilitation strategy that, "...will include the rehabilitation of 731 hectares the post-mined landscape to be consistent with Central Hunter Grey Box Ironbark Woodland and a 1,247 hectares of the post-mined landscape to be consistent with derived native grasslands. A further 183 hectares of rehabilitation works and habitat enhancement works will be undertaken along Bowman's Creek to assist in the recovery of the local spotted-tailed quoll population". OEH had requested that the proponent use the BioBanking Calculator in order to quantify the adequacy of the proposed offset but notes that this has not been undertaken.

Table 2. Extent of proposed rehabilitation activities

Revegetation Type	Study Area Total (ha)	Substitution ration*	Effective Offset equivalent (ha)
Native woodland (currently non-native)	731	0	-
Open grassland with pockets of Native Vegetation (Grassland)	1247	?**	-
Bowmans Creek Riparian Corridor (upgraded to Forested Wetland/grassy woodland)	183	0.5***	91

*Based on best draft information held by OEH.

**It is difficult to assign the second category to any particular vegetation formation or type, so OEH will assign this as a 'derived grassland' outcome. Adding more difficulty to how much could be counted as an offset is that some areas are existing derived grassland while others are not. The two areas are not clarified.

***This corridor is largely existing derived grassland and riparian habitat and so a 50% ecosystem credit substitution rating can be applied though it is not clear how much is intended to be Forested Wetland offset (Swamp Oak type) or how will be grassy woodland.

With respect to the 'Native Woodland' category, in the absence of any accepted substitution ratio, there are two ways in which OEH can incorporate this land as part of an offset strategy, as there is no minimum standard on the condition of vegetation that can be used for an offset site under the BBAM. However, in order to apply the BBAM vegetation communities must be placed within Biometric Vegetation Types. This is not possible if the vegetation does not exist. Also OEH does not accept as offset any land which is required as rehabilitation as a development consent. While substitution ratios for mine rehabilitation have been flagged as part of the Upper Hunter Strategic Assessment, there is no final position on this matter.

Glencore in association with Umwelt have undertaken various mine rehabilitation trials, however, there is currently no strong evidence that mine rehabilitation can be used to recreate threatened ecological communities or threatened species habitat.

With respect to 1,200 ha of the Open Grassland with Pockets of Native Vegetation category that is proposed, it is understood that this area is mostly not intended as an ecological zone, but one better suited for agriculture (see above). While scattered trees or 'pockets of native vegetation' are intended to play a part of rehabilitation mix, this category can only be regarded as having a final vegetation type as being grassland, and then it is unclear if native species will be the dominant type, given its anticipated outcome to provide forage for stock.

With respect to the use of the 183 ha corridor habitat enhancement area as an offset, this would be acceptable to OEH as an offset given most of this zone is on unmined land and contains stands of existing River Oak forest. However, it is stated in Ch.6.2.2 of Appendix H, some of this corridor would be rehabilitated to Central Hunter Grey Box Ironbark Woodland outside of the 'riparian zone' and some would be rehabilitated to be 'Hunter Valley River Oak Forest'. This would be an acceptable offset for the loss of the Swamp Oak Forest in the development footprint, however it is not clear from the figures provided in Appendix H approximately how much of each type is anticipated as an outcome within the riparian corridor and so in terms of how this corridor can offset residual impacts is uncertain.

It would take only 10 ha of Riparian River Oak forest to offset the loss in Forested Wetland under a Tier 3 outcome, though 200 ha of remnant grassy woodland are still required to offset residual impact upon this community and the threatened species it supports. For the riparian corridor, OEH supports a 50% substitution ratio for this restoration area which would provide an appropriate level of biodiversity value to offset the loss to the Swamp Oak Forest, though will provide an unknown number of hectares to offset the loss of Grey Box-Ironbark Forest.

Conservation Mechanism

The proponent states that the conservation mechanism that would protect the offset lands in perpetuity would be identified at the DA stage, it is OEH's preference that this be determined as a condition of consent. Please note that it is now OEH policy that a Conservation Agreement under the NPW Act is no longer an acceptable conservation mechanism for offset lands, except where they have a very high biodiversity value.

In conclusion,

- The Swamp Oak Forest and derived grassland communities are the only vegetation formations that are likely to be adequately offset according to the Interim Offset Policy and this has been achieved through the extensive rehabilitation programme. A question remains over the extent of the riparian vs Grey Box-Ironbark vegetation that will be established.
- OEH is required to conclude that due to deficiencies in the mitigation measures and the offset package to offset the loss of threatened biodiversity, residual impacts still remain with respect to those matters listed in Part 1 above.
- Recommended conditions of approval for the long term ongoing management of threatened biodiversity within the proposed extension area are given in **Attachment 2**.

References

Department of Environment and Conservation, 2004. Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). New South Wales Department of Environment and Conservation, Hurstville, NSW.

Department of Environment and Climate Change, 2007. Threatened species assessment guidelines: The assessment of significance. New South Wales Department of Environment and Climate Change, Goulburn Street, Sydney, NSW.

Office of Environment and Heritage, 2011. NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects. Approved by the Chief Executive Officer 25 June 2011.

Office of Environment and Heritage, 2013. NSW Offset principles for major projects (state significant development and state significant infrastructure) www.environment.nsw.gov.au/biodivoffsets/nswoffsetprincip.htm

Umwelt, 2008. Liddell Colliery Landscape Management Plan (Including Mine Closure Plan and Rehabilitation Management Plan). Report prepared for Liddell Coal Operations Pty Ltd.

ATTACHMENT 2: RECOMMENDED CONDITIONS OF APPROVAL

Aboriginal Cultural Heritage

OEH acknowledges that the Aboriginal cultural heritage assessment has been undertaken in accordance with the OEH's assessment guidelines. The results of the Aboriginal cultural heritage assessment for the proposed modifications to and extension of Liddell Coal Operations indicate that there will be future impacts to Aboriginal cultural heritage are to occur as a result of the proposed extension. As such, the following conditions of approval are recommended:

1. An OEH Section 90 Aboriginal Heritage Impact Permit (AHIP) will need to be applied for prior to any ground disturbance works occurring.
2. The proponent must continue to consult with and involve all the registered local Aboriginal representatives for the project, in the ongoing management of the Aboriginal cultural heritage values. Evidence of this consultation must be collated and provided to the consent authority upon request.
3. In the event that ground disturbance identifies a new Aboriginal object/s outside the AHIP footprint (once approved by AHIP), all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified cultural heritage specialist and representatives of the local Aboriginal community must be contacted to determine the nature, extent, scale and significance of the finds. The site is to be registered in the Aboriginal Heritage Information Management System (AHIMS) (managed by OEH) and the management outcome for the site included in the information provided to the AHIMS. The proponent will consult with representatives of the local Aboriginal community, and the cultural specialist to develop and implement appropriate management strategies for all objects/sites. Any management strategy development must also comply with the appropriate legislative provisions.
4. If human remains are located in the event that surface disturbance occurs, all works must halt in the immediate area to prevent any further impacts to the remains. The NSW Police are to be contacted immediately. No action is to be undertaken until the NSW Police provide written notification to the proponent. If the skeletal remains are identified as Aboriginal, the proponent must contact OEH's Environment Line on 131 555 and representatives of the local Aboriginal community. No works are to continue until OEH provides written notification to the proponent.
5. An Aboriginal Cultural Heritage Education Induction Program must be developed as a component of the Land Disturbance Protocol for the induction of all personnel and contractors involved in the construction activities on site. Records are to be kept of which staff/contractors were inducted and when for the duration of the project. The program should be developed and implemented in collaboration with the registered Aboriginal parties.

