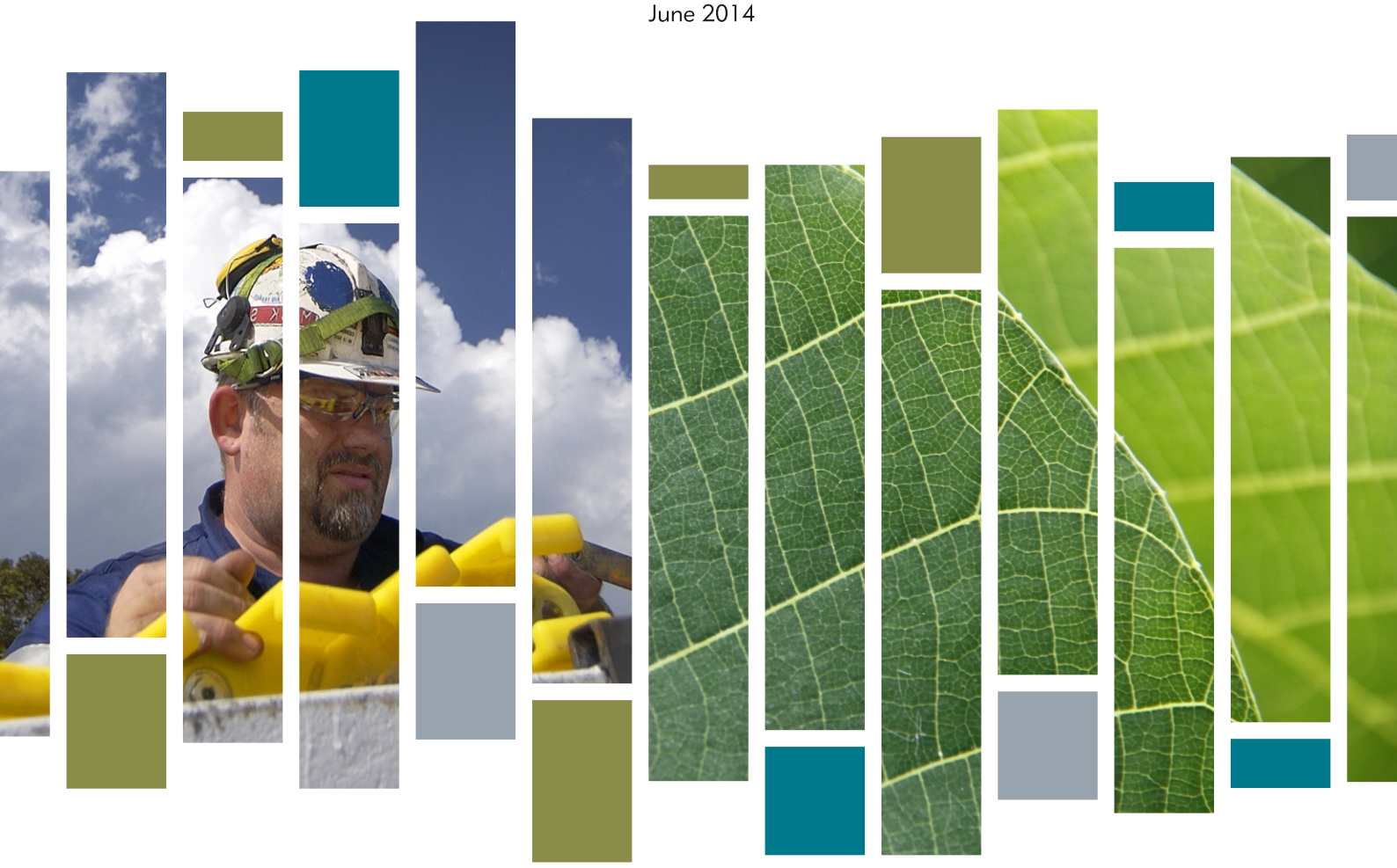
WEST WALLSEND
UNDERGROUND
GLENCORE

RESPONSE TO SUBMISSIONS REPORT

Proposed Longwalls 51 & 52
West Wallsend Colliery

June 2014



umwelt

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Proposed Longwalls 51 & 52
West Wallsend Colliery

June 2014

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Oceanic Coal Australia Pty Limited

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Report No. **3149/R04/FINAL**
Date: **June 2014**

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1.0 Introduction

This document provides a response to the issues raised in submission made during the public exhibition of Environmental Assessment (EA) for proposed Longwalls (LW) 51 and LW 52 (the Project) at West Wallsend Colliery (WWC). It has been prepared on behalf of Oceanic Coal Australia Pty Limited (OCAL) in response to a request from the Secretary of the Department of Planning and Environment in accordance with Section 75H(6) of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). The EA for was exhibited from 4 April 2014 to 21 April 2014. This report outlines OCAL's response to the issues raised in the submissions.

1.1 The Project

The Project is a proposed continuation of underground coal mining operations at the existing WWC, which is located in Western Lake Macquarie, New South Wales (NSW). The current mining operations at WWC utilise modern longwall mining techniques with mining currently progressing beneath areas of native woodland/forest vegetation, including mining beneath the Sugarloaf State Conservation Area (SSCA). Mining is approved to continue at WWC until 2021.

As a result of the ongoing review of mining operations at WWC, Oceanic Coal Australia Pty Limited (OCAL), the operator of WWC, is seeking to modify the current Project Approval for WWC granted in 2012 (PA 09_0203) to include two additional longwall panels; LW 51 and LW 52. The proposed additional mining area is adjacent to areas previously mined by WWC. The Project will consist of the development and mining of the two longwall panels with no changes proposed to the key WWC surface infrastructure which supports the mining operations. The proposed modification to the Project Approval is being sought under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project is an outcome of a detailed review undertaken of the WWC operations by OCAL, including review of the remaining coal resources within the WWC Mining Leases. As part of this review, OCAL has identified that it no longer intends to mine substantial portions of the currently approved coal resources at WWC in order to provide improved protection for environmental features above the approved mining area, and to ensure compliance with subsidence performance criteria. Within the currently approved mining areas, the combination of coal previously excluded from mining and those now no longer planned to be mined, equates to approximately 3 Million tonnes of run-of-mine (ROM) coal. This review process also identified that with the recent termination of a sub-lease to the adjacent Newstan Colliery, two additional longwall blocks (the Project) could be mined within the existing WWC Mining Lease area.

The proposed LW 51 and LW 52 will recover approximately 2.55 Million tonnes of ROM coal. As significant areas of the approved mine plan at WWC will no longer be mined, the inclusion of LW 51 and LW 52 will not result in any changes to the approved mine life. Annual production will remain at the existing approved limit of 5.5 million tonnes per annum (Mtpa) ROM coal.

The conceptual mining layout for the Project was developed by OCAL following consideration of a range of surface features and the findings of environmental studies. Key environmental and infrastructure constraints considered for the conceptual mine plan included:

- avoidance of impacts to significant Aboriginal cultural heritage and archaeological sites located to the east of the proposed mining area;

- minimising potential impacts to identified areas of alluvium to the south of the Project Area along Palmers Creek;
- minimising potential impacts to Wakefield Road and the M1 Motorway to the north of the proposed mining area; and
- avoiding an area of low depth of cover to the west of the proposed mining area.

1.2 Submissions Made on the Project

The Department of Planning and Environment (DP&E) advised that a total of 14 submissions were received during the EA exhibition period. Eight of the submissions were from government agencies including the following submissions that raise issues requiring a response:

- Lake Macquarie City Council (LMCC);
- Office of Environment and Heritage (OEH);
- Department of Primary Industries (DPI), including:
  - Crown Lands;
  - NSW Office of Water (NOW); and
- NSW Trade and Investment, Regional Infrastructure and Services, Division of Resources and Energy (DRE).

Issues raised in these submissions are addressed in detail in **Section 2.0** of this report.

In addition to the above, submissions were received from:

- Environment Protection Authority (EPA);
- OEH Heritage Division;
- Office of Agricultural Sustainability & Food Security; and
- Hunter New England Local Health District, Hunter New England Population Health.

None of the above agencies raised any issues to be addressed as part of this report.

Two public submissions and two environment group submissions, being the National Parks Association of NSW (NPA) and the Nature Conservation Council of NSW (NCC), were also received on the EA. These four submissions objected the Project. Issues raised in these submissions are addressed in detail in **Section 3.0** of this report.

A submission from the Sugarvalley Neighbourhood Centre in West Wallsend was received on the Project. The submission did not raise any issues to be addressed and supported the Project on the grounds of OCAL's ongoing support and funding of various activities and items within the Sugarvalley Neighbourhood Centre.

A submission was also received from the Construction, Forestry, Mining and Energy Union (CFMEU). The submission did not raise any issues to be addressed as part of the Project and strongly supported the Project.

1.3 Structure of the Report

This response to submissions report has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of OCAL to address the key issues raised through the submissions received on the EA through the public exhibition period. For each issue, the theme of the issue raised is noted in bold, followed by a response in normal type.

2.0 Response to Government Agency Submissions

2.1 Lake Macquarie City Council

Traffic

In relation to the impact of the proposal on roads and traffic, the following comments are provided:

- **A survey of the existing road asset condition may be required prior to undermining occurring.**
- **A Road Management Plan should be prepared between the Colliery and Council.**
- **Traffic control measures should be implemented where subsidence is expected to occur, such as lowering of the speed limit, and any other measures deemed suitable dependant on expected subsidence level. All traffic control plans to be submitted to Council's AM Transportation Planning Department prior to implementation, and drawn in accordance with AS1742.3 and RTA's Traffic Control at Worksites manual.**

As outlined in the EA, Wakefield Road is located outside of the predicted subsidence affection area (i.e. outside of the 20 millimetre subsidence contour) and is therefore unlikely to be adversely impacted by vertical subsidence. Cracking of the road surface is unlikely to occur.

WWC has previously successfully undermined Wakefield Road and worked with LMCC to develop and implement an appropriate Road Management Plan. As outlined in the EA, WWC will work with LMCC to develop an appropriate management plan prior to mining that addresses each of the above points raised in Council's submission.

This issue is also addressed by Condition 5 of Schedule 3 (Extraction Plan) of the WWC Project Approval which requires WWC to develop a Built Features Management Plan that addresses the management of infrastructure that may be potentially affected by subsidence. This Management Plan must be prepared in consultation with the asset owner and DRE. This plan would address potential impacts on Wakefield Road in consultation with LMCC and DRE.

Biodiversity Monitoring Requirements

A detailed assessment and proposed monitoring program for subsidence impacts to significant features including creeklines, water dependent ecosystems and significant owl trees is requested. Known threatened large forest owl roost and nest trees are rare within the city and significant for the survival of local populations. It is recommended that given the number of threatened owl records in the area, that owl nest and roost trees within the subject site be identified by an owl expert, marked clearly on a plan and monitored for any signs of stress and destabilisation due to subsidence.

A detailed ecological survey methodology was designed and completed in order to gain a thorough understanding of the ecological features of the Project Area. The methods included a detailed literature review of relevant reports and vegetation mapping, as well as searches of relevant ecological databases. Information gathered from the literature reviews and database searches was then used to design a field survey program to survey and map

vegetation communities, and to target threatened and migratory species, endangered populations, threatened ecological communities (TECs) and their habitats.

The detailed fauna surveys included targeted surveys for large forest owls which included call playback surveys and habitat assessments that identified potential roost and/or nesting trees (refer to Sections 3.5.5, 3.5.7 and Figure 3.2 of the EA Ecological Assessment). Surveys were undertaken by highly experienced fauna ecologists with considerable experience and expertise in the identification of forest owl species and their habitat requirements, and also have extensive experience undertaking surveys within the Sugarloaf State Conservation Area (SSCA). The detailed fauna surveys did not identify any large forest owls within the Project Area (refer to Section 4.4.2.1 of the EA Ecological Assessment), however, there is potential habitat for these species and the impact of the Project on these species was assessed. Umwelt considers that the results of the targeted forest owl surveys can be viewed with a high degree of accuracy and confidence.

Similarly, a detailed assessment of creeklines and water dependent ecosystems was undertaken as part of the field survey program with the results presented in Section 4 of the EA Ecological Assessment. The results of the flora assessment and vegetation mapping are robust and applicable at the scale of the assessment, and therefore are adequate for the purpose of accurately describing and mapping the extent and quality of communities and habitats in the Project Area. No groundwater dependent ecosystems were identified within the Project Area.

The current WWC biodiversity monitoring program aims to establish two permanent monitoring plots above each longwall panel at least two years prior to mining. The location of the monitoring plots are selected based on the highest potential for ecological impact as a result of longwall mining; being their proximity to riparian areas, steep slopes and proximity to the end of a longwall panel. Each monitoring plot is then monitored on an annual basis for flora, fauna habitat (including aspects such as owl nesting/roosting habitat) and selected fauna groups (reptiles and amphibians), during the time of mining of the corresponding longwall panel and for two years following mining (usually five years in total). Currently, a total of 18 biodiversity monitoring sites have been examined within the WWC continued operation area (refer to Figure 6.1 of the EA Ecological Assessment).

The current biodiversity monitoring program is tailored to focus on the potential impacts of longwall mining, mainly subsidence and subsidence related impacts such as ponding and tree fall. Sites are added to the monitoring schedule with the advancement of mining into each new longwall and sites are removed from the monitoring schedule once it can be demonstrated that subsidence impacts have resulted in no discernible impact on the vegetation and fauna characteristics of the sites. As outlined in the EA, OCAL has committed to implement this existing biodiversity monitoring program for LW51 and LW52, addressing LMCCs request above for a detailed monitoring program. It is also noted that a detailed subsidence monitoring program, including subsidence impacts on creeklines, is implemented for each mining area at WWC. Details of this monitoring were provided in the EA.

Monitoring of Grevillea parviflora subsp parviflora is to be undertaken in accordance with the Interim Lake Macquarie Grevillea parviflora subsp. parviflora (Planning and Management Guidelines, Lake Macquarie City Council June 2013).

Four additional biodiversity monitoring locations are proposed as part of the Project, with indicative locations shown on Figure 6.1 of the Ecological Assessment. The exact location of the monitoring locations will be determined during the establishment of the baseline monitoring locations and at least one of the monitoring locations will be located within known locations of *Grevillea parviflora* subsp. *parviflora*.

OCAL commits to monitoring of *Grevillea parviflora* subsp *parviflora* being undertaken in accordance with the Interim Lake Macquarie *Grevillea parviflora* subsp. *parviflora* (Planning and Management Guidelines, Lake Macquarie City Council June 2013), where relevant (i.e. within the LW 51 and LW 52 Project Area). This would include seeking to conduct monitoring surveys in the *Grevillea parviflora* subsp. *parviflora* flowering period (nominally September to December), mapping the extent of individuals and groups of stems that are separated by at least 10 metres and determining the level of fruit set (LMCC 2013).

Creeks and Watercourses

Umwelt (Australia) Pty Ltd have assessed the impact of mining Longwall 51 and Longwall 52 on the water resources within the project area as low/negligible. However, Ditton Geotechnical Services Pty Ltd have predicted panel subsidence after extracting LW 51 and LW 52 will range from 2.41 to 2.61 metres (57% to 58% of mining height). This level of subsidence is significantly greater than other mining projects currently being carried out within the Lake Macquarie Area. The proposal presents an unacceptable level of environmental risk (to surface and groundwater) when alternative methods are available.

The level of vertical subsidence in itself is not a direct indicator of the impact of an underground mine on surface features or impacts to surface and groundwaters. Other factors such as tilt, strains, predicted cracking etc. are typically those aspects that result in surface and drainage impacts rather than the extent of vertical subsidence.

WWC consulted with DRE and DP&E during the development of the mining layout. Under WWCs mining lease it is incumbent on the leaseholder to maximise the resource recovery and this requirement was re-iterated to WWC during discussions of the mine layout with government agencies. WWC also considered the environmental, cultural and built features above and near the proposed mining area in designing the mine layout. The proposed mine layout has been designed to avoid impact on key environmental features (e.g. the Palmers Creek alluvium), key Aboriginal sites (e.g. grinding grooves) and key surface features such as the M1 motorway and Wakefield Road whilst also seeking to maximise resource recovery.

As LMCC indicates in its submission, the EA found that the impact of the project on water resources was predicted to be low. This assessment was based on the full range of potential subsidence impacts predicted by Ditton Geotechnical Services (DgS) (2013) and on the findings of the detailed groundwater assessment completed by Aurecon (2013) which found that the Project would meet the minimum harm criteria as outlined in the NSW Aquifer Interference Policy. WWC designed the project to avoid the potential for a significant impact on the Palmers Creek alluvial zone by providing a substantial buffer between the alluvium and the LW 51 and LW 52 extraction zone.

The uppermost reaches of two first order tributaries of Palmers Creek are located within the subsidence affectation zone. These tributaries are ephemeral and only flow for short periods following rainfall. A detailed assessment of the potential impact of the project on these tributaries was undertaken based on the findings of the subsidence assessment. This included surface water modelling using predicted subsidence levels. The surface water assessment found that although sections of the tributaries would be subsided by the project, the impact on these tributaries is not predicted to be to be significant, and impacts to water quality are predicted to be negligible. This assessment was made based on the detailed subsidence assessment and, where relevant, modelling of factors including changes in ponding, water flow depth, water flow velocity, tractive stress and water quality.

WWC also disagrees with LMCC's comment that alternative mining methods are available for the Project. WWC has completed detailed feasibility studies for the proposed project and these studies have identified that other mining options such as bord and pillar, mini-wall or

dividing the two proposed longwall blocks into three or four narrower width longwall blocks are not economically viable. WWC believe that the Project proposed is the most appropriate approach for the proposed Project such that it is economically viable and can recover the coal resource in an efficient and sustainable manner.

OCAL's recent subsidence incidents at LW41 demonstrate that monitoring and mitigation measures are unable to adequately manage environmental risk. Given the difficulties to predict, access and remediate subsidence affected water resources a more conservative subsidence limit should be established.

Hence, Council's Ecosystem Enhancement Team do not support the proposal in its current form, and request that consideration be given to the use of an alternate mine plan, which is designed in a manner to reduce the impacts of subsidence on the landform, hydrology and ecology.

A detailed review of the LW41 subsidence incidents has been completed by OCAL and also by a high-level interagency working group, the Sugarloaf Safety and Remediation Committee (SSRC) consisting of DP&E, OEH, DRE and the EPA.

The SSRC report (March 2013) found that 'while two of the three incidents at WWC are considered significant, the scale and significance of the incidents are not as serious as some media reports have suggested'. In regard to the vertical block movement (VBM) feature, the SSRC found that while the scale and significance of the VBM feature exceeded the predictions of subsidence impacts expected, it is not large in itself. It also found that the greatest impact of the VBM is not in its environmental, visual or landscape significance, but in the current and future risks it may present to public safety. Controls have been implemented by OCAL to address this public safety issue. The SSRC report also notes that as the occurrence of the VBM feature was not predicted it was therefore not avoidable and that OCALs slope stability advisors are of the view that the risk of a further VBM incident is low and another such event is not anticipated.

As outlined in the EA, the LW41 subsidence event occurred as a result of anomalous subsurface fracturing due to unknown geological conditions, with these features resulting in unpredicted movement as mining progressed through the area. The terrain of the Project Area is substantially different to the terrain where mining within LW 41 was undertaken. There is approximately 8.3 hectares of steep slopes within the Project Area, however, there are no rock face features, minor cliffs, cliffs or cliff terraces within the Project Area. As also discussed in the EA, underground and surface geological mapping work has not detected any significant geological structure of concern in the Project Area and therefore the geological conditions that led to the unpredicted subsidence events above LW41 are not predicted to occur in the Project Area. The subsidence assessment for the Project has identified that if present, differential subsidence due to the Project is unlikely to generate VBM's greater than 1 metre deep based on the features observed on similar terrain to the north. The difference in the topography and the lack of any significant geological structures of concern in the Project Area mean that the subsidence impacts are more predictable and manageable.

It is also noted that a detailed report into the environmental consequences of subsidence impact on LW 41 (Umwelt 2013) concluded that the subsidence surface disturbance impacts are not likely to result in a substantial impact on flora species diversity or the extent, structure or floristic composition of vegetation communities recorded. Similarly, the extent of fauna habitat is also not expected to be adversely affected. The SSRC agreed with this overall finding indicating that it expects that there will be minimal long-term impact on flora and fauna within the subsidence affected areas and the Sugarloaf SCA more broadly.

It is also noted that to avoid higher-than-predicted subsidence incidents at WWC in the future, the SSRC have requested OCAL to provide specific additional information with all future Extraction Plans and Subsidence Management Plans, including the plans that would be required as part of the implementation of LW51 and LW52. OCAL has also updated its subsidence remediation procedures in consultation with relevant government agencies including OEH regarding the SSCA to address the grouting incidents that occurred and general subsidence remediation practice.

On the basis of the above, in particular the differences in geological and topographic conditions in the LW41 incident area compared to the Project Area and the recent further improvements to OCALs rehabilitation procedures and practices; OCAL does not agree with LMCCs comment that 'monitoring and mitigation measures are unable to adequately manage environmental risk'. OCAL believes that these risks can be effectively managed through the range of measures that OCAL has committed to and in accordance with the requirements of NSW government agencies.

Refer to further discussion above regarding impacts on water resources and LMCCs comment about alternative mine plans.

However, if the consent authority are seeking to countenance the application, we request the opportunity to view draft conditions of consent requiring the preparation of detailed monitoring programs (relevant to surface waters, ground water, and subsidence) be included, as well as the preparation of detailed remediation strategies to address subsidence impacts.

OCAL notes LMCCs request to DP&E and advise that consultation with LMCC during the preparation of management plans is covered by OCALs commitments and requirements of the existing WWC Project Approval.

Heritage

It is recommended that a revision of the Aboriginal Cultural Heritage Management Plan be made to include the recording and monitoring of the newly identified Aboriginal sites (ST1 and IF1) for the duration of mining works.

As discussed in Section 10.1 of the EA Aboriginal Cultural Heritage Assessment report 'the ACHMP (Umwelt 2012a) will be revised in consultation with the registered Aboriginal parties and the NPWS/OEH to incorporate all additional management measures arising from the modification to the existing Project Approval to include the Project Area.' Therefore, as stated in the assessment, following approval WWC would prepare a revised Aboriginal Cultural Heritage Management Plan that includes the newly identified sites.

Furthermore consultation with the registered Aboriginal parties is required, due to the comments made on the draft report by Awabakal Traditional Owners Aboriginal Corporation and Awabakal Descendants Traditional Owners Aboriginal Corporation.

Correspondence has been provided to Awabakal Descendants Traditional Owners Aboriginal Corporation and Awabakal Local Aboriginal Land Council regarding the concerns they raised in relation to the assessment. The correspondence included information regarding the potential subsidence impacts on Palmers Creek Grinding Groove 2. OCAL has also provided information to registered Aboriginal parties regarding the materials utilised for the completion of subsidence remediation works, the requirement for Aboriginal stakeholders to be present for ground disturbance works and the frequency and extent of subsidence monitoring undertaken by OCAL in the SSCA.

Property

LMCCs submission dated 19 March 2014 identified that LMCC is:

..the owner of the majority of the individual lots contained within the Ryhope Estate (paper subdivision), with the land (and that of its vegetation) presently being assessed for use as a biodiversity offset.

In an addendum to this submission via email on 25 March 2014, LMCC identified that Council's Flora and Fauna Officer provided an addendum to its previous comments which included:

I object to any subsidence that may occur on a biodiversity offset site. However, if the proposal is approved then the following should be considered:

- **That any subsidence is made safe and any natural areas are rehabilitated or compensated by a biodiversity offset. If another biodiversity offset is required then this offset has to consider that the natural land contained within the Ryhope Estate had already been used as an offset and therefore any biodiversity offset would need to be doubled.**

OCAL identified early in consultation about the Project that LMCC was considering the potential of this area as a future biodiversity offset. As indicated on **Figure 2.1**, OCAL understands that LMCC is considering all of its land holding as a biodiversity offset, being an area of approximately 18.8 hectares. Approximately 1.04 hectares of this proposed offset is proposed to be undermined by the Project. This issue was specifically addressed in OCALs meeting with LMCC on 24 May 2013 and OCAL assumes that LMCC will, in finalising its approach to this potential offset, take into account the presence of a mining lease that covers this area. It is noted that no biodiversity offset currently exists at this site. Regardless, as OCAL has outlined in the EA and in consultation with LMCC, OCAL considers that a biodiversity offset in the area and underground mining would be compatible.

This view is supported by the findings of the detailed ecological assessment which found that although the Project will impact on ecological values, the majority of vegetation and fauna habitat in the Project Area will remain largely undisturbed. It also found that the predicted impacts are not expected to result in a significant loss of floristic diversity or community composition, or fauna habitat within the Project Area or the region; and that the Project is not predicted to result in a significant impact on threatened species, populations or communities known or with potential to occur in or around the Project Area.

In regard to LMCCs comments relating to making any subsidence safe and rehabilitating any natural areas, OCAL made commitments to meet these requirements in the EA and is also required to achieve these outcomes by the existing WWC Project Approval. In regard to contingencies for offsetting any unexpected adverse ecological impacts, as outlined in the EA OCAL has reaffirmed the commitment it made in the EA for the WWC Continued Operations Project (refer to Commitment 6.4.1) which stated that in the event that significant impacts on identified ecological values are identified and cannot be adequately remediated, OCAL will engage a suitably qualified and experienced ecologist to prepare a Biodiversity Offset Strategy in consultation with OEH and DP&E.

This commitment is further reinforced by Condition 2 of Schedule 3 of the WWC Project Approval which requires that any impacts on threatened species, threatened populations, endangered ecological communities or core koala habitat, that results in more than negligible environmental consequences and that cannot be remediated, needs to be offset.

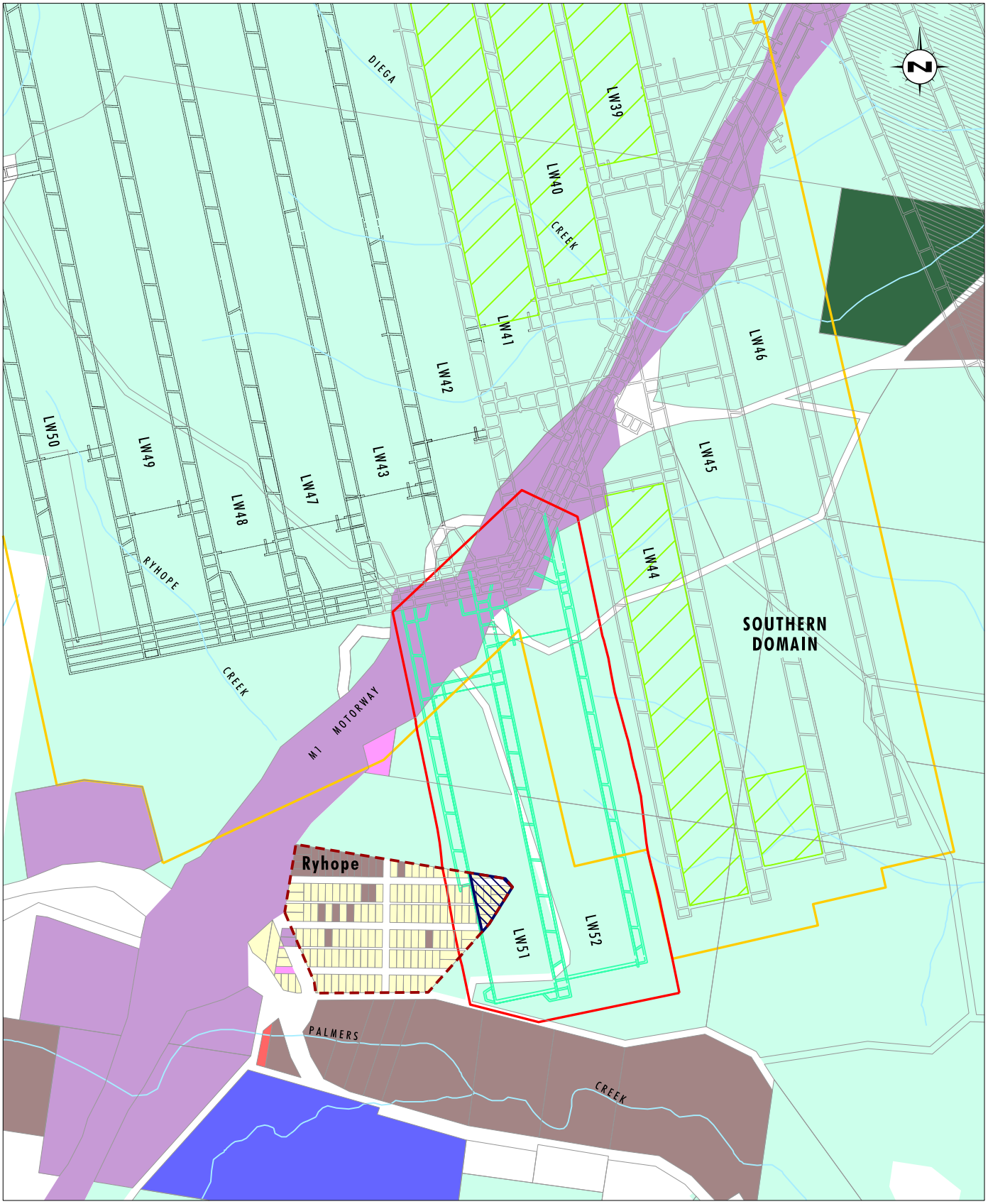

Image Source: OCAL (2008)
Data Source: OCAL (2013), LPI (2003), OEH (2013)

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Legend

- Project Area
- Continued Underground Mining Area
- Approved Underground Workings in the West Borehole Seam
- Proposed Longwall Panels 51 and 52 (Conceptual Layout)
- Longwall Progression as of October 2013
- Former Underground Workings
- LMCC
- Macquarie Memorial Park Pty Ltd
- Private
- RMS
- State Conservation Area
- State of NSW
- Unknown
- LMCC Subdivision
- LMCC Subdivision to be directly undermined

FIGURE 2.1

LMCC Subdivision

File Name (A4): R04/3149_062.dgn
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Collectively, these existing commitments made by OCAL and the existing conditions of the WWC Project Approval appropriately address the proposed measures identified by LMCC.