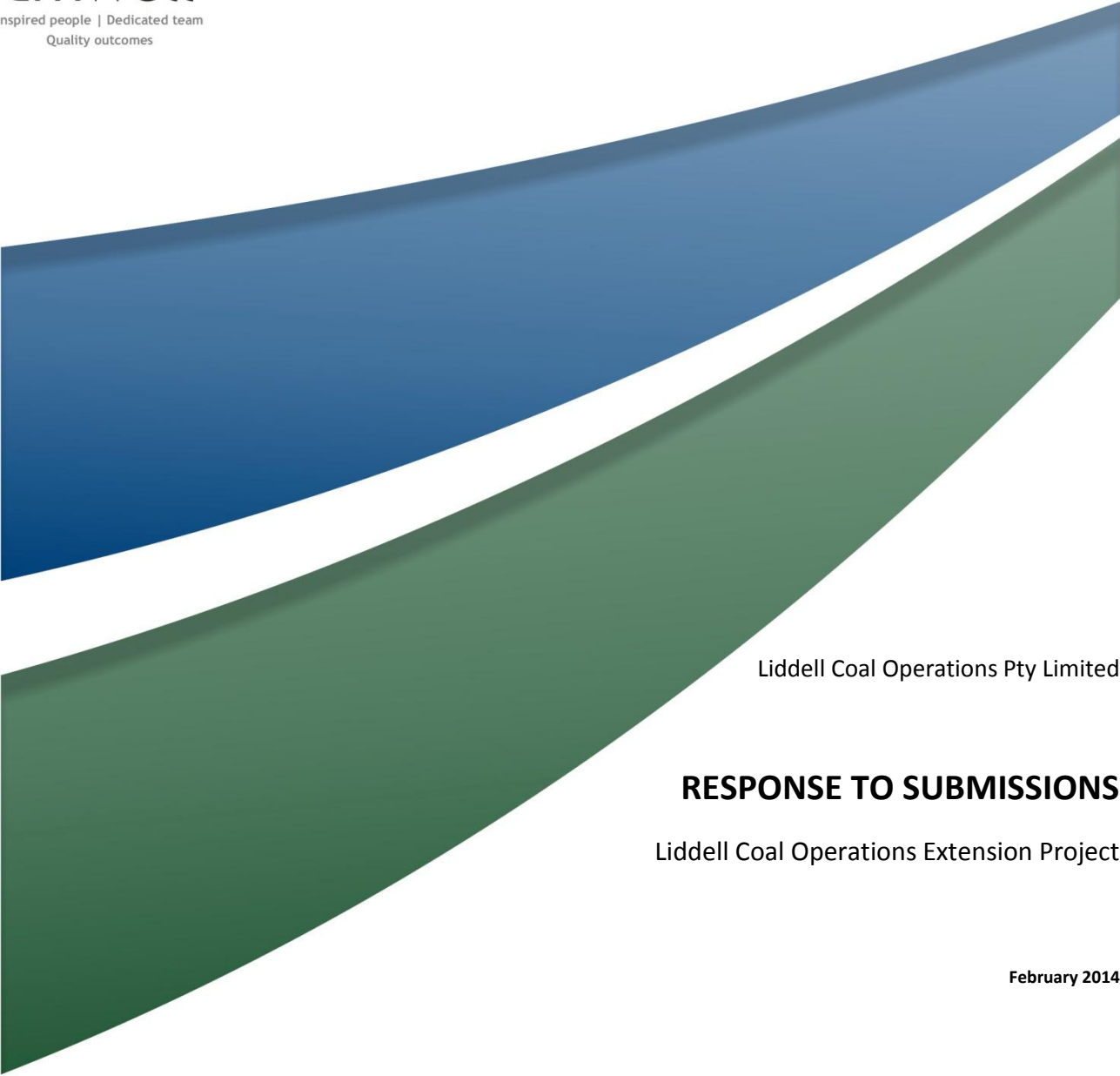
The importance of protecting Aboriginal cultural heritage is reflected in the provisions of the NPW Act. OEH notes that the requirements of the NPW Act have recently been amended. It is strongly recommended that the proponent familiarises itself with the new requirements during the development and any subsequent assessment and/or development processes.

Threatened Biodiversity

It is recommended that the proponent;

1. Alter the mine design so that the distance of the Entrance Pit from Bowmans Creek is such that it will allow a southern extension of the 200 metre wide riparian corridor down to the southern point of the LCO;
2. Locate and protect in perpetuity an additional 200 hectares of grassy woodland within the Upper Hunter region;

3. Identify the in perpetuity conservation mechanism that is appropriate for this site;
4. Develop a specific site rehabilitation plan that identifies clear revegetation and habitat enhancement targets, locations and detailed completion criteria.



Liddell Coal Operations Pty Limited

RESPONSE TO SUBMISSIONS

Liddell Coal Operations Extension Project

February 2014

Liddell Coal Operations Pty Limited

RESPONSE TO SUBMISSIONS

Liddell Coal Operations Extension Project

February 2014

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Liddell Coal Operations Pty Limited

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Project Manager:	Rebecca Vere
Report No.	3122/R05/FINAL
Date:	February 2014



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1.0 Introduction

Liddell Coal Operations (LCO) is an established open-cut mine located at Ravensworth, approximately 25 kilometres (km) north-west of Singleton in the Upper Hunter Valley of New South Wales (**Figure 1.1**). LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore), on behalf of a joint venture between Glencore (67.5 per cent (%)) and Mitsui Matsushima Australia (32.5%).

LCO is seeking to modify development consent DA 305-11-01 pursuant to section 75W Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow for the continuation of open cut mining within the current development consent and mining lease boundaries (the Project) (**Figure 1.2**). The Project will therefore facilitate optimisation of an existing mining operation, enabling the extraction of additional coal resources within an existing operational mining area. An Environmental Assessment (EA) (SLR, 2013) for the Project was submitted to the Department of Planning and Infrastructure (DP&I) and placed on public exhibition from 20 September 2013 to 18 October 2013.

2.0 Response to OEH Submission on Biodiversity Issues

This report has been prepared in response to a request from the Director-General of DP&I in accordance with clause 85A of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), that LCO prepare a response to the submissions raised by Office of Environment and Heritage (OEH) in relation to biodiversity issues during the public exhibition period of the EA for the Project.

For the purposes of this Response to Submissions, specific sections of the OEH submission have been noted in **bold** to ensure the reader has a clear understanding of the issues raised in the submission, followed by a response in normal type.

2.1 Corrections to Details Referred to in OEH Comments

Within the submission, OEH makes the following statement:

OEH has reviewed the Environmental Assessment (EA) and the relevant Appendices and notes that the proposed works will result in the removal of 125 hectares of remnant and regrowth woodland vegetation, including 58 hectares of 'Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions Endangered Ecological Community' (EEC) and 65 hectares of derived native grassland.

These numbers are incorrect, and are likely to have been sourced from previous drafts of the Ecological Assessment provided to OEH. The correct values, as per the exhibited document are:

- Remnant and regrowth woodland vegetation – 123 hectares;
- Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregion EEC – 56 hectares; and
- Derived native grassland – 65 hectares.



FIGURE 1.1
Locality Map

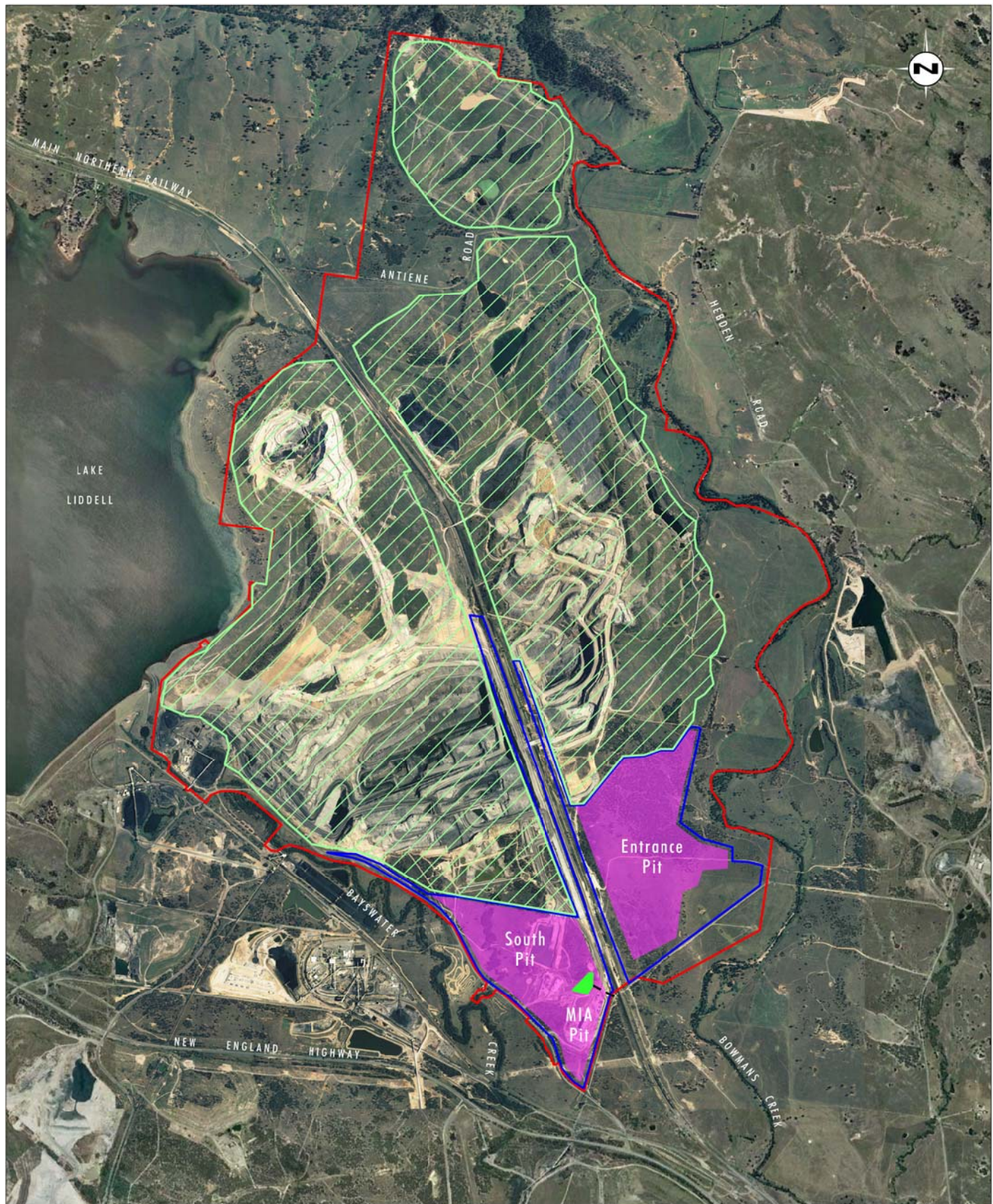


Image Source: Xstrata (2013), Google Earth (2008)
Data Source: Xstrata (2012)

0 0.5 1.0 2 km
1:40 000

Legend

- Liddell Coal Operations Approved DA Boundary
- Approved Mining Footprint
- Proposed Modification Area
- Proposed limit of open cut mining
- Proposed Conveyor
- Proposed Stockpile location including hopper/crusher

FIGURE 1.2

Existing and Proposed Operations
at Liddell Coal Operations

Where OEH make further mention of these values (or any other values that are dependent on these – such as offsetting needs), Umwelt have used the corrected values for this Response to Submissions.