2.2 Office of Environment and Heritage

Subsidence

The OEH submission makes a number of comments under the heading of definitions regarding the existing Project Approval conditions for the Project and its interpretation of how these are applied. It is noted that these comments are directed at DP&E, however, OCAL provides below a response to a number of these comments.

Definitions: The definition of cliff, cliff terrace, minor cliff or rock face feature in the proposal have an arbitrary length specification of 20m before any features qualifies. The specification that a cliff, cliff terrace, minor cliff or rock face feature must be greater than 20m means that there are potentially numerous features in the project area which have not received adequate assessment for impact in the current proposal, simply because they are less than the 20m threshold length.

Definitions of these features are required for categorisation of all such features for assessment and compliance management purposes. However, it should be noted that regardless of any such definitions, there are no cliffs, cliff terraces, minor cliffs or rock face features in the Project Area. No features were excluded from assessment through use of such definitions, with the definitions only used throughout the WWC operations area to determine in which category each feature is assessed and monitored. All features are recorded and considered. As noted above, the adoption of the 20 metre threshold length for categorisation and assessment purposes does not mean that any cliffs, cliff terraces, minor cliffs or rock face features were excluded from the assessment process and no cliff lines occur in the Project Area for LW51 and LW52. As discussed in the EA Subsidence Assessment there are some areas of steep slopes with rocky outcropping.

The comment that there are potentially numerous features in the Project Area that have not received adequate assessment because of the 20 metre threshold length is not accurate as, as outlined in the EA Subsidence Assessment, there were no rock faces > 1.5 metres observed above LWs 51 and 52. In accordance with the landscape feature definitions in the WWC Project Approval (09_0203), a rock face feature is defined as:

'A rock face having a minimum length of 20 metres, heights between 3 metres and 5 metres and a minimum slope of 2 to 1(>63.4°)'.

Again, regardless of the above definitions, there are no features considered rock face features within the Project Area.

As part of the subsidence assessment for the WWCCOP and based on the discontinuous nature of the cliffs in the West Wallsend area, it was considered for that Project that any impact to cliffs < 20 metres long were unlikely because the cliffs were already articulated by vertical jointing at < 10 metre spacing that were likely to absorb the majority of the predicted curvatures before generating fresh cracks.

Definitions

.....OEH has a concern about the current conditions which state.....

Such conditions are considered arbitrary, unenforceable and inconsistent with conditions of consent at other mines such as the Tasman Underground Coal Mine, which also undermines Sugarloaf SCA, and has a negligible impact condition for cliffs and steep slopes.

OCAL notes that consent authorities issue approval conditions that are specific to particular projects based on their nature, specific issues, location, predicted impacts and other site and project specific considerations. Whilst both WWC and other mining operations have approval to mine under the SCA, these mines operate in different areas, have different surface features above them, have different mining techniques and mine plans and have different issues. It would therefore be inappropriate to arbitrarily apply the same conditions to all operations.

The OEH submission refers specifically to conditions for Tasman Mine and compares these to the conditions for WWC. OCAL notes that the surface features and geological conditions for Tasman Mine were different than those relevant to WWC. Tasman had the Sugarloaf Recreation Area facilities, various Aboriginal sites including rock shelters with PADs, cliffs with high public visibility, walking tracks exposed to rock roll-out, an optic fibre cable with relatively low depths of cover, communication towers and former mine workings that would affect subsidence impacts. As noted above, it is not considered appropriate to apply the same conditions to all mining operations without consideration of the unique situation and issues relevant to each project.

It is also noted that the NSW government recently established a high-level interagency working group, the Sugarloaf Safety and Remediation Committee (SSRC) that consisted of a number of government agencies including OEH and also including DP&E, DRE and the EPA. The SSRC was established to undertake a detailed review of subsidence incidents that occurred as a result of LW41 at WWC.

In regard to the approval conditions, the report prepared by the SSRC stated that:

> 'The project approval acts to keep these (subsidence impacts) within reasonable and appropriate limits. It includes a number of strict performance measures for all natural and built features in the vicinity of the underground mining operations'

The views of the SSRC, which included high level OEH representatives, seems contradictory to the views put forward in the OEH submission which indicates that the WWC approval conditions are not appropriate. OCAL agrees with the findings of the SSRC that the current WWC conditions include strict performance measures that are appropriate for the operation.

Mining Dimensions and Subsidence

Longwall panels 51 & 52 are proposed to be 178.8m and 206.6m wide. The latter panel represents an increase of 12% over the existing width of longwalls at West Wallsend Mine, which have already resulted in considerable damage to Sugarloaf SCA.

DgS have advised that the increase in panel width of 12% did not increase the predicted subsidence by more than 170 mm or 7% of the 2.44 metres predicted for the current panel widths of 178.6 metre wide panels. DgS notes that where the overall panel geometry is supercritical[1], reducing the panel width is not a very effective way of reducing surface impacts when the maximum subsidence is likely to range between 50% and 60% of the mining height, regardless of width. DgS also notes that the panel width would have to be decreased significantly (to < 50% of its current width) to achieve sub-critical panel geometries and minimal surface cracking. OCAL has undertaken detailed feasibility assessments for the Project, finding that mining panels of this significantly reduced width would not be economically viable due to the costs of further first workings required to access the longwall blocks.

In regard to OEH's comment that WWC 'already resulted in considerable damage to Sugarloaf SCA', the SSRC report (March 2013) found that 'while two of the three incidents at WWC are considered significant, the scale and significance of the incidents are not as serious as some media report have suggested'. It is noted that OEH was a contributor to the report along with DP&E, DRE and the EPA. In regard to the vertical block movement (VBM) feature, the SSRC found that while the scale and significance of the VBM feature exceeded the predictions of subsidence impacts expected, it is not large in itself. It also found that the greatest impact of the VBM is not in its environmental, visual or landscape significance, but in the current and future risks it may present to public safety. OCAL is working with relevant government agencies to address this public safety risk and has also agreed to provide an offset for these unpredicted adverse impacts.

Subsidence

However, the methodology used for this assessment is based on a mean (and 95% confidence on the mean) and not a maximum. This means that maximum subsidence levels could well be much higher than even these very high predicted subsidence estimates. OEH notes that subsidence using the same methodology for the earlier longwalls at West Wallsend Colliery underestimated subsidence by up to 30%. Given that the Bulli Seam Planning Assessment Commission used values of 0.5mm/m tensile stress and 2mm/m compressive stress as thresholds above which rock fracturing was likely, the extremely high stresses and tilts predicted for LW 51 & 52 are likely to lead to widespread bedrock fracturing above the longwall panels. The subsidence levels predicted for this mine layout are actually the highest that OEH has previously reviewed and have major implications for public safety, public access and the conservation values of Sugarloaf SCA.

Due to the stochastic nature of subsidence development (i.e. it is part deterministic and part random) it is not possible to provide a guarantee that the predicted maximum values won't be exceeded. This is always the case with subsidence predictions and is the same for all underground mining projects. It is likely that there will be occasional exceedances due to 'unpredictable' sub-surface conditions. DgS anticipates that the U95%CL values will be exceeded 5% of the time due to unforeseen interactions with geological structures or surface topography. As the panels are supercritical it is unlikely that the maximum subsidence will exceed 60% to 65% of the mining height of 4.2 metres to 4.5 metres. This equates to a 5% probability that maximum subsidence will range between 2.52 metres and 2.93 metres (i.e. an exceedance of the U95%CL values by 3% to 10%).

[1] **Supercritical** longwall panels refer to panels that are too wide to span the void extracted by the longwall. The maximum panel subsidence is controlled by the mining height (T) and typically ranges between 50% to 60%T due to the bulking effect of collapsed ground and cover depth (surcharge pressure on the goaf). This condition generally occurs when the panel width is >1.2 to 1.4 x cover depth. Further increases in panel width will not result in significant increases in the subsidence effect if the mining height and cover depth remains constant.

The subsidence prediction exceedances of 30% referred to occurred above WWCs LW38 and were discussed in the End of Panel Report (DgS 2011) as follows:

> 'The predicted mean and Upper 95% Confidence Limit of First Maximum Subsidence at XLs 1 and 2 under predict the measured subsidence for the first 700 m of longwall retreat by 0.4 m to 0.6 m (a prediction exceedance of 20% to 30%).'

The DgS 2011 report also noted:

> 'A review of the model input assumptions within the first 700m of longwall retreat required the Subsidence Reduction Potential (SRP) for an upper level massive geological strata unit (Channel 4) to be reduced from High to Low in order for the model predictions to 'bracket' the measured subsidence. The interpreted maximum thickness of Channel 4 was subsequently reduced from 25 m to 13 m at a distance of 133 m above the workings. The interpreted thicknesses of the channels above other areas of the proposed mining layout remain unchanged.'

It was also noted that '*Overall, the predicted impacts above LW38 were similar to the measured subsidence impacts, despite some of the observed exceedances*.' Consistent with the predictions for LW38 there were no impacts to the M1 Motorway, major pipelines and fibre optic cables.

The conglomerate channels above the proposed longwalls 51 and 52 are not expected to reduce subsidence and 'Low' Subsidence Reduction Potential (SRP) has been assumed. It is therefore unlikely that the subsidence predictions for the proposed longwalls will be exceeded by more than 10%.

In regards to the Bulli Seam PAC, there are significant differences between the Bulli Seam Project and WWC in terms of subsidence impacts. Firstly, the proposed mining geometries are significantly deeper (i.e. > 300 metres) and surface strains and cracking are therefore significantly lower. The thresholds for cracking are probably the lower end of the cracking limit in a rock mass with widely spaced joints associated with the Hawkesbury and Narrabeen Sandstones. The cracking threshold of the rock mass is likely to be higher where natural joints are not as widely spaced and could be around 2 mm/m for tensile strains and 3 mm/m for compressive strains. The depth of soil cover or weathered rock will also influence the cracking threshold limits as strains tend to be distributed more uniformly. Therefore, DgS do not consider that it is appropriate to directly apply the Bulli Seam PAC to this current WWC project.

The extent of cracking above the proposed longwalls will be affected by both jointed shallow rock and deeper colluvial soils and it is considered that the cracking will be no more extensive than the observed cracking to date above moderately undulating terrain at WWC (refer to LW44 and 45 Subsidence Impact reports by RCA).

The magnitude of subsidence predicted for LWs 51 and 52 are higher than other areas of WWC due to the relatively shallow depth of cover and 4.5 metre mining height. However, the subsidence impacts from this magnitude of subsidence, and in this undulating terrain, are predicted to be less than in other areas of the WWC Continued Underground Mining Area. Based on current assessments there are other areas of the WWC that are predicted to result in more extensive surface cracking and associated subsidence features. It is noted that the level of vertical subsidence in itself is not the only subsidence effect that determines the level of impact on surface features and cannot in isolation be used to identify the extent of subsidence impact.

In regards to public safety management within the SSCA, WWC has also recently developed a revised Public Safety Management Plan (PSMP) for LW 42 and 43 and a Land Management Plan (LMP) for LW 42 and 43. The approved PSMP has been developed in consultation with OEH and DRE and includes a governance process to detail how WWC will manage subsidence impacts within the SSCA. The PSMP includes detailed management measures that have been developed for the respective features within the mining area. The management measures have been developed in consultation with OEH and DRE and have been developed based on the results of a risk assessment conducted by WWC and geotechnical specialists (Douglas Partners). The risk assessment was undertaken to determine the potential subsidence impacts from WWC's mining and subsequently identify the management measures to be utilised to manage and remediate the subsidence impacts. A key outcome of the risk assessment was the development of a public safety management governance process which provides remediation strategies for the predicted subsidence impacts as well as a consultation process to review the effectiveness of the remediation of subsidence impacts post mining. The public safety management governance process has been developed in consultation with DRE and OEH and will be implemented for the ongoing management of mining impacts in the SSCA. As part of this process, OCAL will consult with OEH to obtain agreement that subsidence impact remediation undertaken by OCAL in the SSCA is in accordance with the land management principles which are defined for the SSCA in the *National Parks and Wildlife Act 1974*.

In addition, a revised LMP has been developed for LW 42 and 43 details the strategies, procedures and monitoring programs that will be utilised to manage subsidence impacts within the SSCA. The LMP defines the process for the re-establishment of a safe and stable landform following mining. The LMP also details the remediation measures which will be utilised by OCAL to remediate subsidence impacts associated within mining operations. The measures to remediate surface impacts have been developed in consultation with OEH and in accordance with the requirements of the *National Parks and Wildlife Act 1974* and the *Work Health and Safety Act 2011*. The remediation procedure was developed following the completion of a risk assessment to inform the development of the remediation process. The risk assessment was undertaken by Douglas Partners (Douglas Partners 2014). Recommendations from the risk assessment have been incorporated into the revised LMP, with the risk assessment detailing the circumstances under which subsidence cracks are required to be remediated. The LMP incorporates the remediation of subsidence cracking utilising heavy machinery and remediation of subsidence cracks utilising a suitable void filling product, which is pumped into subsidence cracks.

Subsidence Consequences

Experience with earlier longwalls at West Wallsend Colliery clearly demonstrates the damage that such mining will cause. Early longwalls at West Wallsend Colliery fractured and drained areas of Diega Creek. Large areas of the SCA are currently either fenced off or closed entirely to public access. In addition, 24 hour security guards currently prevent access to some areas of Sugarloaf SCA above the mine due to concerns about public safety. Instead of reducing the potential for such impacts in the current proposal for LW 51 & 52, the mine is likely to increase their effects due to the 12% increase in the width of LW52.

Impacts on Diega Creek

Mining at WWC has been undertaken since 1969. Longwall mining has been undertaken at WWC since 1987 with mining having been undertaken in the Diega Creek catchment for a number of years.

During 2008, DP&E (then NSW Department of Planning) undertook an inspection of Diega Creek which had previously been undermined by WWC. The inspection of Diega Creek was undertaken in response to land holder feedback regarding subsidence impacts to Diega Creek. Following the completion of the inspection, WWC undertook consultation with DP&E as well as landholders along Diega Creek to discuss the results of a review of the subsidence impacts. Following WWC's review of the subsidence impacts on Diega Creek it was concluded that degradation within Diega Creek was not solely attributed to the impacts of mine subsidence. Whilst subsidence may have contributed to increased erosion and consequent degradation in Diega Creek, the impact of mine subsidence was to be considered in conjunction with other land use practices. It was also noted that erosion was observed within the nearby Burkes Creek which had not been undermined. WWC have since implemented a detailed subsidence and creek monitoring program which is included within the WWC Water Management Plan. The plan details a range of pre, during and post mining inspections which are undertaken to confirm baseline conditions within the creek systems prior to mining, as well as monitoring for any impacts during and following the completion of mining.

Width of LW 52

As noted previously, DgS have advised that the increase in panel width of 12% did not increase the predicted subsidence by more than 170 mm or 7% of the 2.44 metres predicted for the current panel widths of 178.6 metre wide panels. DgS notes that where the overall panel geometry is supercritical, reducing the panel width is not a very effective way of reducing surface impacts when the maximum subsidence is likely to range between 50% and 60% of the mining height, regardless of width. OCAL acknowledges the recent unfortunate, unpredicted subsidence events associated with LW 41, including the large VBM that has rendered an area of approximately 0.2 ha presently unsafe for public access. To offset this impact, OCAL has agreed an offset package with the NSW Government.

Public Access

As outlined in the SSRC report, the Sugarloaf SCA has both significant conservation value and significant value for its mineral resources. The SSRC report states:

> 'Before inclusion in the State's reserve system, each parcel of land is assessed for its conservation values and existing land uses to determine the most appropriate reserve category. This process includes consultation with key agencies. The Sugarloaf SCA land was reserved as a State Conservation Area due to the area's mineral values (i.e. underground coal reserves and existing mining leases) which militated against it being reserved under a different reserve category (such as a national park). The NPW Act requires a review of the classification of State conservation areas every five years in consultation with the Minister administering the Mining Act 1992. A review was undertaken in July 2012 in which the status of Sugarloaf SCA remained unchanged.'

OCAL believes that the objectives of conservation and sustainable recovery of coal reserves can both occur.

In regards to public safety management within the SSCA, WWC has also recently developed a revised Public Safety Management Plan (PSMP) for LW 42 and 43 and a Land Management Plan (LMP) for LW 42 and 43. The approved PSMP has been developed in consultation with OEH and DRE and includes a governance process to detail how WWC will manage subsidence impacts within the SSCA. The PSMP includes detailed management measures that have been developed for the respective features within the mining area. The management measures have been developed in consultation with OEH and DRE and have been developed based on the results of a risk assessment conducted by WWC and geotechnical specialists (Douglas Partners). The risk assessment was undertaken to determine the potential subsidence impacts from WWC's mining and subsequently identify

the management measures to be utilised to manage and remediate the subsidence impacts. A key outcome of the risk assessment was the development of a public safety management governance process which provides remediation strategies for the predicted subsidence impacts as well as a consultation process to review the effectiveness of the remediation of subsidence impacts post mining. The public safety management governance process has been developed in consultation with DRE and OEH and will be implemented for the ongoing management of mining impacts in the SSCA. As part of this process, OCAL will consult with OEH to obtain agreement that subsidence impact remediation undertaken by OCAL in the SSCA is in accordance with the land management principles which are defined for the SSCA in the *National Parks and Wildlife Act 1974*.

OCAL is committed to providing the results of the monitoring and remediation of activities to OEH to confirm that the remediation meets the management principles for a State Conservation Area as designated by the *National Parks and Wildlife Act 1974*. OCAL has also established an independent review committee to review the results of subsidence monitoring for each longwall panel at WWC.

In addition, the revised LMP that has been developed for LW 42 and 43 details the strategies, procedures and monitoring programs that will be utilised to manage subsidence impacts within the SSCA. The LMP defines the process for the re-establishment of a safe and stable landform following mining. As discussed previously, the LMP also details the remediation measures which will be utilised by OCAL to remediate subsidence impacts associated within mining operations. The measures to remediate surface impacts have been developed in consultation with OEH and in accordance with the requirements of the *National Parks and Wildlife Act 1974* and the *Work Health and Safety Act 2011*. The LMP incorporates the remediation of subsidence cracking utilising heavy machinery and remediation of subsidence cracks utilising a suitable void filling product through the pumping of the void filling product into subsidence cracks.

OCAL is committed to conducting all its operations in a safe and sustainable manner, including effectively remediating subsidence impact so that public safety within the SSCA is not affected. This commitment is enforced by Condition 3 of Schedule 3 of the WWC Project Approval which requires negligible additional risk to public safety. In line with the revised PSMP, OCAL will continue to implement a range of controls to limit access to subsidence affected areas until remediation works are completed. This access restriction is temporary with OCAL endeavouring to have all works completed in a timely manner to allow public access as soon as practical after mining.

Widespread fracturing is predicted for this mine plan and it is notable that only a fraction of the existing fracture networks have been remediated over completed West Wallsend longwalls. In addition, there are likely to be many fractures in the bedrock that have not been identified. A recent OEH site inspection (3 February 2014) identified numerous fractures and holes on steep slopes that had not been remediated and no clear risk management plan for selection of fractures for remediation. There was also no clear evidence that cement grouting would actually prevent a landslip in the future due to the existence of fractures upslope of the remediation areas. The long-term effectiveness of this remediation is therefore questionable.

As discussed above, OCAL has developed a new risk based process to guide the remediation of subsidence cracking. This new process was developed in consultation with OEH and DRE. With this new process in place, OCAL will prioritise remediating the existing subsidence cracking within the SSCA.

In regard to OEH's comment about the lack of clear evidence that cement grouting is effective, DgS 2011 states:

> 'The development of deep cracks on the steep slopes behind cliff lines are likely to result in the lowering of the Factors of Safety (FoS) against deep-seated sliding from >3.0 (after mining) to between 1.2 and 1.5 if the cracks fill with water during wet weather. It is considered that a minimum design FoS for the post-mining slopes should not be <1.5 for an extreme range of weather conditions (excluding earthquakes). To increase and maintain a FoS to >1.5 in the long term it will be necessary to infill significant longitudinal cracks after mining with low-strength grout (2 to 5 MPa) to minimise water ingress into the slopes.'

More recently, Douglas Partners completed an independent assessment of the impact of surface cracking on the steep slopes above the Sugarloaf Range (DP Report 81234_Rev 2 dated 5 December 2013) that applies to LWs 41 to 43 and LWs 51 and 52 and the effectiveness of grouting on long-term stability. They concluded that appropriate targeted grouting or backfilling of the cracks should be undertaken to reduce the risk of inflow and that these measures will further reduce the probability of large scale sliding (Douglas Partners 2013).

Many cliff/steep slope features have also not been assessed because of the arbitrary 20m length definition identified earlier.

As discussed above, it should be noted that regardless of any such definitions that are used for feature categorisation purposes, there are no cliff or similar features in the Project Area. No cliffs, cliff terraces, minor cliffs or rock face features were excluded from assessment through use of such definitions, with the definitions only used throughout the WWC operations area to determine in which category each feature is assessed and monitored. All features are recorded and considered. All of the surface area above the mining areas is inspected post mining for impacts and is rehabilitated if required, regardless of the definitions in the Project Approval.

Many cliff/steep slope features have also not been assessed because of the arbitrary 20 m length definition identified earlier. There is a clear risk of landslip in the current proposal for vertical block movements (VBM) identified as a potential result of the proposed mining. In assessments for earlier for earlier longwalls and for Longwalls 42 -43, Ditton Geotechnical Services (DgS) Pty Ltd has previously suggested that:

> **'VBM have been observed on four of ten ridge spurs mined to-date and DgS have predicted a 40% chance of VBMs occurring in locations with similar geology.**
>
> **Hence it is considered if they occur, large block slides would probably have tension crack depths ranging from about 7 m to 34 m.**
>
> **In the longer term the tension cracks and shears associated with the VBMs have the potential to become transient water filled tension cracks on the upslope side of a sliding block failure.'**

If the probability of a vertical block movement (VBM) of 40% is used to estimate risk in the current proposal, then binomial probability theory suggests that a landslip event would potentially be predicted to be in the 'possible' to 'likely' category (see Table 7 in DgS 2013). DgS suggests that this can be reduced if remediation is applied, however, given the uncertainty in remediation effectiveness OEH requests that it be reduced/eliminated altogether through modification of the mine plan where it occurs under steep slopes at risk of VBM.

In regards to the 'arbitrary' 20 metre length descriptor for cliffs, see earlier discussion.

The term vertical block movement (VBM) is used to describe a specific mechanism of subsidence and the occurrence of a VBM does not mean that significant surface impacts will occur or that substantive remediation works are necessarily required. The predicted likelihood of a VBM should therefore not be seen as synonymous with significant surface impacts.

The assessment of the 40% probability of a VBM was assessed in DgS 2013 and is re-presented below:

> 'Based on the end of panel reports for LWs 40 and 41, interaction of subsidence and strains with persistent geological structure zones in the overburden appears to have allowed discontinuous subsidence features (i.e. vertical block movements) to develop on four out of ten ridge spurs that have been undermined to-date.
>
> The vertical block movements (VBMs No. 1 to 4) were of varying size and affected a total area of 0.6 ha. The VBMs typically developed above LWs 40 (one VBM) and 41 (three VBMs) on the crests of steep slopes. Whilst the impacted area of 0.2% is significantly < 7% of the total area of steep slope within the mining area, VBM (No.3) observed above LW41 had a vertical displacement range of 1.6 m to 4 m over solid coal. This movement was greater than the predicted subsidence contour range of 0.5 m to 2.0 m above the panel extraction limits at this location.
>
> Geotechnical modelling of this feature undertaken by Douglas Partners, 2013 assessing the potential for ongoing movements and safe risk levels indicates further movement is unlikely to occur and within acceptable levels of risk when appropriate management control measures are implemented....
>
> The other VBMs observed to-date were all < 1 m, and are within the predicted subsidence contour predictions and impacts for the panels.'

A summary of the VBM geometries is provided in **Table 1**.

Table 1 – Observed VBM Details Above LWs 40 and 41

VBM No.	Orientation of Scarps	Length (m)	Width (m)	Area (m^2)	Step Depth (m)	Crack width (mm)	Crack Depth (m)
1	NW-NNW	143	15 – 21	2,521	0.3 – 0.6	60 – 70	0.5 – 1.0
2	NW-NNW	78	7 – 17	976	0.5 – 0.9	100 – 500	0.5 – 2.5
3	NW-NNW	130	17	2210	1.6 – 4.0	300 – 700	1.5 – 6.8
4	ENE-E	37	13	435	0.05 – 0.6	30 – 400	0.05 – 2.5

It is considered that the following key factors must all be present in an unconfined ridge spur in order for a VBM to develop after it has been subsided by a longwall panel:

- **NW striking shear zones that hade towards the SW or NE.**
- **Sub-parallel joints (i.e. striking NNW) that hade towards the NE or SW.**
- **The subsidence development beneath the ridges results in differential settlement between the crest and the toe of the ridge spur causing dilation of the rock mass structure and allowing a pre-existing rock mass wedge to slip vertically.'**

The assessment of VBMs for LWs 51 and 52 noted that:

> 'Underground and surface mapping work has not detected any significant structure of concern in the proposed project area above LWs 51 and 52, however if present, differential subsidence is unlikely to generate VBMs > 1 m deep based on the features observed on similar terrain to the north.'

It is therefore considered that the probability of a large VBM occurring is not likely to be 40% and more likely to be < 10% due to the absence of the key features required as previously discussed.

In regards to public safety management within the SSCA, as discussed previously, WWC has also recently developed a revised Public Safety Management Plan (PSMP) for LW 42 and 43 and a Land Management Plan (LMP) for LW 42 and 43. The PSMP has been developed in consultation with OEH and DRE and was approved by DRE on 11 April 2014. The PSMP includes a governance process to detail how WWC will manage subsidence impacts within the SSCA. The PSMP includes detailed management measures that have been developed for the respective features within the mining area. The management measures have been developed in consultation with OEH and DRE and have been developed based on the results of a risk assessment conducted by WWC and geotechnical specialists (Douglas Partners).

OCAL is committed to providing the results of the monitoring and remediation of activities to OEH to confirm that the remediation meets the management principles for a State Conservation Area as designated by the *National Parks and Wildlife Act 1974*. OCAL has also established an independent review committee to review the results of subsidence monitoring for each longwall panel at WWC.

Subsidence - Connective Fracturing

If there is any interaction of the fractured, constrained and surface zones then it is clear that surface to seam fracturing is a very real possibility for the proposed layout. If this occurs aquifers (such as the soil/rock aquifer identified by Aurecon) is likely to drain down the fracture network and potentially emerge in a lower aquifer or into the mine itself. OEH notes that there is no proposed monitoring of any aquifer or the extent of connective fracturing for the proposed longwalls.

It is noted that under the current conditions of consent for West Wallsend mine there is to be no connective fracturing between the surface and the mine for Diega, Cockle and Bangalow Creeks. No such protection currently exists for Palmers Creek and Ryhope Creek even though the potential influence of such mining on the alluvial aquifers of these creeks is clear. Due to the magnitude of existing and predicted fracturing it is highly likely that the groundwater flow paths will be altered by mining, potentially affecting baseflows and aquifer recharge characteristics. If there is surface to seam connective fracturing then water which previously replenished the alluvial aquifers is likely to drain into the mine. The company has informed OEH there is no data available on the connection of the groundwater alluvium in Ryhope Creek with other aquifers or stream flow within affected catchments. OEH believes it is the proponents' responsibility to undertake the research required to support major decisions on mining that will impact on Sugarloaf SCA and its catchments. The EA is considered deficient because of this lack of knowledge (or any monitoring to fill such a knowledge gap) and the lack of assessment of interconnection between sub-surface aquifers (i.e. soil/rock interface aquifer), alluvial aquifers and surface stream flow. The proposal is also considered to be deficient in regards to groundwater monitoring and assessment. Without adequate facture connectivity monitoring and aquifer monitoring over the longwalls there is no capacity for the measuring of compliance with existing conditions of consent.

Impact on Overburden Aquifers

The OEH response states that '*surface to seam fracturing is a very real possibility*' and '*if this occurs aquifers (such as the soil/rock aquifer identified by Aurecon) is likely to drain down to the fracture network and potentially emerge in a lower aquifer or into the mine itself. OEH notes that there is no proposed monitoring of any aquifer or the extent of connective fracturing for the proposed longw*alls'.

While it is agreed that the mining is likely to cause fracturing that will drain any overburden aquifers into the mine opening, the groundwater assessment examined the impact of this, and concluded that '*the evidence indicates that, where the weathered rock aquifer exists in the region, it is of minimal importance, due to its poor yield and continuity. The available data also indicate that there is no evidence for the existence of a weathered rock aquifer above longwalls 51 and 52. As a result, the risk of any adverse impacts on this aquifer from the mining will be negligible, and does not require any further evaluation.*'

In relation to fractured rock aquifers the assessment concluded that '*based on previous mining experience at West Wallsend, as well as the results of recent exploratory boreholes carried out for the current project, the conditions in the longwall 51 and 52 mining area are likely to be similar to the rest of the workings, and there is no evidence of the existence of any significant fractured rock aquifers in the near-roof strata. Consequently, the risk of an adverse impact on any fractured rock aquifer is negligible, and requires no further evaluation.*'

To summarise, there is no evidence for the existence of any significant near-surface overburden aquifers, which may be important to the local hydrogeological regime, either in the general area or directly above LWs 51 and 52. This has been confirmed by the drilling for overburden piezometers above nearby LWs 39 to 40, 44 and 45. Most of these bores did not intersect groundwater, and were dry prior to the undermining of the longwall panels. Since there is no groundwater of any significance in the overburden, the interconnected fracturing in the overburden will have no significant impact on the hydrogeological regime. Since the assessment concluded that no further evaluation of these impacts was necessary, there is no proposed monitoring of these impacts. Even if further evaluation was considered necessary, it is impossible to monitor aquifers that don't exist in the overburden. There are also limitations on the type of monitoring that can be carried out (see further discussion below).