OEH have also stated that:

...OEH concurs that the Project is expected to have a significant impact on the following matters listed under the TSC Act:

Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions...

The Ecological Assessment **did not** consider the loss of 56 hectares of Central Hunter Grey Box – Ironbark Woodland EEC to constitute a significant impact, with the loss representing approximately 0.38 per cent of the extant distribution of this community (based on the mapping of Peake (2006)).

2.2 Direct and Indirect Impacts

The proponent has not mapped or indicated the likely area of expected indirect impact (noise, dust, light pollution) as a result of the modification. Consequently an assessment of the potential indirect impacts upon the ecological communities and species known or expected to occur in the area, is deficient. Particularly in relation to the location of the pit extension and Bowmans Creek, a known habitat corridor for the spotted-tailed quoll.

Assessments of indirect impacts on ecology matters have been specifically addressed in Section 5.3 of the Ecological Assessment.

The main sources of potential indirect impact relating to the Project include dust, noise and groundwater impacts. The existing vegetation in the Proposed Modification Area is currently fragmented with only poor connectivity outside of LCO. The Project will remove this isolated patch of remnant vegetation, however it is unlikely to disrupt local corridor function, as the narrow riparian corridor along Bowmans Creek will not be impacted by clearing.

The proposed extension of open cut mining associated with the Project is towards Bowmans Creek. However, whilst the Entrance Pit will be extending closer to a portion of Bowmans Creek, existing mining operations at Liddell have been undertaken for many years in parallel with the creek, and the proposed extension is a continuation of this as is evident on **Figure 1.2**. The proposed extent of the Entrance Pit at its closest point will be approximately 160 metres from Bowmans Creek, consistent with existing approved operations, which at various locations have come within 110 metres of the creek within the approved mining footprint. Therefore, given that there are no changes proposed to production levels, mining equipment or mining methods, and that the proposed Entrance Pit extension will be no closer to the creek than previously approved open cut mining activities, the indirect impacts as a result of the Project are not anticipated to be different to that currently approved.

With regards to specific indirect impacts as a result of the Project, particularly in relation to noise, the Noise Assessment conducted by Global Acoustics (2013) concluded that since the Project will see LCO continuing to dump in similar locations to the operations of the last two years, and that LCO will be required to continue to meet the existing noise criteria for the life of the mine, similar noise levels could therefore be reasonably expected as a result of the Project. Similarly, an increase in lighting and dust related indirect impacts on ecological communities and species is not anticipated given that the Project will involve a continuation of mining in parallel with Bowmans Creek at the same production levels and operating hours as are currently approved.

Expected drawdown along the alluvial aquifer of Bowmans Creek throughout the life of the Project has been modelled by SKM (2013), and is predicted to peak during the last year of mining in the Entrance Pit, at approximately 1.4 metres below the steady state water level pre-1990. Of this 1.4 metres, less than 1 metre is attributed to the Project (i.e. the incremental drawdown) with the remaining drawdown as a result of other approved activities in the area. The peak predicted drawdown is not expected to result in any significant impacts on the aquifer, aquatic ecological features or groundwater dependent ecosystems, as there will be at least 7 metres of saturated sediments remaining over the majority of the aquifer (ELA 2013).

Section 5A of the EP&A Act requires the assessment of indirect impacts as part of several of the factors that form part of the seven-part test process, however factor (a) is particularly relevant to indirect impacts. Factor (a) requires an assessment of *whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*. Factor (c) requires an assessment of *whether the action proposed is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction*. The Department of Environment and Climate Change (DECC) (now OEH) (2007) *Threatened Species Assessment Guidelines* define the 'local population' as the population that occurs in the 'study area' and also defines the 'study area' as the area directly affected by the proposal and any additional areas that are likely to be affected by the proposal, either directly or indirectly. The DECC (2007) *Threatened Species Assessment Guidelines* indicate that the study area should extend as far as is necessary to take all potential impacts into account. The same approach has been adopted in order to define the *local occurrence* of an ecological community.

Indirect impacts should be, and have been as part of the Ecological Assessment, considered on a case by case basis, because the potential for indirect impacts on each species, community or population is different. It is not possible to accurately produce a map showing the expected indirect impacts caused by the Project. The area over which indirect impacts such as noise and dust pollution could impact on ecological communities, endangered populations and species is unique to each indirect impact type and to the ecological community, endangered population or species potentially affected. For example indirect impacts from dust will vary according to wind strength and direction and will also vary over time (from hourly to across seasons). Additionally indirect impacts may extend beyond the Project disturbance footprint to varying distances depending on the ecological community, endangered population or species affected. While impacts on some species may be relatively localised, impacts on other species may extend a considerable distance from the impact area. For example impacts on a fauna species in one locality that reduce foraging efficiency could result in decreased survivorship of individuals within a population that may be contained within a remnant woodland patch or that extends across a number of patches. Indirect impacts should therefore be considered on a case by case basis, and were so within this Ecological Assessment.

Assessments of the direct and indirect impacts of the Project on all threatened species, endangered populations and threatened ecological communities (TECs) were undertaken on a case-by-case basis in the main text of the Ecological Assessment (Umwelt, 2013) in Section 5, and as part of the seven-part tests undertaken (see Appendix 4 of the Ecological Assessment). This same approach has been used consistently in previous Ecological Assessments which have been accepted by both OEH and in the NSW Land and Environment Court.

The most pertinent example of this approach is the precautionary assessment approach adopted for the spotted-tailed quoll (*Dasyurus maculatus maculatus*). While the Project will not directly impact the known breeding den within the LCO development consent boundary, the loss of 123 hectares of moderate quality and 65 hectares of lower quality foraging habitat for this breeding female from the Proposed Modification Area could have the potential to threaten future breeding success of this species in the immediate area through indirect impacts. Based on the application of the precautionary principle it was concluded that as a result of this indirect impact, the Project has the potential to result in a significant impact on this species. This conclusion has been reached without confirmation of direct use of the habitats of the Proposed Modification Area by this species, despite detailed surveys of those habitats.

In summary, an appropriate assessment of indirect impacts was completed as part of the Ecological Assessment.

2.3 Significance of Impacts

When considering direct impacts, Appendix H only provides an analysis of the impact upon the extent of vegetation communities within the context of the broader Upper Hunter Region, and while an important aspect, does overlook impacts upon ecological communities at the local level (study area). No study area is identified in the EA, though usually it may be considered to be the area occupied by the DA boundary or area of indirect impact.

Despite this OEH concurs that the Project is expected to have a significant impact on the following matters listed under the TSC Act:

- ***Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions***
- ***Spotted-tailed quoll***
- ***Brown treecreeper***
- ***Grey-crowned babbler***
- ***Hooded robin***
- ***Speckled warbler***

The Ecological Assessment prepared for this Project concluded that the Project would result in:

a potential significant impact on the following threatened species:

- *spotted-tailed quoll (Dasyurus maculatus maculatus);*
- *brown treecreeper (eastern subspecies) (Climacteris picumnus victoriae);*
- *speckled warbler (Chthonicola sagittata);*
- *grey-crowned babbler (eastern subspecies) (Pomatostomus temporalis temporalis); and*
- *hooded robin (south-eastern form) (Melanodryas cucullata cucullata).*

The Ecological Assessment **did not** consider the loss of 56 hectares of Central Hunter Grey Box – Ironbark Woodland EEC to constitute a significant impact, with the loss representing approximately 0.38 per cent of the extant distribution of this community (based on the mapping of Peake (2006)).

The study area assessed in the Ecological Assessment comprises the Proposed Modification Area which represents the maximum area of surface disturbance for the Project. The Proposed Modification Area occurs within the LCO approved DA boundary. The Proposed Modification Area incorporates the extension of the open cut mining footprint, including the extension of the existing South and Entrance Pits to the south-east and the mining of coal resources under the Mine Infrastructure Area (MIA) during which the MIA will be relocated to a temporary facility. Survey and assessment of areas within the broader LCO approved DA boundary were also undertaken to further define the presence and extent of key threatened fauna species and ecological communities that are known to occur in the local area. For the purposes of the Ecological Assessment, the LCO approved DA boundary can be considered the local level in relation to the assessment of ecological impacts.

The Ecological Assessment provides an extensive assessment of the ecological communities of the Project at the local level and includes a detailed description of vegetation communities (refer to Section 4.2 and Figure 4.1 of the Ecological Assessment), fauna habitats and fauna species (including threatened species) known to occur at the local level (refer to Section 4.3 and Figure 4.2 of the Ecological Assessment) and aquatic habitats and species occurring locally (refer to Section 4.3.5 of the Ecological Assessment). The impact assessment presented in Section 5.0 of the Ecological Assessment provides a thorough assessment of the loss of ecological values identified in the Proposed Modification Area at both the local level and also at a regional scale.