Impact on Alluvial Aquifers

The OEH submission also states that '*if there is surface to seam connective cracking, then water which previously replenished the alluvial aquifers is likely to drain into the mine.*' This is a valid concern, as the alluvial aquifers provide the most important groundwater source in the region. It is noted that only near-surface overburden aquifers could potentially contribute to the alluvial water source, as any deeper aquifers are not connected to the alluvium. If near-surface aquifers were drained as a result of the mining, then there would be the possibility of some impact on the alluvial aquifer. However, as indicated above, the overburden does not contain any significant near-surface overburden aquifers, so that any groundwater contribution from these zones that serves currently to replenish the alluvial aquifers is negligible. Any impacts on the alluvium from the proposed mining that removes this contribution will also be negligible.

The monitoring to date has clearly confirmed this contention. The catchment of Palmers Creek (including Central Creek and Ryhope Creek) has already been undermined by LWs 44 and 45 in WWC and several longwall panels Newstan Colliery, with no measurable impact on the groundwater levels in the alluvium. Groundwater monitoring in registered bore GW63752 was carried out over a 12 month period in 1998/99 by Newstan Colliery, before longwall mining commenced under the alluvium of Palmers Creek. During this period, the average

groundwater depth in this bore was 2.0 metres. No subsequent monitoring data was available for this bore and it is possible that no further monitoring was carried out by Newstan Colliery. In 2013, WWC recommenced monitoring in this bore, and the average groundwater depth over the period August 2013 to March 2014 was 1.3 metres. This slight rise in groundwater level in the alluvium occurred despite the fact that longwall mining has been carried out extensively in the catchment of the creek and beneath the alluvium. Based on this data, it is difficult to conclude that the extraction of two additional panels will have any significant impacts on water levels in the alluvium. Nevertheless, monitoring will be continued in this bore, and in an additional bore installed in the alluvium closer to LWs 51 and 52 to measure compliance.

As detailed within Section 6.6.3, Palmers Creek will not be undermined by the Project, with the mine plan designed to be located approximately 170 metres from the alluvial aquifer. This significant setback was incorporated into the mine design by OCAL so as to not impact on the Palmers Creek alluvial aquifer, with the Groundwater Impact Assessment confirming that negligible impacts are predicted due to the Project.

Fracture monitoring

The OEH response concludes that '*without adequate fracture connectivity monitoring and aquifer monitoring over the longwall panels, there is no capacity for the measurement of compliance*'.

The future groundwater monitoring requirements for LWs 51 and 52 have been considered in detail as part of the EA Groundwater Assessment. The primary goal of the monitoring program is to check that the alluvial aquifers are not negatively impacted. To that end, monitoring bores have been installed in the alluvium in both Palmers Creek and Ryhope Creek.

Previously, groundwater monitoring has also been utilised as a verification tool, to check whether the actual measured responses in the field were consistent with the height of fracturing predicted by the sub-surface fracturing model in the low cover depth areas. In order to refine and verify the sub-surface fracture model, any monitoring bores need to be placed in areas of low depth of cover so that the minimum A-zone height can be determined. When the overall depth of cover increases, the height of fracturing above mining also increases due to the additional overburden load. If groundwater bores are installed in areas with a larger depth of cover, this will overstate the minimum height of fracturing (as the length of longwall panels are currently confined by depth of cover constraints). Consequently, it is not useful to install bores in any location that has a depth of cover greater than 110 metres. This presents additional difficulties as, in areas of shallow depth of cover, the groundwater table is usually below the level of the top of the A-zone, due to the lack of aquifers in the near-surface strata. Consequently, monitoring the groundwater level will not give any indication of level of the top of the A-zone, unless it is well below the predicted level.

In addition to these difficulties, the monitoring to date has indicated that groundwater monitoring installations over longwall panels are easily damaged and rarely survive to provide useful post-mining data. Aurecon has already installed a number of nested piezometers over longwall panels, most of which have been monitored during the passage of mining, but are now unable to provide any meaningful data after undermining, due to mining-induced damage.

For the above reasons, no groundwater monitoring is proposed directly above LWs 51 and 52.

The height of continuous fracturing is a concern to any mining operation. If surface to seam connectivity occurs, then potential ventilation and spontaneous combustion issues may result in safety risks. OCAL is therefore focussed on effectively managing any risk of connective fracturing. At WWC, based on subsurface fracture monitoring data and mine site groundwater pumping and ventilation records for LWs 38 to 41, DgS has assessed that the likelihood of surface to seam connectivity is unlikely for the proposed longwalls. Monitoring of surface to seam connectivity will therefore be ongoing using groundwater pumping and ventilation records. WWC will also implement a Trigger Action Response Plan (TARP) for mining within areas which have a reduced depth of cover. The TARP outlines controls and monitoring requirements for mining in these areas.

Subsidence – Conclusion

The proposal for longwalls 51 & 52 are likely to result in a high level of damage and has not sought to reduce impacts on the basis of previous experience of impacts on Sugarloaf SCA. This could be achieved through narrowing pillars and widening panels (approaches adopted in other parts of the mine), but instead the current proposal increases the width of longwall 52 by 12% over existing longwall panel widths. Any trade-offs between extraction of coal and public safety, public access and the conservation values of Sugarloaf SCA need to be explicit. The social and environmental consequences of this damage to the SCA are considered to potentially be understated in the EA and there is a lack of appropriate monitoring of groundwater aquifer levels or connective fracturing above the proposed longwalls. In addition, the public safety, public access and conservation values of Sugarloaf SCA have not received any appropriate valuation for the proposal and are not included in any part of the cost-benefit analysis for the proposal.

As outlined in the SSRC report, the Sugarloaf SCA has both significant conservation value and significant value for its mineral resources. The SSRC report states:

> 'Before inclusion in the State's reserve system, each parcel of land is assessed for its conservation values and existing land uses to determine the most appropriate reserve category. This process includes consultation with key agencies. The Sugarloaf SCA land was reserved as a State Conservation Area due to the area's mineral values (i.e. underground coal reserves and existing mining leases) which militated against it being reserved under a different reserve category (such as a national park). The NPW Act requires a review of the classification of State conservation areas every five years in consultation with the Minister administering the Mining Act 1992. A review was undertaken in July 2012 in which the status of Sugarloaf SCA remained unchanged.'

OCAL believes that the objectives of conservation and sustainable recovery of coal reserves can both occur

Changes to Mine Plan

The OEH comments that reduced impacts could be achieved by reducing the width of the chain pillars and widening the panels. It is assumed that the statement was meant to say instead the opposite is true whereby a reduction in panel width and increase in chain pillar width is necessary (to reduce impacts). As discussed earlier, the panel widths would have to be reduced significantly to reduce cracking and would render the proposed Project uneconomic.

Public Safety, Public Access and Conservation Values

As outlined in the SSRC report, the Sugarloaf SCA has both significant conservation value and significant value for its mineral resources. The SSRC report states:

> 'Before inclusion in the State's reserve system, each parcel of land is assessed for its conservation values and existing land uses to determine the most appropriate reserve category. This process includes consultation with key agencies. The Sugarloaf SCA land was reserved as a State Conservation Area due to the area's mineral values (i.e. underground coal reserves and existing mining leases) which militated against it being reserved under a different reserve category (such as a national park). The NPW Act requires a review of the classification of State conservation areas every five years in consultation with the Minister administering the Mining Act 1992. A review was undertaken in July 2012 in which the status of Sugarloaf SCA remained unchanged.'

OCAL believes that the objectives of conservation and sustainable recovery of coal reserves can both occur and does not agree with the inference that these values need to be traded off against each other.

DgS has identified that the predicted impacts for the proposed longwalls are likely to require remedial works to backfill cracks and has assessed that the impacts and works required should not result in medium to long term impact or on-going environmental degradation that can't be repaired or managed safely. This conclusion was also confirmed by an independent review of the impacts of LW41 by Douglas Partners (2013).

OCAL is committed to conducting all its operations in a safe and sustainable manner, including effectively remediating subsidence impact so that public safety within the SCA is not affected. This commitment is enforced by Condition 3 of Schedule 3 of the WWC Project Approval which requires negligible additional risk to public safety. In line with its Public Safety Management Plan OCAL puts in place a range of controls to limit access to mine affected areas until remediation works are completed. This access restriction is temporary and with the new remediation procedures that OCAL is developing in consultation with OEH, OCAL will endeavour to have all works completed in a timely manner to allow public access as soon as practical after mining. OCAL has always, and will continue to prioritise the remediation of public access tracks within the SCA as quickly as possible after mining.

OCAL acknowledges the recent unfortunate, unpredicted subsidence events associated with LW 41, including the large VBM that has rendered an area of approximately 0.2 ha presently unsafe for public access. To offset this impact, OCAL has agreed an offset package with the NSW Government.

Social and Environmental Consequences Potentially Understated & Groundwater Monitoring

We disagree with OEH's comment that the EA potentially understates the social and environmental consequences. A thorough assessment of the project was completed, involving detailed study of the existing environment and the use of engineering and scientific modelling and investigation, to assess and determine potential impacts as a result of the Project. It is considered that the EA accurately identifies the key issues and potential impacts of the Project.

A detailed response to OEH's comments regarding groundwater monitoring is included above.

OEH ESTATE

Little detail has been provided on the impact of the project on the recreational users of Sugarloaf SCA. In fact, no analysis has been presented regarding the potential effect of mining impacts such as subsidence, surface cracking and cliff instability on the recreational opportunities for park users. (Section 6.7.5- Socio-economics page 71). The effect upon routine National Parks and Wildlife reserve management operations such as fire fighting may be significant due to increased safety risks. Recent rock fall events and surface cracking and slumping associated with previous and current mining operations, indicate there is the potential for more areas to be made 'exclusion zones' and no information has been presented that analyses the effect on park users such as mountain bike riders, orienteering clubs, commercial operators and casual park users.

DgS has identified that the predicted impacts for the proposed longwalls are likely to require remedial works to backfill cracks and has assessed that the impacts and works required should not result in medium to long term impact or on-going environmental degradation that can't be repaired or managed safely.

OCAL is committed to conducting all its operations in a safe and sustainable manner, including effectively remediating subsidence impact so that public safety within the SCA is not affected. This commitment is enforced by Condition 3 of Schedule 3 of the WWC Project Approval which requires negligible additional risk to public safety. In line with its Public Safety Management Plan OCAL puts in place a range of controls to limit access to mine affected areas until remediation works are completed. The areas to be undermined are closed, clearly demarcated, data provided to OEH and these areas notified on the SSCA website. This access restriction is temporary and with the new remediation procedures that OCAL is developing in consultation with OEH, OCAL will endeavour to have all works completed in a timely manner to allow public access as soon as practical after mining. OCAL has always, and will continue to prioritise the remediation of public access tracks within the SCA as quickly as possible after mining. The total area currently closed within the SSCA due to WWC mining operations is approximately 295 hectares, which equates to approximately 8% of the total area of the SSCA.

In terms of access for routine reserve management operations and fire fighting, consistent with the approach for other major access tracks such as Sugarloaf Range Road, WWC will commit to undertaking remediation works for the main access road (fire trail) through the LW 51 and 52 Project Area. The road would be subject to ongoing inspections during undermining and any cracking fixed as it appears so that the road remains open and available for routine operations and fire fighting.

Discussions with OEH have also identified that one of the critical measures required to support fire fighting is ensuring that OEH has up to date information about subsidence impacts, so that this information can be sourced and considered in planning fire fighting should a fire occur. OCAL has committed to regularly providing data regarding subsidence impacts and management at WWC to OEH, however, based on recent discussions, OCAL has committed to work with OEH to develop a more robust information sharing system. This will ensure that up-to-date information is held by OEH at all times.

OCAL acknowledges the recent unfortunate, unpredicted subsidence events associated with LW 41, including the large VBM that has rendered an area of approximately 0.2 ha presently unsafe for public access. To offset this impact, OCAL has agreed an offset package with the NSW Government.

No evidence has been presented that consultation with any park users, such as mountain bikers, orienteers and casual users has occurred. Broader Consultation beyond the local area should occur, as typically park users can travel long distances to utilise SCA's.

There is very little information publically available regarding the recreational use of the section of the SCA that is the subject of this Project. OCAL discussed this issue with OEH who was unable to provide any data but suggested which groups OCAL could contact to gather more information. The outcomes of this consultation are included below.

In terms of consultation with potentially interested parties, as discussed in the EA, a newsletter relating to OCALs operations, including the Project was distributed to the community surrounding WWC including West Wallsend, Barnsley, Ryhope and Wakefield in November 2013 including contact details for OCAL personnel for those wanting to further discuss the Project. Since the completion of the EA OCAL has done further consultation with the community regarding the Project, including holding an open day on 9 February 2014 at Sugarloaf Community Centre at West Wallsend. Invitations to the open day extended to 3000 local residence in the suburbs of Ryhope, Wakefield, Killingworth, Barnsley, Edgeworth, Teralba, Holmesville and West Wallsend. Invitations were also given to NSW parliamentary representatives Greg Piper and Pat Conry and also to LMCC, the WWC Community Consultative Committee and the local Aboriginal community. This consultation approach would have provided opportunities for local users of the SCA to raise any issues with OCAL.

Since the completion of the EA, OCAL has also approached the Hunter Mountain Bike Association and a representative from Orienteering NSW for further feedback on their usage of the Project Area and any issues that need to be considered by OCAL. This further consultation has indicated that the Hunter Mountain Bike Association (HMBA) that the HMBA utilise a registered 'Mountain Bike Park' in the Olney State Forest, Cooranbong as well as land west of Killingworth, with both areas being outside of the Project Area. HMBA confirmed that the land within the Project Area was not utilised for HMBA events, however HMBA could not provide any further information on usage of land within the Project Area. The representatives from Orienteering NSW indicated that the SSCA is utilised for orienteering events, with the closure of portion of the SSCA limiting their ability to undertake events in these portions of the SSCA due to the public safety risks. It was noted by Orienteering NSW that other locations are also utilised for orienteering events when access to the SSCA is restricted.

The EA has also been publically advertised and exhibited by DP&E including advertising in the Newcastle Herald which has a wide distribution across the region. Collectively, these consultation mechanisms are considered appropriate to seek to capture the input of park users as they relate to this specific Project.

Depth of cover – The potential for connective cracking at 80m

The EA (pages 33-41, and Appendix 3) indicates that connective cracking at cover depths of 80m is 'unlikely' if the mining height is reduced to 3.6m in LW51. However, the data presented does not appear to support this conclusion. Appendix 3, page 60, indicates the minimum A-Zone fracture heights above LW51 (at mining height of 3.6m) is 55-66m, while the B-Zone thickness values range between 21-24m and the D-Zone surface cracking depths are estimated to range between 10-12m. These data indicate a likely potential for connective cracking. Even the U95%CL graph presented in Appendix 3, Figure 26b indicates the height of the continuous cracking lies very close to the 12m below surface line which is the estimated distance of surface cracking. This regression equation within the U95%CL graphs (Appendix 3, 26a & 26B) is dependent upon the three measured variables, all of which have been taken at cover

depths between approximately 97m to 155m depth of cover so the cover depth estimations at 80m and 90m are extrapolations of the data and hence the predictions are less reliable in this section of the curve.

Further details should be provided to justify that connective cracking should not occur as a result of longwall mining as detailed in the EA.