The assessment of impacts of vegetation removal upon threatened species and ecosystems was undertaken at a local level as part of the seven-part tests, including impacts upon dispersal, foraging and breeding habitat. Specifically, the seven-part tests were conducted for all threatened species, populations and ecological communities identified as requiring a detailed assessment of significance (refer to Appendices 4 and 5 of the Ecological Assessment). The seven-part tests undertaken for each species, population and community included an assessment of impacts at the local level during factors (a), (b), (c), (d) and (e).

The impact assessment provided within Section 5.0 of the Ecological Assessment provides a thorough and appropriate assessment of the ecological impacts of the Project at both a local and regional scale and the outcomes of the impact assessment can be viewed with a high degree of certainty.

2.4 Review of Mitigation Measures

OEH commends the range of impact mitigation measures that are proposed as part of the Project, particularly the rehabilitation of the Bowmans Creek Corridor that will result in increased connectivity across the landscape and rehabilitate a high conservation value riparian corridor. OEH contends however, that there are a number of issues which detract for the overall approach proposed in the Ecological Assessment, in terms of OEH's ability to make an assessment of the adequacy of the proposed measures.

- a) *While connection is intended to be made with remnant vegetation within the Mountain Block Offset Area (see comments below) this proposed 'native woodland' connection spans an area of largely disturbed grassland which will require long-term commitment to realise a functioning 'corridor', at the moment, the EA only identified preliminary completion criteria, no work schedules are provided.*

The proposed community-based outcomes of the revegetation of the Bowmans Creek Riparian Corridor are provided in detail in **Table 2.1** and **Figure 2.1**, and are discussed in detail in the following section. These outcomes have been designed based on those communities currently present, or those that would have been present previously.

Revegetation works completed at the neighbouring Mount Owen Complex have included the revegetation of large areas (175 hectares) of existing pasture with species characteristic of Central Hunter Ironbark – Spotted Gum – Grey Gum Forest. This community is comparable to those proposed to be revegetated within the Bowmans Creek Riparian Corridor.

As part of a recent assessment of the ecological outcomes of mine rehabilitation, regeneration and revegetation at the Mount Owen Complex (Umwelt 2013), the revegetation and regeneration areas were found to be in typically of good condition. The canopy is typically sparse to mid-dense and dominated by species characteristic of Central Hunter Ironbark – Spotted Gum – Grey Gum Forest. The shrub layer is typically sparse and consists of a range of native species. The ground layer is typically mid-dense and is dominated by a variety of native herbs and grasses.

Comparisons were made against the NSW Scientific Committee's final determination for the *Central Hunter Ironbark – Spotted Gum – Grey Gum Forest in the NSW North Coast and Sydney Basin Bioregions* Endangered Ecological Community (EEC). Revegetation and regeneration areas were found to be self-sustainable (through species recruitment), support a canopy dominated by spotted gum (*Corymbia maculata*) and other characteristic canopy species, and support a reasonable to moderate proportion of species that are listed as being characteristic of the EEC.

The revegetation and regeneration areas also provide habitat for a variety of fauna species, with a range of threatened fauna species having been recorded utilising revegetation and regeneration areas to date, including the spotted-tailed quoll and a variety of woodland birds.

Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.), which can be measured against to demonstrate progress and ultimate success of rehabilitation or revegetation/regeneration works. As such, they provide a defined end point, at which point in time rehabilitation or revegetation/regeneration works can be deemed successful.

The preliminary rehabilitation or revegetation/regeneration completion criteria for the Project are outlined in Table 6.2 of the Ecological Assessment and will guide the ongoing rehabilitation or revegetation/regeneration of the site. The criteria have been developed considering site specific issues and objectives, Glencore standards and the outcomes of the 2005 ACARP study entitled 'Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley'.

The completion criteria are expected to be subject to refinement as the Project progresses, including through consultation with the relevant stakeholders, as an outcome of ecosystem monitoring, modifications to best practice rehabilitation or revegetation/regeneration techniques and process within the mining industry in the Hunter Valley and elsewhere over the life of the Project and will be utilised to demonstrate achievement of rehabilitation or revegetation/regeneration objectives.

The achievement (or otherwise) of the completion criteria will be monitored and reported within the reports to be submitted to relevant government agencies and will be finalised in consultation with relevant authorities as part of the decommissioning process of the mine.

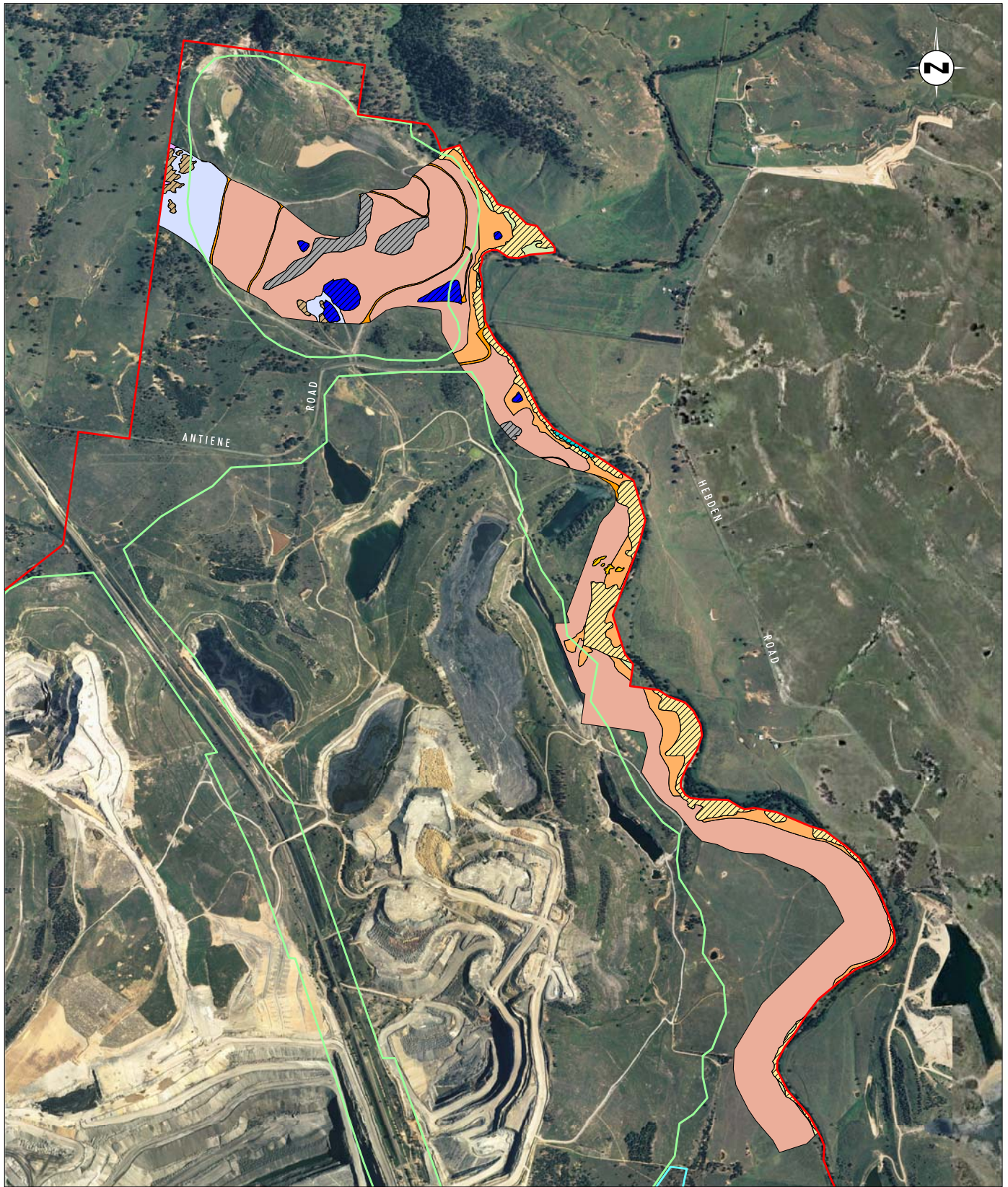


Image Source: Xstrata (2013), Google Earth (2008)
Data Source: Xstrata (2012)

0 0.5 1.0 1.25 km
1:25 000

Legend

- Liddell Coal Operations Approved DA Boundary
- Approved Mining Footprint
- Referral Area
- Central Hunter Box - Ironbark - Angophora Dominated - Rehabilitation
- Central Hunter Box - Ironbark - Ironbark Dominated - Rehabilitation
- Central Hunter Box - Ironbark Woodland
- Dam
- Disturbed Land
- Hunter Valley River Oak Forest

- Hunter Valley River Oak Forest - Revegetation
- Narrow-leaved Ironbark - Spotted Gum Woodland
- Narrow-leaved Ironbark - Spotted Gum Woodland - Rehabilitation
- Narrow-leaved Ironbark - Spotted Gum Woodland DNG
- Rehabilitation
- Water Body
- Unchanged Vegetation

FIGURE 2.1

Post Rehabilitation of Bowmans
Creek Riparian Corridor

Further to this, it was not a requirement of the DGR's that the level of post-approval planning required to provide a schedule of works be provided as part of the Ecological Assessment (as requested by OEH), or broader EA. This level of work is typically provided in post-approval management plans, and will be so as part of this Project.

b) The amount of river oak and ironbark – box forest to be planted in the 'riparian corridor' is not clear.

Approximately 143 hectares of either current grassland or disturbed land occurring within the Bowmans Creek Riparian Corridor is proposed to be rehabilitated as part of the Biodiversity Offset Strategy. Proposed rehabilitated target communities are provided in **Table 2.1** below, and the post-revegetation vegetation communities are presented in **Figure 2.1**.

Table 2.1 – Proposed Revegetation Outcomes for Bowmans Creek Riparian Corridor

Vegetation Community	Existing (Ha)	Proposed Revegetation (Ha)	Post-Revegetation (Ha)
Central Hunter Box - Ironbark DNG	10	0	0
Central Hunter Box - Ironbark Woodland (EEC)	0	130.7	130.7
Dam	4	0	4
Disturbed Land	5	0	0
Hunter Valley River Oak Forest	20	1.5	21.5
Introduced Grassland	121	0	0
Introduced Woodland	4	0	4
Narrow-leaved Ironbark - Spotted Gum Woodland (EEC)	2	10.5	12.5
Narrow-leaved Ironbark - Spotted Gum Woodland DNG	9	0	0
Rehabilitation	7	0	7
Water Body	1	0	1
TOTAL	182	143	181

Note: All values have been rounded up to the nearest whole number. All values subject to minor mapping/GIS-based variation.

Revegetation works will include a mixture of tree plantings and habitat structures constructed adjacent to the creekline. It is the intention that these works will link this area with native vegetation corridors established on rehabilitated mine land to facilitate the movement of the spotted-tailed quoll and other fauna species to other remnant vegetation areas in the region such as the Mountain Block Offset Area and the Hillcrest Offset Area (managed by Glencore Coal's Ravensworth Operations).

c) According to Figure 6.1 and 6.2 of Appendix H, no enhancement of the 'corridor' is to the south of where the Entrance Pit is to be located. This is the area where the creek is at its closest location to the new pit extension (160m) and is the area which would require supplementary planting to mitigate indirect impacts from the mine the most.

The location of the proposed Bowmans Creek Riparian Corridor has been determined to specifically address the key residual ecological impacts of the Project, in particular, residual impacts on the spotted-tailed quoll (*Dasyurus maculatus maculatus*). The location of the Bowmans Creek Riparian Corridor includes areas of known habitat, such as the confirmed

breeding den, and seeks to link proximate areas of known and potential habitat in the local area, including known habitat in nearby Glencore conservation areas established by Ravensworth Surface Operations and the Mount Owen Complex (refer to **Figure 2.2**). One of the key objectives of the Bowmans Creek Riparian Corridor is to provide a linkage between areas of known, conserved habitat for the spotted-tailed quoll.

While it is noted that the Corridor does not extend south of the Entrance Pit location, the southern portion of Bowmans Creek was not considered as vital to the ongoing persistence of the spotted-tailed quoll in the local area as the disjunct habitats to the north of the Proposed Modification Area. Focusing the Corridor in the area to the north of the Proposed Modification Area has also intended to facilitate movement to secure habitats to the north, as opposed to operational areas to the south. While this species has clearly existed in proximity to operational mining for a number of years, it is the intent to focus rehabilitation, revegetation and habitat augmentation works in areas away from the operating mine.

The proposed location of the Bowmans Creek Riparian Corridor is appropriate in order to meet its stated objective of compensating for the residual impact of the Project on the spotted-tailed quoll, as it contains the known den site as well as areas of high activity leading north to other areas of known habitat and high activity records.

It is also noted that the enhancement of the habitat values within the Bowmans Creek Riparian Corridor will result in an improved ecological outcome for threatened woodland birds that are considered potentially significantly impacted by the Project and also locally occurring threatened vegetation communities.

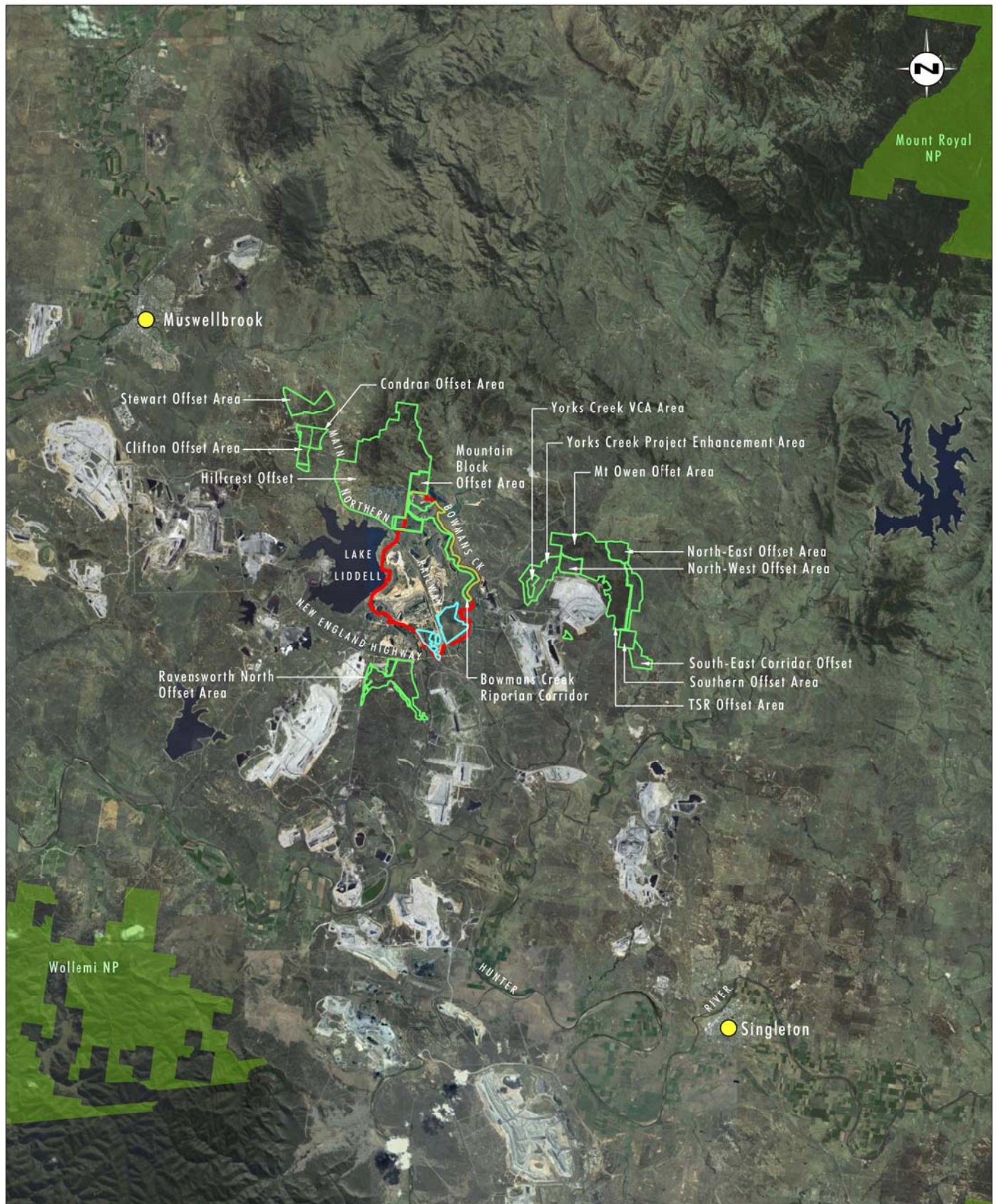
2.5 Review of Compensatory Package

The key objectives of the Biodiversity Offset Strategy are to:

- maintain or improve the biodiversity values of the surrounding region in the medium to long term;
- maintain or improve the viability of threatened species that could be affected by the Project through the securing and/or restoration of habitat in the Hunter Valley or elsewhere within their range; and
- ensure that there are no residual significant impacts on key threatened species and ecological communities in the long term as a result of the construction and operation of the Project.

The Biodiversity Offset Strategy consists of a number of components designed to address the identified impacts on TECs and threatened species. These measures include:

- an effective targeted post-mining rehabilitation strategy to be undertaken on a progressive basis to reduce impacts of the Project at any one time and reduce offsetting requirements;
- immediate establishment and long-term protection of the 166 hectares of land in the form of the Mountain Block Offset Area to allow for the conservation of comparable areas of existing vegetation and the protection of threatened woodland birds, known spotted-tailed quoll habitat, micro-bats and TECs;



Source: Google Earth (2010), Xstrata (2013)

0 2.5 5.0 10. km
1:250 000

Legend

- Liddell Coal Operations Approved DA Boundary
- Referral Area
- Approved Glencore Offsets
- National Park

FIGURE 2.2

Conservation Areas Surrounding
Liddell Coal Operations

-
- ongoing management and monitoring of the Mountain Block Offset Area to increase existing biodiversity values, including actions such as weed and feral animal management, fencing, and natural regeneration;
 - immediate establishment, long-term protection and revegetation of the 182 hectare Bowmans Creek Riparian Corridor to allow for the protection and enhancement of an area of high spotted-tailed quoll activity (including a known breeding den), TEC establishment, as well as establishment of additional woodland bird and micro-bat habitat;
 - preliminary rehabilitation and revegetation/regeneration completion criteria to measure the achievement of objectives. These also relate to revegetation/regeneration and habitat enhancement works planned for the Biodiversity Offset Areas; and
 - the development of an appropriate ecological monitoring program to assess the success of the Biodiversity Offset Strategy in counterbalancing the impacts of the Project on ecological values.