DgS has advised that the data presented in Appendix 3 does support the conclusions made as the predicted heights of fracturing were not 'minimum' values but 'mean and U95% Confidence Limit values' as stated in the footnotes of Table 9. This means that for a cover depth of 80 metres, the A-Zone is estimated to be 25 metres (expected) to 14 metres (worst-case) below the surface. The surface cracking depth of 12 metres is considered to be a maximum likely value, so it is reasonable to conclude that where the worst case A-Zone height of cracking value terminates below the worst-case surface cracking depth, the two zones are unlikely to intersect.

The location of surface cracking and near surface lithology in the B-Zone are also important considerations for surface to seam connectivity assessment, and as discussed in the EA subsidence report:

> 'It is also assessed that as the surface along the downslope side of the panels is likely to be in compression due to surface topography, the surface cracking depth will probably be < 12 m. The presence of weathered and/or tuffaceous materials near the surface will also reduce the potential for A-Zone and D-Zone crack interconnection in this area.'

It should be understood that the B-Zone represents the Zone above the A-Zone where the strata has not undergone enough bending for continuous cracking to develop through the strata. The cracks are likely to be discontinuous vertically or open bedding partings in the horizontal plane. Surface D-Zone cracks may interact with B-Zone 'voids' but are unlikely to interact with the A-Zone cracks.

The model used to make the height of fracturing predictions (the Pi-Term Model) allows all of the significant mining geometry factors to be included (i.e. panel width, cover depth and mining height) as well as the influence of local geology (i.e. effective strata unit thickness). The PI-Term model was calibrated to data from the WWC extensometers that were installed in the centre of the longwall panels (39 and 40) adjacent to an alluvial aquifer where cover depth was 97 metres and in a ridge where cover depth was 113 metres. The model itself was based on 29 case studies of various mining geometries (sub-critical to supercritical) and geologies (Southern, Newcastle and Hunter Coalfields) with non-linear regression curves fitted to measured heights of continuous fracturing with cover depths ranging from 75 metres to 500 metres with a root mean square error of 12%. The U95%CL values were found to be +/- 10% of the effective panel width and successfully re-predicted all of the cases in the data base. There were two cases in the database that had cover depths between 75 and 80 metres and three between 80 and 95 metres. The predictions for the proposed panels are therefore not extrapolations in the context of the data base.

Surface crack remediation (Page 15) – No details

The EA indicates surface cracks will be remediated according to existing WWC Subsidence Crack Remediation Procedures. However, the treatment of the existing procedures has come into question, and the existing Public Safety Management Plan for LW41 has been determined as inadequate by DRE and OEH. Oceanic Coal has yet to provide an updated public safety governance process for OEH to review.

WWC has now provided a revised LW42/43 Public Safety Management Plan (PSMP) to OEH for its review and also presented to OEH the revisions to the PSMP including a public safety governance process in meetings in March 2014. This PSMP contains a revised public safety governance process. WWC has also recently received revised SMP approval conditions from DRE regarding the LW41 PSMP and WWC is revising the plan based on the new conditions. WWC also received approval of the revised LW42/43 PSMP on 11 April 2014 from DRE. A revised void filling process has been developed for OCAL by Golder Associates and has been provided to OEH on 16 May 2014. The procedure is currently being trialled for remediation works in the SSCA, in consultation with OEH.

Oceanic Coal have also recently supplied a 'Risk Assessment of Subsidence Cracks Less than 100 mm in Width, Within Remote Areas and Access by OEH Personnel and Bushwalkers' (Douglas Partners) which indicates all cracks greater than 100mm should be filled to mitigate against potential risk to bushwalkers and NPWS park workers. Given the magnitude of the surface cracking predictions, it is difficult to understand how large-scale remediation could not occur.

As discussed previously, WWC has recently developed a revised Public Safety Management Plan (PSMP) for LW 42 and 43 and a Land Management Plan (LMP) for LW 42 and 43 which outline the approach to remediation of subsidence impacts. The approved PSMP has been developed in consultation with OEH and DRE and includes a governance process to detail how WWC will manage subsidence impacts within the SSCA. These include an updated procedure from the one referred to in the submission from OEH. OCAL acknowledges that cracking may occur due to the extraction of LW 51 and 52, however, given the techniques to be used to remediate cracking, this does not mean that large scale clearing or earthworks will be required. This is the basis of the comments in the EA that indicate that large scale remediation works are not predicted; that is, referring to large scale ground or vegetation disturbing works. The new remediation process provides techniques for areas that aren't readily accessible by machinery, with these techniques designed to minimise impact to vegetation and avoid excessive ground disturbance.

Public amenity – No mention of public safety and temporary closure of reserve sections

The EA indicates this area is likely to be closed from public access for approximately six months as a result of the operation. However, reserve closures due to land slips and remediation activities from existing operations are taken into account, a much greater area of the reserve is being excluded from public access.

The Public Amenity section of the EA discusses both temporary closure of reserve sections and management of public safety. The total area currently closed within the SSCA due to WWC mining operations is approximately 295 hectares, which equates to approximately 8% of the total area of the SSCA.

The EA discussed the expected temporary closures associated with the Project. As OEH indicates, due to parts of the approved mining operations other areas of the SCA may have restricted access concurrently with the Project Area for LWs 51 and 52. As discussed above, OCAL is committed to conducting all its operations in a safe and sustainable manner, including effectively remediating subsidence impact so that public safety within the SCA is not affected. This commitment is enforced by Condition 3 of Schedule 3 of the WWC Project Approval which requires negligible additional risk to public safety. In line with its Public Safety Management Plan OCAL puts in place a range of controls to limit access to mine affected areas until remediation works are completed. This access restriction is temporary and with the new remediation procedures that OCAL is developing in consultation with OEH, OCAL will endeavour to have all works completed in a timely manner to allow public access

as soon as practical after mining. OCAL will prioritise the remediation of public access tracks within the SCA as quickly as possible after mining.

In terms of the main access road/fire trail through the Project Area, as discussed above, OCAL has committed to undertaking inspection and remediation works so that this road stays open both during and after mining. This will provide ongoing access to and through this area at all times including whilst remediation of cracking affected areas is completed.

As noted in the EA, mining of each longwall panel will take approximately 6 months, with mining of LW 51 and LW 52 therefore expected to take approximately 12 months. After mining, areas of cracking that require remediation will continue to have access restrictions until cracking is repaired. Under OCALs revised cracking repair procedures, a period of around 12 to 18 months post mining is required for subsidence to completely cease allowing effective crack remediation. As indicted by OEH, this will mean that access restrictions in place for LW 51 and 52 will likely be in place concurrently with those for other longwall panels.

OCAL also acknowledges that due to ongoing consultation with OEH and DRE regarding revising remediation procedures as an outcome of the LW 41 process, the progress of some current remediation works has been delayed. As new procedures have developed (May 2014) in put in place, OCAL will strive to have all required remediation works completed in a timely manner. These new procedures would be in place for mining of LW 51 and 52.

OCAL acknowledges the recent unfortunate, unpredicted subsidence events associated with LW 41, including the large VBM that has rendered an area of approximately 0.2 ha presently unsafe for public access. To offset this impact, OCAL has agreed an offset package with the NSW Government. All other access restrictions are temporary in nature and will be available for return for full public access once remediation works are completed.

However, OEH are still concerned regarding the potential risk to public safety in the longer term on these steep slopes particularly because the procedure for crack repairs is still being developed, and the utilisation of crushed rock is not being considered for remediation at the present time.

As discussed above, new remediation procedures and processes have been developed in consultation with OEH and DRE (May 2014). These new procedures will be applied to all future operations including for LW 51 and 52. OCAL uses crushed rock and soil for crack remediation in areas where access for earthmoving machinery is available. In other areas that are in-accessible the use of a product that can be pumped is required. A revised void filling process has been developed for OCAL by Golder Associates and has been provided to OEH. The procedure is currently being trialled for remediation works in the SSCA, in consultation with OEH.

Threatened Species

Adequacy of flora and fauna surveys

In general, OEH is unsure whether or not the baseline flora and fauna survey components undertaken for the proposal are adequate, and whether or not they have been conducted in accordance with OEH guidelines (DEC 2004 and DECC 2009a). OEH acknowledges that the proposal does not involve the direct clearing I removal of native vegetation or habitat, however, potential effects associated with any subsidence (as stated above) may adversely impact threatened species habitat. As such, OEH is of the opinion that appropriate above surface surveying, in accordance with accepted guidelines, must be undertaken to determine all likely fauna and flora, notably threatened species that occurs within the Project Area to which may be

impacted upon. In light of this, OEH notes that both the flora and fauna surveying (based on Figures 3.1 and 3.2) appears to concentrate on central and southern portions of the Project Area, with no survey sites (including quadrats and random meanders) in the northern or north-eastern parts of the study area. OEH considers this a potential major failing of the EA in that this covers most of LW52, and therefore it appears that very little baseline surveying was undertaken in this area to ascertain the biological values of this area.

OEH recommends that appropriate surveying in accordance with accepted guidelines be undertaken in these areas, unless other data sources are provided. OEH notes that Section 3.4 (Summary and Adequacy of Flora Field Survey Effort) of Appendix 5 states that the mapping conducted by Bell and Driscoll (2009) of Sugarloaf SCA was used given its accuracy, but fails indicate if survey sites undertaken for this mapping fall within the Project Area (i.e. quadrats) and whether they were used to verify the vegetation communities.

Furthermore, given that the EA and Appendices (notably Appendix 5) appear not to state that areal extent of the Project Area, this further adds to OEH inability to determine whether or not the baseline surveys are adequate. OEH estimates that LW51 and LW52 panels cover an above surface area of approximately 34 hectares. With respect to general baseline and targeted surveys, OEH must be satisfied that the following issues have been adequately addressed with respect to survey effort:

- **a suitable survey design was adopted**
- **appropriate survey methodologies were utilised (as specified in the guidelines) and applied at a scale commensurate to detect the target species or guild**
- **targeted surveys were adequate and the subject species chosen were appropriate**
- **all surveys were conducted at the appropriate time with respect to seasonality and weather conditions (e.g. flower phenology)**
- **all surveys I methodologies adequately cover the study area, including all vegetation I habitat types and indirect impact areas.**

To ensure that the flora and fauna surveys are compliant with OEH guidelines, OEH believes that further clarification of the sampling stratification units is required. Specifically, how they were determined and how the survey design was applied to these units would lend greater support to the baseline survey effort conducted to date.

OEH suggests that the proponent provide a table that details sampling methods and survey effort per stratification unit, including size of each unit, timing of surveys (not just the survey, but each specific component), prevailing climatic conditions at time of survey, and how they meet the minimum requirements in OEH survey guidelines (DEC, 2004). A map overlaying the survey details over the stratification units I vegetation types must also be included in any future versions of the EA.

A separate map for both flora and fauna is recommended. Additionally, all threatened species should be schematically shown. If such details reveal that certain aspects of the surveying (including coverage [i.e. north/north-eastern corner of Project Area]) have not been adequately addressed, then further sampling may be required and/or justification as to why the current surveys are adequate for the proposal.

Flora Survey and Vegetation Mapping

Comprehensive vegetation mapping has been undertaken previously within the SSCA by Bell and Driscoll (2009) and much of Lake Macquarie LGA has been described and mapped by Bell and Driscoll (2013). The survey methodology undertaken by Bell and Driscoll (2009) for the mapping of the SSCA is considered to be comprehensive and appropriate with adequate levels of sampling. As part of the survey, two semi-quantitative vegetation plots and 24 Rapid Data Points were sampled within the boundary of the proposed modification. The SSCA mapping and the *Vegetation mapping of Lake Macquarie LGA: Stages 1-3, 5 Report* (Bell and Driscoll 2013) were reviewed as part of the Project and it has been determined that they provide a highly accurate and informative assessment of the vegetation and floristics of the Project Area, and that they provided an accurate description of vegetation community floristics. The SSCA vegetation map and the *Vegetation mapping of Lake Macquarie LGA: Stages 1-3, 5 Report* (Bell and Driscoll 2013) was used by Umwelt as a baseline vegetation map for the Project which was ground-truthed during flora surveys.

Umwelt undertook sampling of approximately 750 metres of flora transects along with 6 vegetation quadrats during the ground-truthing exercise which builds on the work done by Bell and Driscoll (2009; 2013) and is considered appropriate survey effort to target the range of threatened flora species, and their habitats and threatened ecological communities (TECs) predicted to occur in the Project Area.

Figure 2.2 shows the extent of survey effort undertaken by Bell and Driscoll (2009) for the SSCA mapping project. **Figure 2.3** shows the extent of Umwelt flora surveys in the project area in relation to native vegetation communities; and also shows the location of sampling locations undertaken for the West Wallsend Colliery Continued Operations Project (WWCCOP) Environmental Assessment (Umwelt 2010c) and the annual West Wallsend Biodiversity Monitoring program. All of these surveys and assessment were considered in the preparation of the Ecological Assessment for the Project and the results of the flora assessment and vegetation mapping are therefore considered to be robust and applicable at the scale of the assessment, and therefore are adequate for the purpose.

Fauna Surveys

Two broad habitat types were stratified in the Project Area: with forest habitat covering an area of approximately 62 hectares and riparian/wet gully habitat covering approximately three hectares. **Figure 2.4** shows the extent of each stratification unit in the Project Area and **Table 2** outlines the adequacy of the fauna survey against the DEC (2004) and the DECCW (2009) survey guidelines.

Table 2 demonstrates that substantial fauna sampling has been undertaken in the Project Area during Project specific surveys. **Figure 2.4** also identifies additional fauna surveys undertaken in proximity to the Project Area, including from the Environmental Assessment for the WWCCOP (Umwelt 2010c) or as part of the WWC Annual Biodiversity Monitoring (Umwelt 2010b, 2011, 2012b and 2013). As a result, the species composition of the Project Area and the surrounding habitats is considered to be well understood.

The fauna surveys undertaken during the Project includes adequate effort and rigor to accurately describe the fauna species composition and specific fauna habitats across the Project Area and was undertaken in accordance with the methods and recommended effort described in the Threatened Species Survey and Assessment: Guidelines for development and activities (working draft) (DEC 2004) and the Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians, (DECCW 2009).

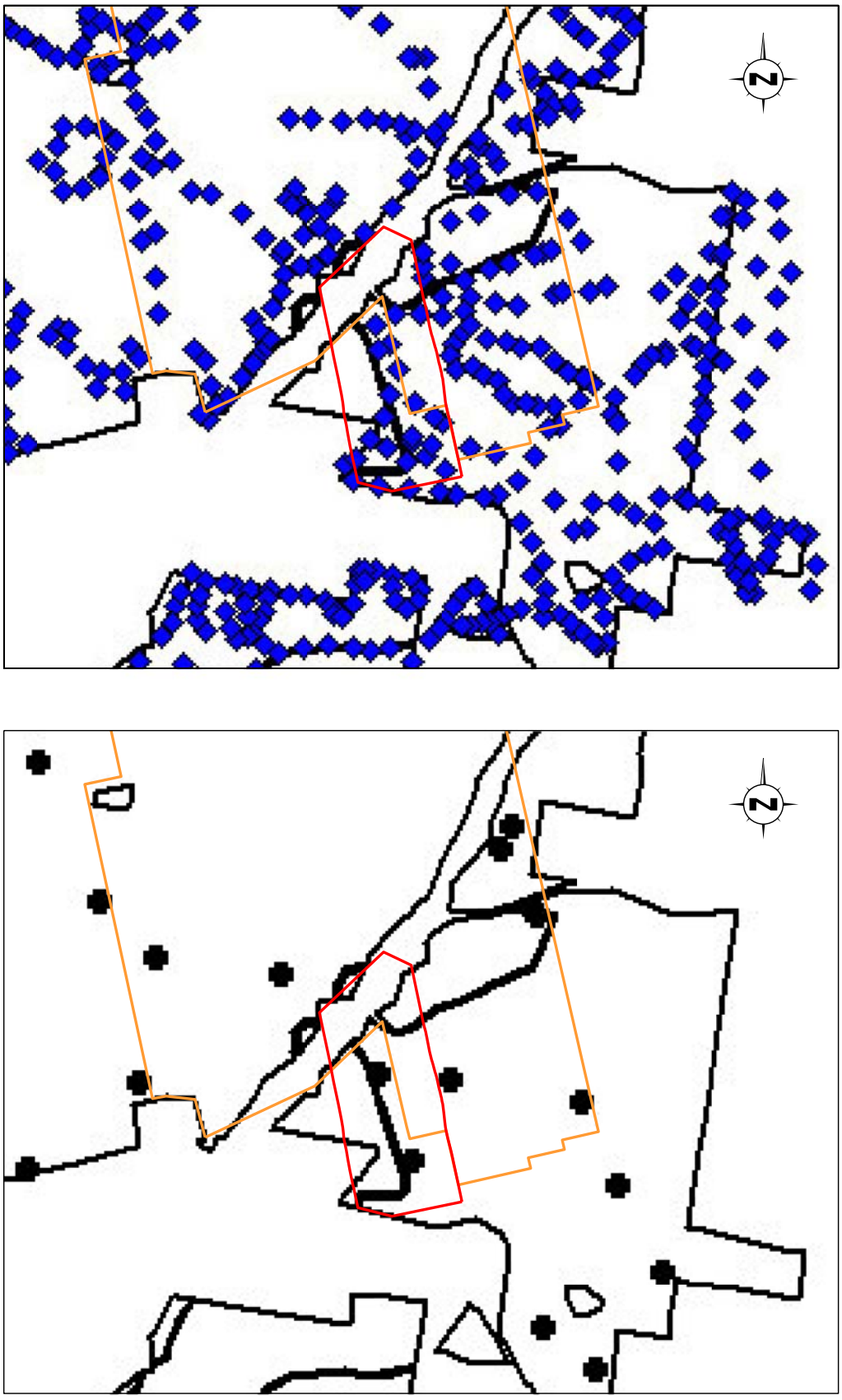

Image Source: Stephen A.J. Bell & Colin Driscoll (2009)
Data Source: OCAL (2014)

0 0.5 1.0 2.0km
1:35 000

Legend
- Project Area
- Approved Continued Underground Mining Area
- Sugarloaf SCA
- Sampling Plot
- Rapid data Points

FIGURE 2.2

Sugarloaf SCA Vegetation Mapping
(Bell and Driscoll 2009) Survey Effort

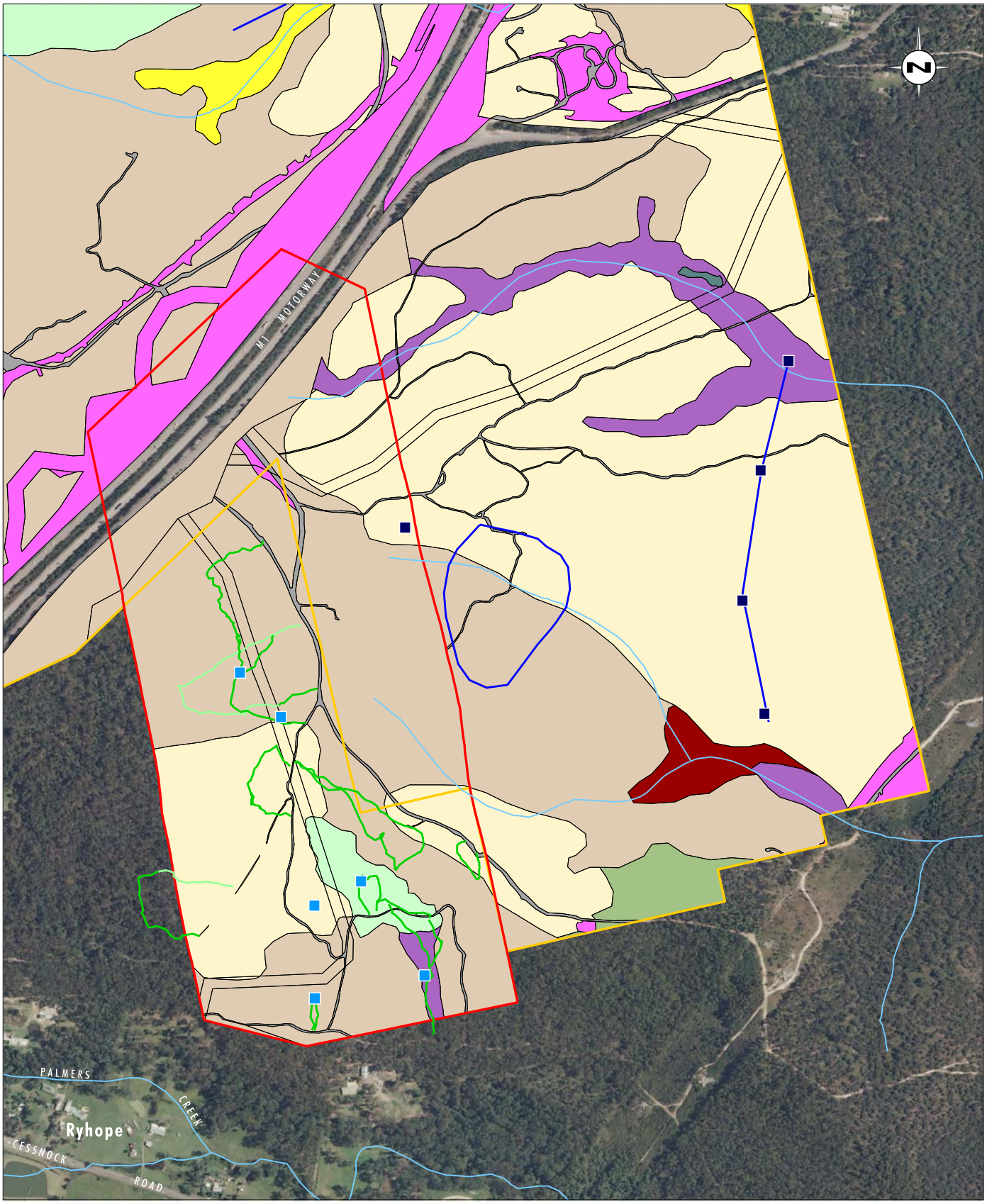

Image Source: OCAL (2008)
Data Source: OCAL (2013), Bell & Driscoll (2009), Umwelt (2013)

0 100 250 500m
1:10 000

Legend

- Project Area
- Approved Continued Underground Mining Area
- Cleared Land
- Disturbed - Regrowth
- Coastal Wet Gully Forest
- Coastal Foothills Spotted Gum-Ironbark Forest
- Freemans Peppermint-Apple-Bloodwood Forest
- Riparian Paperbark-Peppermint Forest
- Sugarloaf Uplands Smooth-barked Apple Forest
- Sugarloaf Uplands Dry Spotted Gum-Ironbark Forest
- Alluvial Tall Moist Forest
- Mesic Paperbark Thicket
- Current Project Meandering Transect
- Current Project Floristic Transect
- Current Project Flora Quadrat
- (WWCCOP) Floristic Transect
- (WWCCOP) Flora Quadrat

FIGURE 2.3

Flora Survey Stratification and Survey Effort

File Name (A4): R04/3149_059.dgn
20140407 15.36

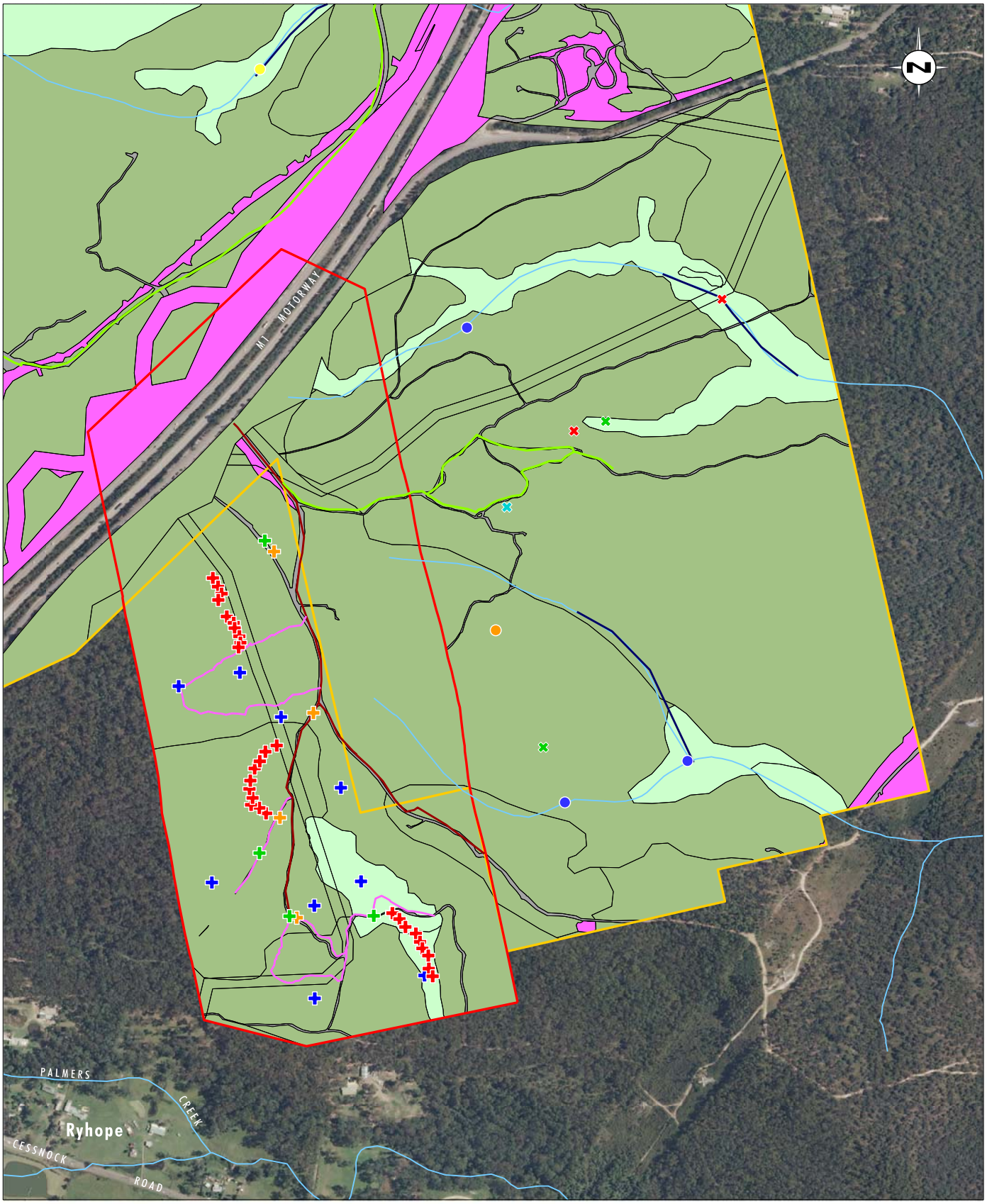

Image Source: OCAL (2008)
Data Source: OCAL (2013), Bell & Driscoll (2009), Umwelt (2013)

0 100 250 500m
1:10 000

Legend

- Project Area
- Approved Continued Underground Mining Area
- Cleared Land
- Disturbed - Regrowth
- Riparian / Wet Gully Habitat
- Forest Habitat
- Current Project Driving Spotlighting
- Current Project Walking Spotlighting
- Current Project Hairtube Line
- Current Project Anabat Recorder
- Current Project Call-playback
- Current Project Diurnal Bird and Herpetological Surveys
- (WWCCOP) Driving Spotlighting
- (WWCCOP) Aquatic Survey Line
- (WWCCOP) Additional Anabat
- (WWCCOP) Additional Diurnal Bird and Herpetological Surveys
- (WWCCOP) Endangered Ecological Community Monitoring Site
- (WWCCOP) Biodiversity Monitoring Site
- (WWCCOP) *Tetratheca juncea* Monitoring Site

FIGURE 2.4

Fauna Survey and Stratification Units

File Name (A4): R04/3149_060.dgn
20140407 15.35

Table 2 – Summary of the Adequacy of Fauna Sampling in the Project Area per Stratification Unit

Survey Target	Survey Method	Survey Requirement (DEC 2004; DECCW 2009) per stratification unit	Survey Effort and Timing Employed with Forest Stratification Unit (62 hectares)	Survey Effort and Timing Employed with Riparian/Wet Gully Stratification Unit (3 Hectares)
Amphibians	Diurnal herpetological searches	One hour per stratification unit	7 diurnal herpetological searches totalling 3.5 person hours. No areas of standing water were identified in the Project Area and therefore nocturnal amphibian searches were not required.	2 diurnal herpetological searches totalling 1 person hour. No areas of standing water were identified in the Project Area and therefore nocturnal amphibian searches were not required.
Reptiles Stratification Unit up to 100 hectares on the coast and ranges	Diurnal herpetological searches	30 minute search on two separate days targeting specific habitat per stratification unit	7 diurnal herpetological habitat searches, each of 3.5 person-hour on 2 separate days. Surveys generally undertaken in the morning between 9am and 11.30am with opportunistic records collected during entire survey.	2 diurnal herpetological searches each of 1 person hours, on 2 separate days. Surveys generally undertaken in the morning between 9am and 11.30am with opportunistic records collected during entire survey.
	Spotlighting surveys searches	30 minute search on two separate nights targeting specific habitat	2 nocturnal spotlighting survey nights comprising 3 person-hours walking spotlighting and 4.5 km driving spotlighting. Spotlighting undertaken between 8pm and 12.00am.	2 nocturnal spotlighting survey nights comprising 1 person-hour. Spotlighting undertaken between 8pm and 12.00am.
Diurnal Birds	Area search	Per stratification unit	7 diurnal bird surveys, each of 1 person-hour. Surveys generally undertaken in the morning between 9am and 11.30am with opportunistic records collected during entire survey.	Two diurnal bird surveys, each of 1 person-hour. Surveys generally undertaken in the morning between 9am and 11.30am with opportunistic records collected during entire survey.