OEH has a number of concerns about the suitability of the offset package in terms of it being able to remove any residual impact upon threatened biodiversity. OEH contend that they requested the proponent to choose one pathway to evaluate their offset proposals and that the proponent use the BioBanking Assessment Methodology (BBAM) to quantify the biodiversity losses and gain.

There is no quantification of residual impact (in terms of biodiversity gain or loss) that would satisfy Principle 9 of the old Principles “Offsets must be quantifiable – the impacts and benefits must be reliably estimated” or Principle 2 of the new principles “Offset requirements should be based in reliable and transparent losses and gains” (OEH 2013).

Since the submission of the Ecological Assessment, detailed vegetation mapping of the existing vegetation of the Bowmans Creek Riparian Corridor has been completed in order to inform revegetation planning (**Figure 2.1**). This now supplements the substantial, detailed surveys completed in the Mountain Block Offset Area and the Bowmans Creek Riparian Corridor in order to gain a thorough understanding of the ecological values of the proposed offset sites to allow for a quantifiable and transparent assessment of their value in compensating for the residual impacts of the Project, under the Tier 3 Mitigated Net Loss offset strategy outcome. The Ecological Assessment details the ecological features of the Proposed Modification Area, as well as the Mountain Block Offset Area and Bowmans Creek Riparian Corridor.

From the detailed surveys and assessment provided in the Ecological Assessment, thorough quantification of the direct and indirect impacts (biodiversity losses) of the Project were made, which included application of the precautionary principle, where appropriate. The additional surveys completed within the Bowmans Creek Riparian Corridor reinforce the data on which these assessments were made.

Section 3.0 of the Ecological Assessment details the extent of flora and fauna survey undertaken within the Proposed Modification Area and Bowmans Creek Riparian Corridor, and Section 7.9.2 provides the survey effort for the Mountain Block Offset Area, in accordance with OEH ecological survey guidelines (DEC 2004). Thorough knowledge of the vegetation communities, fauna habitat presence/absence of threatened and migratory species and communities, condition and threats relating to the proposed offset sites was gained as a result of the targeted surveys. The knowledge has allowed for an accurate assessment of the biodiversity gains provided by the in perpetuity conservation of the proposed offset sites and consideration was given to the results of recent research into the

ecological outcomes of targeted restoration of threatened vegetation communities at the nearby Mount Owen Complex. The restoration of native vegetation communities (and associated habitat) is an integral and well demonstrated component of contemporary offset establishment and management. Consideration of outcomes of similar ecological restoration initiatives at adjacent Glencore Operations allows the habitat revegetation and regeneration proposed as part of the Biodiversity Offset Strategy to be viewed with a high degree of confidence.

The thorough ecological survey and assessment provided in the Ecological Assessment allows for a reliable, thorough, transparent and clearly quantifiable assessment of the biodiversity losses resulting from the Project and the biodiversity gains proposed as part of the in-perpetuity Biodiversity Offset Strategy.

OEH contend that the proposed offset strategy does not meet the Tier 3 mitigated net loss scenario as it provides a maximum offset ratio of 0.5:1 and that without consideration of the rehabilitation strategy, the offset package does not meet the requirements of a Tier 3 outcome.

The Biodiversity Offset Strategy has been developed through detailed consideration of likely impacts of the Project on threatened and migratory species and TECs (including their habitats), which have been identified and discussed in Section 5.0 of the Ecological Assessment. The selection of the Mountain Block Offset Area took into account identified impacts, and identified preferences based on the ability of available areas to appropriately address such impacts. The potential for restoration and recreation of substantial areas of threatened species habitat was also prioritised in the selection of the site.

It is notable that in their assessment of the adequacy of the proposed Biodiversity Offset Strategy, OEH have not included the Bowmans Creek Riparian Corridor as an offset. This area is indeed proposed for in-perpetuity conservation as part of the Biodiversity Offset Strategy. Its contribution to achieving the Tier 3 Mitigated Net Loss outcome must then be included in the overall assessment of adequacy.

In addition to this, OEH have not considered the ecological gain from the proposed regeneration and revegetation works proposed as part of the Biodiversity Offset Strategy in their overall assessment of adequacy of the strategy. This too, should be considered in the outcomes. The inclusion of gain from environmental improvement through the revegetation or regeneration of grassland is consistent with OEH's BioBanking and BioCertification methods, and should not be overlooked.

When including the two above factors, **Table 2.2** demonstrates how the proposed Biodiversity Offset Strategy addresses the minimum 2:1 offset to impact ratio in accordance with a Tier 3 Mitigated Net Loss outcome.

Table 2.2 – Adequacy of Proposed Biodiversity Offset Strategy

	Amount Impacted	Area needed at Tier 3 (2:1)	Regenerated Mountain Block Offset Area	Rehabilitated Bowmans Creek Offset Area	Ratio Achieved (x:1)	Tier 3 (2:1) Outcomes Achieved?	Ratio Achieved if Considering Native Woodland Component of Post-Mining Rehabilitation
Central Hunter Grey Box Ironbark Woodland EEC	56	112	157.7	131	5.2:1	Yes	5.2:1*
Woodland birds	123	246	165.7	179	2.8:1	Yes	8.7:1
Migratory Winter Birds	56	112	157.7	131	5.2:1	Yes	18.2:1
Spotted-tailed Quoll	188	376	165.7	175.7	1.8:1	No	5.7:1

Note: All values have been rounded up to the nearest whole number. All values subject to minor mapping/GIS-based variation.

* The vegetation composition of the Native Woodland community has yet to be defined, as such has not been allocated to the ratio achieved for the EEC. It has, however been added as habitat for woodland birds, migratory winter birds and the spotted-tailed quoll, as it will be native and dominated by locally-occurring flowering eucalypts.

The above table identifies that the key ecological features (known and potential) that factored into the development of the Biodiversity Offset Strategy are offset at greater than Tier 3 requirements (2:1), except for the spotted-tailed quoll. However, Liddell's commitment to rehabilitate approximately 731 hectares of Native Woodland within the post-mining LCO will equate to a ratio of 5.7:1 for the spotted-tailed quoll. This excludes consideration of the 1247 hectares of Open Grassland with Pockets of Scattered Trees that have been proposed for the remainder of that rehabilitation area. This could also reasonably be considered as habitat for the spotted-tailed quoll as it has been recorded in grasslands of the area (including grazed areas); however this is of lower habitat quality.

Liddell's commitment to rehabilitate around 731 hectares of mined land to Native Woodland will provide additional gains for a range of other threatened fauna, particularly in the medium (5 to 10 years) to long term, as rehabilitation works will focus on the creation of woodland communities characteristic of those impacted by the Project. This is a major commitment by Liddell, with significant cost inputs required to achieve this quality and type of rehabilitation above conventional mine rehabilitation practices.

OEH had requested that the proponent use the BioBanking Calculator in order to quantify the adequacy of the proposed offsets but notes that this has not been undertaken.

Glencore propose to offset the residual impacts of the project under the OEH Biodiversity Offsets Policy (2013) in accordance with a Tier 3 Mitigated Net Loss Outcome. Justification for the use of the Tier 3 outcome is provided in Section 7.3.2 of the Ecological Assessment.

Tier 3 is most applicable to the LCO Project Biodiversity Offset Strategy. In considering whether the mitigated net loss standard is appropriate, consideration is given to:

- whether the credits required by the calculator are available on the market;
- whether alternative offset sites (other than credits) are available on the market; and
- the overall cost of the offsets and whether these costs are reasonable given the circumstances.

Should any of these circumstances apply, then it is reasonable to apply the variation criteria to the point that:

- suitable offset sites can be found within a reasonable timeframe;
- the costs of offsetting is brought within a reasonable range; and
- an offset to clearing ratio of at least 2:1 vegetated to cleared hectares is achieved.

As it is proposed to offset the residual impacts of the Project under a Tier 3 outcome, a BioBanking calculator assessment is not required.

Glencore in association with Umwelt have undertaken various mine rehabilitation trials, however, there is currently no strong evidence that mine rehabilitation can be used to recreate threatened ecological communities or threatened species habitat.

An assessment of mine rehabilitation and regeneration activities at the Mount Owen Complex was undertaken (Umwelt 2013) to report on the ecological value of the rehabilitated vegetation communities at the Mount Owen Complex, particularly in the context of vegetation community re-establishment and threatened species habitat. A targeted flora survey and condition assessment was undertaken in mine rehabilitation and vegetation areas across the Mount Owen North Pit rehabilitation area, the New Forest Area and existing Mount Owen Biodiversity Offset Areas, to provide context and certainty surrounding the inclusion of proposed mine rehabilitation and regeneration works in proposed Glencore Biodiversity Offset Strategies in the Hunter Valley. Following collection of the flora and condition assessment data, a thorough assessment of fauna monitoring results in relation to mine rehabilitation and habitat regeneration was undertaken, particularly focussing on the statistical analysis that is undertaken annually as part of the fauna monitoring. The key outcomes of the assessment (Umwelt 2013) are provided below.

The assessment of similarity between rehabilitation, revegetation and regeneration areas and the EEC determination for Central Hunter Ironbark – Spotted Gum – Grey Box Forest identified that areas of revegetation and regeneration in the New Forest Area and Biodiversity Offset Areas conform to the scientific committee determination of Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC and therefore meet the rehabilitation objectives and site preliminary completion criteria detailed in the Landscape Management Plan. At this stage, the mine rehabilitation (variously 6, 9-10 and 15 years old) was assessed as trending towards the Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC, and there is evidence that this trend will continue.

Monitoring of the fauna habitat provided by the rehabilitation and regeneration sites at the Mount Owen Complex is clearly demonstrating that actively managed rehabilitation and regeneration can provide a high quality habitat for native fauna species from each of the main vertebrate fauna groups and including threatened species. Annual fauna monitoring has measured the diversity of threatened species utilising forest, regeneration and rehabilitation monitoring sites. A total of 29 species listed under either the TSC or EPBC Act

have been recorded at the Mount Owen Complex. Of the 29 threatened species recorded, 13 have been recorded in forest regeneration monitoring sites and 11 in post mining rehabilitation sites. Threatened species that have been recorded in mine rehabilitation include (amongst others) the spotted-tailed quoll, grey-crowned babbler, speckled warbler, hooded robin. All of these species are considered to be potentially significantly impacted by the Project at Liddell, as they have been recorded within the Proposed Modification Area. In addition, at the Mount Owen Complex additional threatened species such as the squirrel glider, masked owl and grey-crowned babbler have each been regularly recorded in regeneration monitoring sites.

Mount Owen has had considerable success in re-establishing vegetation communities on mine spoil. Mount Owen has worked closely with researchers from the University Of Newcastle with the initial goal of the Mount Owen Complex research program to re-establish sustainable nutrient acquisition and cycling using natural root-microbe associations. This project soon expanded to include research into the use of available bulk materials and amelioration techniques for mine rehabilitation when forest topsoil would eventually run out. The rehabilitation strategy at the Mount Owen Complex has also benefited from the results of research such as a doctorate project through the University of Queensland titled 'Enhancing Eucalypt Forest Re-establishment on Coal Mined Land at Mount Owen'.

Mount Owen has also participated in several Australian Coal Association Research Program (ACARP) projects on mine site rehabilitation. In collaboration with the University of Newcastle, Mount Owen has embarked on a research program that will lead to the most effective methods to establish dry sclerophyll and other native forest communities on rehabilitated overburden dumps.

Since commencement, research has continued to develop as part of the Ravensworth State Forest Complex Research Program, with over forty studies and investigations currently established. Mount Owen is now listed as a 'Highly Commended' site on the Global Restoration Network of the Society for Ecosystem Restoration, International.

In addition to the on-going ecological research and monitoring at the Mount Owen Complex, Glencore is also funding or contributing funding towards other projects to improve success in native ecosystem rehabilitation and to develop an appropriate monitoring program for EEC communities in the Hunter Valley. The two most notable projects include:

- **Hunter Ironbark Research Program** – This program aims to foster research into the recovery of the establishment of Central Hunter Ironbark – Grey Box Woodland and Central Hunter Ironbark – Spotted Gum - Grey Box Forest, both of which are listed as EECs under the TSC Act, within rehabilitation areas. The research has a particular focus on the ground stratum plant species of the EECs. CAA has engaged the University of Newcastle's CSER undertake this research program at Glencore's Ravensworth mine in the Hunter Valley.
- **Hunter Spotted Gum – Ironbark Reference Sites Project** – This current project is being undertaken by Umwelt. Its aim is to review the existing performance indicators and completion criteria for Central Hunter Ironbark – Grey Box Woodland and Central Hunter Ironbark – Spotted Gum - Grey Box Forest EECs, as detailed in relevant commitments within EAs/EISs, conditions of approval from the Department of Planning and Infrastructure and relevant management plans for participating mines. This study will identify the location of suitable reference sites for these two communities and develop a comprehensive monitoring program in order to inform whether completion criteria/performance indicators are being met in mine rehabilitation, revegetation and regeneration areas. The study is being undertaken in conjunction with Rio Tinto as part of the Upper Hunter Mining Dialogue.

The assessment of the ecological values of rehabilitated formerly mined land and those areas that have been subject to vegetation community and fauna habitat reconstruction programs demonstrates that rehabilitated land can create quality vegetation communities and fauna habitats that includes threatened fauna species and EEC habitat. In addition, on a regional scale rehabilitation of mined land to native woodland communities makes a fundamental contribution to the re-establishment of vegetation corridors across the highly cleared and fragmented Hunter Valley floor.

With respect to 1200 ha of the Open Grassland with pockets of Native Vegetation category that is proposed, it is understood that this area is mostly not intended as an ecological zone, but one better suited for agriculture. While scattered trees or 'pockets of native vegetation' are intended to play a part of rehabilitation mix, this category can only be regarded as having a final vegetation type as being grassland, and then it is unclear if native species will be the dominant type, given its anticipated outcome to provide forage for stock.

The proposed rehabilitation of post-mining land within LCO (including the post-mining Proposed Modification Area) involves the reestablishment of 1247 ha of Open Grassland with Pockets of Native Vegetation and 731 hectares of Native Woodland (see Section 6.2 of the Ecological Assessment).

Commensurate with the primary intended final land use of grazing in Open Grassland with Pockets of Native Vegetation rehabilitation areas, the Ecological Assessment states that both native and suitable exotic pasture species will be used in these areas. All woody vegetation established in Open Grassland with Pockets of Native Vegetation areas will be native. The Open Grassland with Pockets of Native Vegetation areas are considered to contribute to mitigating the overall impacts of the project, providing lower quality habitat for the spotted-tailed quoll and other native fauna species such as brown tree creeper (eastern subspecies) (*Climacteris picumnus victoriae*), grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) and hooded robin (south-eastern form) (*Melanodryas cucullata cucullata*).

Even though it is not proposed for in-perpetuity protection, it is reasonable to include the 731 hectares of Native Woodland that will be established as part of this post-mining rehabilitation in addressing the minor shortfall in achieving 2:1 offsetting for the spotted-tailed quoll (see **Table 2.2**). This species has been recorded using rehabilitation and grassland areas with scattered trees in the LCO and at the nearby Mount Owen Complex, as such this proposed rehabilitation will provide large amounts of additional moderate quality (woodland) and lower quality (grassland areas with scattered trees) habitat for this species. If considering only the woodland rehabilitation works proposed and the habitat within the Biodiversity Offset Areas, this would equate to 5.7:1 outcome for the spotted-tailed quoll. This outcome would increase to 12.3:1 if including the grassland component of this rehabilitation. It is noted that the impact assessment has included loss of grassland on this species, so a consistent approach would result in 12.3:1 offsetting outcomes.

With respect to the use of 183 ha corridor habitat enhancement area as an offset, this would be acceptable to OEH as an offset given most of this zone is on unmined land and contains stands of existing river oak forest. However, it is stated in Ch6.2.2 of Appendix H, some of this corridor would be rehabilitated to Central Hunter Grey Box – Ironbark Woodland outside of the ‘riparian zone’ and some would be rehabilitated to Hunter Valley River Oak Forest. This would be an acceptable offset for the loss of the Swamp Oak Forest in the development footprint, however it is not clear from the Figures provided in Appendix H approximately how much of each type is anticipated as an outcome within the riparian corridor and so in terms of how this corridor can offset residual impacts is uncertain.

Revegetation of the Bowmans Creek Riparian Corridor will improve the current poor levels of vegetative connectivity within the LCO holdings and to adjoining remnant vegetation in the local area.

The current and proposed revegetated vegetation communities of the Bowmans Creek Riparian Corridor are provided in **Table 2.3**, below and are depicted in **Figure 2.1**.

Table 2.3 – Post-Revegetation Bowmans Creek Riparian Corridor

Vegetation Community	Existing (Ha)	Proposed Revegetation (Ha)	Total Post Revegetation (Ha)
Central Hunter Box - Ironbark DNG	10	0	0
Central Hunter Box - Ironbark Woodland (EEC)	0	130.7	130.7
Dam	4	0	4
Disturbed Land	5	0	0
Hunter Valley River Oak Forest	20	1.5	21.5
Introduced Grassland	121	0	0
Introduced Woodland	4	0	4
Narrow-leaved Ironbark - Spotted Gum Woodland (EEC)	2	10.5	12.5
Narrow-leaved Ironbark - Spotted Gum Woodland DNG	9	0	0
Rehabilitation	7	0	7
Water Body	1	0	1
TOTAL	182	143	182

Note: All values have been rounded up to the nearest whole number. All values subject to minor mapping/GIS-based variation.

From the above, approximately 143 hectares of either current grassland or disturbed land occurring within the Bowmans Creek Riparian Corridor is proposed to be regenerated as part of the Biodiversity Offset Strategy. The amount of Hunter Valley River Oak Forest proposed to be regenerated is limited by the topography of the area, with this community only currently occurring to the top of the creek bank and not extending further onto the creek terraces. This pattern has been replicated within the proposed regeneration of this area. The remaining vegetation to be regenerated will comprise the Central Hunter Box - Ironbark Woodland, with suitable variation built into to the on ground planning, where suitable. An example of this will be focusing the rough-barked apple dominated variant of this community on the lower slopes.

Revegetation works will include a mixture of tree plantings and habitat structures constructed adjacent to the creekline. It is the intention that these works will link this area with native vegetation corridors established on rehabilitated mine land to facilitate the movement of the spotted-tailed quoll and other fauna species to other remnant vegetation areas in the region such as the Mountain Block Offset Area and the Hillcrest Offset Area (managed by Glencore Coal's Ravensworth Operations).

Habitat enhancement measures within the Bowmans Creek Riparian Corridor will also include spotted-tailed quoll specific habitat structures such as log-piles (similar to that containing the known female spotted-tailed quoll den site) as well as works aimed at increasing prey-densities for the spotted-tailed quoll through installation of nest boxes and the planting of specific foraging resources.

Salvage of hollow-bearing trees (and non-hollow bearing trees if sufficient resources are lacking) felled during construction and placement of log piles within areas of revegetation (particularly along drainage lines); as well as salvage and placement of large rocks and boulders will be used to increase the extent of potential foraging and denning habitat, where practicable.

It would take only 10ha of Riparian River Oak Forest to offset the loss in Forested Wetlands under a Tier 3 outcome, though 200ha of remnant grassy woodland area still required to offset residual impact upon this community and the threatened species it supports. For the Riparian corridor, OEH supports a 50% substitution ratio for this restoration area which would provide an unknown number of hectares to offset the loss of Grey-Box Ironbark Forest.

As stated in **Table 2.3** above the Bowmans Creek Riparian Corridor contains 20 hectares of River Oak Riparian Forest and it is proposed to revegetate an additional 1.5 hectares within the riparian zone of the creek. As stated by OEH, this outcome adequately offsets the loss of Forested Wetlands under the Tier 3 Mitigated Net Loss outcome.

In addition to the 21.5 hectares of River Oak Forest in the Bowmans Creek Riparian Corridor, it is proposed to revegetate an additional 130.7 hectares of Central Hunter Box – Ironbark Woodland and 10.5 hectares of Narrow-leaved Ironbark Spotted Gum Woodland.

Additionally, as part of Project, previously-disturbed vegetation within the Mountain Block Offset Area will be regenerated consistent with their benchmark community. This will result in increased areas of key threatened ecological communities, as well as increasing and improving the quality of fauna habitat, particularly for species such as the spotted-tailed quoll, and woodland birds.

Regeneration works will also serve to improve connectivity throughout the area and build upon the connectivity of the existing vegetation patches in the Offset Area and to adjoining remnant vegetation in the local area.

Approximately 101 hectares of either current grassland or disturbed land occurring within the Mountain Block Offset Area is proposed to be regenerated. Proposed regenerated target communities are provided in **Table 2.4** below, and the post-regeneration vegetation communities are presented in **Figure 2.3**.

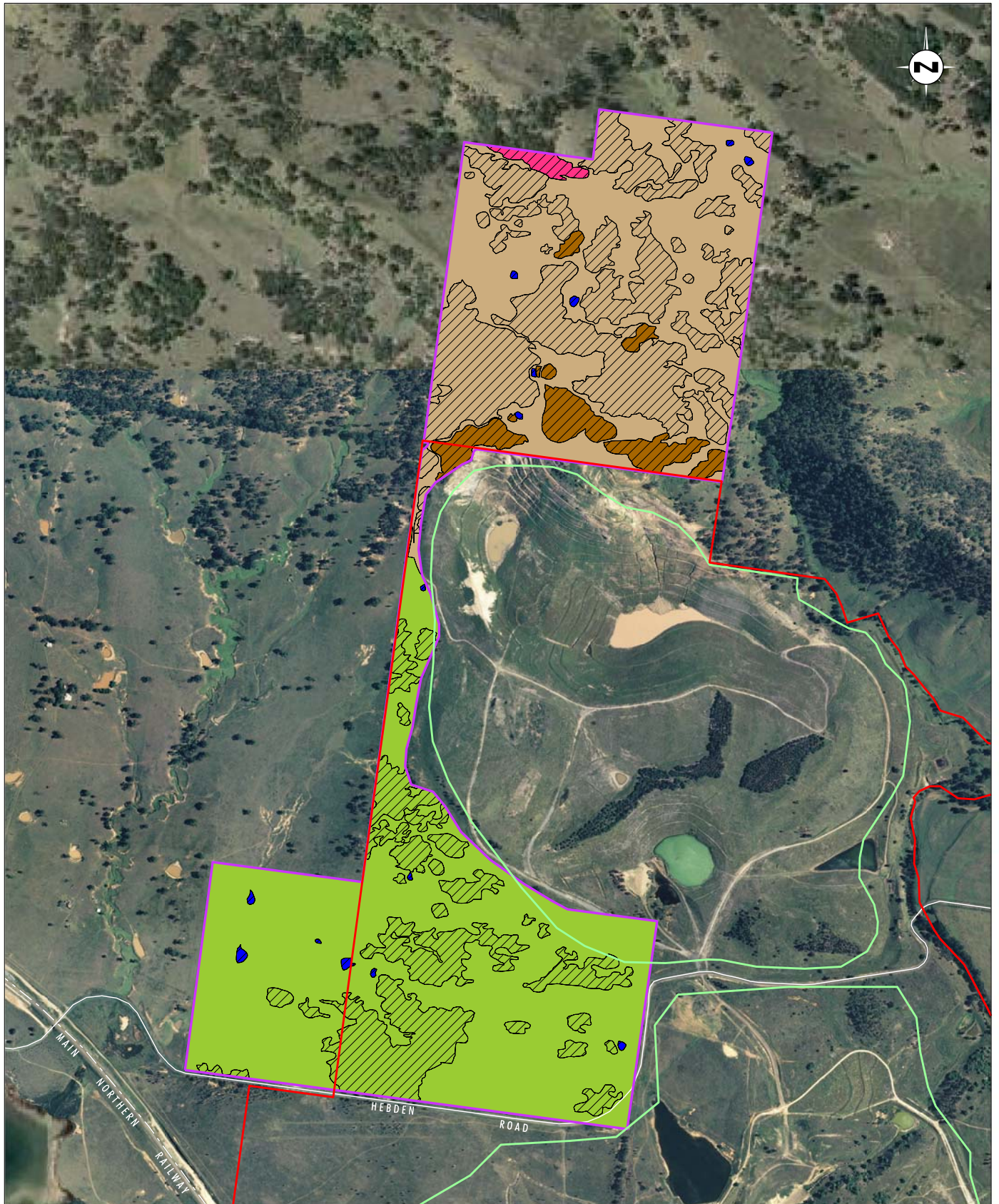


Image Source: Liddell Coal Operations (2013), Google Earth (2008)
Data Source: Liddell Coal Operations (2012), Umwelt (2013), ELA (2012)

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Legend

- Liddell Coal Operations Approved DA Boundary
- Approved Mining Footprint
- Mountain Block Offset Site
- Dam
- Grey Myrtle - Kangaroo Vine Dry Rainforest
- Narrow-leaved Ironbark - Bulloak Open Forest
- Narrow-leaved Ironbark - Bulloak Open Forest
- Narrow-leaved Ironbark - Spotted Gum Woodland
- Rusty Fig Dry Rainforest
- Unchanged Vegetation

FIGURE 2.3

Post-Rehabilitation of
Mountain Block Offset Area

Table 2.4 –Target Regeneration Communities within Mountain Block Offset Area

Target Rehabilitation Community	Status		Current Area (ha)	Target Post-Regeneration Area (ha)
	TSC Act	EPBC Act		
Narrow-leaved Ironbark Spotted Gum Woodland	EEC	-	35	73
Narrow-leaved Ironbark – Bulloak Open Forest	EEC	-	22	84.7
Narrow-leaved Ironbark Spotted Gum Woodland DNG	-	-	33	-
Grey Myrtle – Kangaroo Vine Dry Rainforest	-	-	1.1	1.1
Rusty Fig Dry Rainforest	-	-	6.9	6.9
Narrow-leaved Ironbark – Bulloak Open Forest DNG	-	-	60	-
Disturbed Land	-	-	7.7	-
Dam	-	-	0.6	0.6
TOTAL			166.3	166.3

Note: All values have been rounded up to the nearest whole number. All values subject to minor mapping/GIS-based variation.

Regeneration works will primarily focus on passive methods, however will include plantings or active regeneration works where necessary. Habitat augmentation will also occur within this Offset Area, where monitoring identifies that particular resources are lacking. It is the intention that these works will strengthen the current link to the Bowmans Creek Riparian Corridor, as well as to the existing Hillcrest Offset Area (for the neighbouring Ravensworth Operations). This will assist in facilitating the movement of the spotted-tailed quoll and other fauna species throughout the local area by way of vegetated habitat and corridors.

The proponent states that the conservation mechanisms that would protect the offset lands in perpetuity would be identified at the DA stage. It is OEH's preference that this be determined as a condition of consent. Please note that is now OEH policy that a Conservation Agreement under the NPW Act is no longer an Acceptable conservation mechanism for offset lands, except where they have very high biodiversity value.

Appropriate mechanisms to protect in perpetuity offset areas in the Hunter Valley are currently being determined by Glencore, in consultation with OEH and DP&I. Glencore commits to the in-perpetuity conservation of the lands included in the proposed Biodiversity Offset Strategy.

3.0 References

Department of Environment Conservation (DEC) 2004. Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft, November 2004.

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OEH 2013. NSW Offset Principles for Major Projects (State Significant Development and State Significant Infrastructure).

Umwelt (Australia) 2013. Assessment of the Ecological Outcomes of Mine Rehabilitation, Regeneration and Revegetation at Mount Owen Mine. Report for Glencore Coal Assets Australia.