Survey Target	Survey Method	Survey Requirement (DEC 2004; DECCW 2009) per stratification unit	Survey Effort and Timing Employed with Forest Stratification Unit (62 hectares)	Survey Effort and Timing Employed with Riparian/Wet Gully Stratification Unit (3 Hectares)
Nocturnal Birds	Call playback surveys	Sites should be separated by 800 metres – 1km.	4 sessions of call playback were undertaken within the Project Area targeting both stratification units as no sites are separated by greater than 1km due to the small size of the Project Area. Surveys conducted at dusk (approximately 8.00pm).	4 sessions of call playback were undertaken within the Project Area targeting both stratification units as no sites are separated by greater than 1km due to the small size of the Project Area. Surveys conducted at dusk (approximately 8.00pm).
	Spotlighting surveys	No recommended guideline	2 nocturnal spotlighting survey nights comprising 3 person-hours walking spotlighting and 4.5 km driving spotlighting. Spotlighting undertaken between 8pm and 12.00am.	2 nocturnal spotlighting survey nights comprising 1 person-hour. Spotlighting undertaken between 8pm and 12.00am.
	Day habitat searches	Search habitat for pellets, and likely hollows.	Targeted pellet searches were undertaken and inspection of potential roost trees within the Project Area and at 7 habitat assessment sites. Observation surveys throughout all aspects of the fauna survey targeting potential owl roost and nest trees.	Targeted pellet searches were undertaken and inspection of potential roost trees within the Project Area and at 2 habitat assessment sites. Observation surveys throughout all aspects of the fauna survey targeting potential owl roost and nest trees.
Mammals (excluding bats)	Hair tubes	10 large and 10 small tubes in pairs for at least 4 days and 4 nights for stratification units up to 50 ha with an extra effort for each additional 100 ha.	Hair funnel transects were placed along an approximately 200 metre transect at 2 survey sites. Each transect comprised 10 terrestrial hair funnels and 10 arboreal hair funnels. Hair funnels remained on-site for 14 days thereby resulting in 560 trap nights.	Hair funnel transects were placed along an approximately 200 metre transect at 1 survey site. Each transect comprised 10 terrestrial hair funnels and 10 arboreal hair funnels. Hair funnels remained on-site for 14 days thereby resulting in 280 trap nights.
	Spotlighting surveys	2 x one hour and 1 km up to 200 hectares of stratification unit, walking at approximately 1 km per hour on 2 separate nights.	2 nocturnal spotlighting survey nights comprising 3 person-hours walking spotlighting and 4.5 km driving spotlighting. Spotlighting undertaken between 8pm and 12.00am.	2 nocturnal spotlighting survey nights comprising 1 person-hour. Spotlighting undertaken between 8pm and 12.00am.

Survey Target	Survey Method	Survey Requirement (DEC 2004; DECCW 2009) per stratification unit	Survey Effort and Timing Employed with Forest Stratification Unit (62 hectares)	Survey Effort and Timing Employed with Riparian/Wet Gully Stratification Unit (3 Hectares)
	Search for scats and signs	30 minutes searching each relevant habitat, including trees for scratch marks	7 general habitat searches, each of 1 person-hour, were undertaken within the Project Area.	2 general habitat searches, each of 1 person-hour, were undertaken within the Project Area.
Bats (including threatened micro-bats and the grey-headed flying-fox (*Pteropus poliocephalus*))	Ultrasonic call recording (Anabat)	Two sound activated recording devices utilised for the entire night (a minimum of four hours), starting at dusk for two nights.	A total of four 8 nights of ultrasonic call recording was undertaken at the 4 survey sites. Anabats were located in potential flyways to maximise the opportunity of species identification.	The stratification unit not specifically sampled due to a lack of potential flyways. It is noted that this is a small area of habitat and the adjacent habitats that were surveyed are expected to be representative of the range of micro-bats that may occur within this stratification unit.
	Spotlighting surveys	2 x one hour spotlighting on two separate nights	2 nocturnal spotlighting survey nights comprising 3 person-hours walking spotlighting and 4.5 km driving spotlighting. Spotlighting undertaken between 8pm and 12.00am.	2 nocturnal spotlighting survey nights comprising 1 person-hour. Spotlighting undertaken between 8pm and 12.00am.

Summary of Survey Adequacy

Figures 2.2 and **2.3** and **Table 2** demonstrate that the Project specific surveys undertaken within the Project Area are sufficient to accurately describe and map the ecological values of the Project Area, including the extent and composition of vegetation communities, threatened flora and fauna species and fauna habitats. These Project specific surveys also consider the results of previous substantial survey and assessment that has been undertaken within and in the vicinity of the Project Area that therefore is considered that the Ecological Assessment prepared for the Project provides a robust assessment of the values that occur against which a thorough impact assessment was prepared.

Timing of Surveys

Data on timing of surveys is provided in **Table 2**. Surveys were conducted in March 2013 which is considered to be appropriate for the identification of a wide range of flora and fauna species that were considered likely to occur in the Project Area. Those species that are season-dependent and occur or are most readily detected outside of the autumn survey period were predicted to occur, where relevant, based on the availability of suitable habitat with an assessment of significance at both the State and Commonwealth level undertaken based on predicted habitat availability. The March timing of the flora and fauna surveys is considered to be appropriate and in accordance with relevant survey guidelines (DEC 2004; DECCW 2009).

Weather Conditions Prevailing During Project Specific Field Surveys

Prevailing weather conditions during the project specific fauna surveys were conducive to the identification of a wide range of species from each of the broad fauna groups. **Table 3** details the relevant weather variables during the survey.

Table 3 – Prevailing Weather Conditions During Fauna Surveys

Weather Variable	25 March 2013	26 March 2013
Temperature (max.)	28	28
Temperature (min.)	15	18
Rainfall (mm)	0	0
Solar radiation	20.7	16

Threatened species assessment

OEH acknowledges that the EA has provided a detailed assessment on threatened species and their habitat. OEH concurs that in general the proposal is unlikely to have a significant impact on these given that the proposal is devoid of any direct clearing or removal of native vegetation and habitat.

OEH's comment that the Project is unlikely to result in a significant impact is acknowledged. This finding agrees with the findings of the Ecological Assessment for the Project.

OEH is of the opinion that these impacts could adversely affect threatened species and their habitat within the Project Area.

In light of the potential impacts that subsidence may cause to threatened species habitat, OEH is of the opinion that if the impacts are significant the proponent should be responsible in providing appropriate compensatory habitat. Although the EA indicates that it will monitor subsidence and implement remediation measures where required, it fails to address what measures will be implemented if remediation fails or it is unable to replace certain habitat features with adequate surrogate options (e.g. fallen large mature trees which are hollow-bearing). As such OEH is of the opinion that appropriate offset measures should be applied to areas and/or habitat features that cannot be remediated or replaced in a reasonable timeframe to prevent long-term loss (e.g. fallen hollow-bearing trees which cannot be replaced in the short-term by replanting).

As noted above, OEH has indicated that it agrees with the finding of the Ecological Assessment that the Project will not result in a significant impact on threatened species.

In regard to contingencies for offsetting any unexpected adverse ecological impacts, as outlined in the EA OCAL has reaffirmed the commitment it made in the EA for the WWC Continued Operations Project (refer to Commitment 6.4.1) which stated that in the event that significant impacts on identified ecological values are identified and cannot be adequately remediated.

OCAL will engage a suitably qualified and experienced ecologist to prepare a Biodiversity Offset Strategy in consultation with OEH and DP&E.

This commitment is further reinforced by Condition 2 of Schedule 3 of the WWC Project Approval which requires that any impacts on threatened species, threatened populations, endangered ecological communities or core koala habitat, that results in more than negligible environmental consequences and that cannot be remediated, needs to be offset.
Collectively, these existing commitments made by OCAL and the existing conditions of the WWC Project Approval appropriately address the above comments provided by OEH.

OEH also notes that the proposed longwall panels will partly undermine (south-western part of the Project Area) a proposed Lake Make Macquarie Council (Council) biodiversity offset located at Ryhope, to offset the impact on Grevillea parviflora subsp. parviflora from a development site in the Council's local government area. As such OEH recommend that the proponent consult with Council to ensure that this offset site is not adversely impacted upon by the proposal.

OCAL identified early during consultation about the Project that LMCC was considering the potential of this area as a future biodiversity offset. As indicated on **Figure 2.1**, OCAL understands that LMCC is considering all of its land holding as a biodiversity offset, being an area of approximately 18.8 hectares. Approximately 1.04 hectares of this proposed offset is proposed to be undermined by the Project. This issue was specifically addressed in OCALs meeting with LMCC on 24 May 2013 and OCAL assumes that LMCC will, in finalising its approach to this potential offset, take into account the presence of a mining lease that covers this area. It is noted that no biodiversity offset currently exists at this site. Regardless, as OCAL has outlined in the EA and in consultation with LMCC, OCAL considers that a biodiversity offset in the area and underground mining would be compatible.

This view is supported by the findings of the detailed ecological assessment which found that although the Project will impact on ecological values, the majority of vegetation and fauna habitat in the Project Area will remain largely undisturbed. It also found that the predicted impacts are not expected to result in a significant loss of floristic diversity or community composition, or fauna habitat within the Project Area or the region; and that the Project is not predicted to result in a significant impact on threatened species, populations or communities known or with potential to occur in or around the Project Area.

Aboriginal Cultural Heritage Assessment

Although OEH confirms the validity of these approaches (i.e. the consultation approach adopted by OCAL for the Project), OEH would like to highlight the fact that Aboriginal representative groups are highly dynamic and some facility should be provided on a regular basis for newly identified Aboriginal stakeholders to be included in projects. Some form of public notification should be undertaken at the beginning of the consultation phase of any major modification to an existing project.

It is noted that the OEH submission confirms the validity of the consultation processes adopted for the Project, including the inclusion of the recently registered Native Title claimant group as a registered Aboriginal party for the Project.

OEH also makes a comment regarding the potential benefits of having a process for including newly identified Aboriginal stakeholder groups on an ongoing basis. We note in this regard that OCAL has not closed registration and any Aboriginal stakeholders that identify their interest in the Project would be invited to register. All registered Aboriginal stakeholders are provided relevant project related information and consulted in relation to works. It is noted that the Aboriginal Cultural Heritage Assessment will be placed on public exhibition and that other interested Aboriginal parties may provide submissions through this process. OCAL will continue to consult closely with the registered Aboriginal parties for the Project being, Awabakal Local Aboriginal Land Council (ALALC), Cacatua Cultural Consultants (CCC), the Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC) and the Awabakal Traditional Owners Aboriginal Corporation (ATOAC). As OEH is aware ADTOAC and ATOAC have a registered Native Title claim over the Project Area and have an intimate understanding of this area and the broader Sugarloaf Range. OCAL recognise the obligations of the Traditional Owners to speak for their Country and encourage their involvement along with that of the other registered Aboriginal parties. In accordance with the requirements of the WWC Project Approval, OCAL has also developed and implemented an Aboriginal Cultural Heritage Management Plan (ACHMP) for the ongoing operations at WWC. As detailed within the ACHMP, OCAL have established an Aboriginal Cultural Heritage Management Committee (ACHMC) to oversee the implementation of the ACHMP and to act as a mechanism for ongoing consultation between OCAL and registered Aboriginal parties. The ACHMC meets on a regular basis to discuss the operations undertaken at WWC.

With regard to the proposed various alternative management processes for the scarred tree (Palmers Creek Scarred Tree 1) OEH concurs with the first two management options (a & b) outlined on Page 53 of the EA. OEH also concurs that, in the event irreversible harm occurs to the tree as a result of the proposed works, salvage of the scarred section is appropriate, however, OEH considers more detailed recording should take place. OEH request that prior to the commencement of works the following recording measures are completed for the tree:

- **complete photographic recording of the entire tree from four cardinal directions;**
- **contextual photographic showing surrounding landscape, including the tree itself;**
- **detailed sketch of the tree and scar, including dimensions;**
- **close up photographs of the scar itself.**

As part of the current Aboriginal Cultural Heritage Management Plan (ACHMP – Umwelt 2012a), the scarred trees within the WWC operations area are baseline recorded prior to any impacts from subsidence. As part of the implementation of the Project OCAL has committed to update the ACHMP to include Palmers Creek Scarred Tree 1 which will be baseline recorded in compliance with the ACHMP. Baseline recording includes a complete photographic recording of the tree from the four cardinal directions, contextual photos of the

tree and surrounding landscape, sketches of the tree and scar, with dimensions and detailed photos of the scar. This process, which has been committed to by OCAL in the EA, will fully satisfy this request from OEH. WWC will also review the feasibility of utilising alternate methods for the baseline recording of the scarred tree which may include the utilisation of 3D scanning of the tree. Consultation with OEH and Registered Aboriginal parties regarding the proposed baseline recording methods to be utilised will be undertaken prior to the completion of the baseline recording.

OEH Comment: OEH notes that in a number of submissions from Registered Aboriginal Parties some issues were raised. OEH cannot see any evidence that the concerns raised in this correspondence have been addressed. In particular:

- **the letter from ADTOAC notes the proximity of 38-4-1279 to predicted subsidence impacts and the conflict with the predicted low chance of impact to this site.**
- **a number of incidences of alleged failure to comply with the approved Aboriginal Cultural Heritage Management Plan are noted in the ALALC email of 12 September 2013.**

OCAL noted the concerns raised by ADTOAC in **Section 10.5** of the Archaeological Assessment undertaken for the EA (Appendix 6 of the EA). These concerns related to the potential for direct subsidence to impact Palmers Creek Grinding Grooves 1 and 2, or indirect impacts to these sites as a result of sediment washing onto the Palmers Creek Grinding Grooves 1 and 2.

OCAL has committed to ensuring that impacts to Palmers Creek Grinding Grooves 1 and 2 are effectively mitigated by leaving a substantial barrier of coal under the area. OCAL considers that the detailed subsidence assessment completed for the Project which indicates a very low potential for impact as accurate and appropriate and believes that this finding is consistent with its ongoing commitment to design and implement a mining operation which avoids impacts on these sites. OCAL also notes that the potential for indirect impacts due to sediment mobilisation due to cracking can be effectively managed and is confident that with the controls proposed, that this potential impact will not occur.

It is further noted that these concerns were initially raised and discussed in detail at the workshop held with the registered Aboriginal parties on 15 August 2013 regarding the draft report. During that workshop OCAL provided a detailed answer to ADTOAC and ALALC concerns regarding impacts on Palmers Creek Grinding Grooves 1 and 2 (sites 38-4-1279 and 38-4-1280).As noted above, the WWC ACHMC also provides a forum for regular meetings between WWC and Registered Aboriginal Parties to discuss the ongoing operations of WWC.

OCAL note that ALALC raised concerns about compliance with the ACHMP. These concerns do not relate to the Project and have been addressed outside of this process. In this regard, correspondence has also been forwarded to ALALC regarding their concerns. The correspondence provides detailed answers to each of ALALC's concerns and confirms that OCAL will continue to comply with ACHMP requirements in relation to consultation, vegetation clearance and monitoring.

OEH considers that the EA should include responses from the consultant to the concerns raised in order to inform the determination process.

As noted above, correspondence has been forwarded to ADTOAC and ALALC by OCAL regarding their concerns.

OEH supports the claim by ALALC that foreign material (i.e. crushed basalt) should not be utilised for road works or associated activities where those activities impact on known Aboriginal sites. OEH concurs with ALALC that, at those locations, crushed rock or gravel sourced from locally available raw materials should be used.

During discussions with ALALC as well as ADTOAC and ATOAC, OCAL agreed to utilise other materials for access track repairs. OCAL will update the ACHMP to reflect this commitment.

This issue has also been addressed in OCALs further correspondence provided to ALALC.

Floodplain Management

It should be noted that only the results are included in the EA, the parameters used in the modelling are not included, so a thorough review of the surface impacts cannot be undertaken. OEH request that such data should be included to enable a comprehensive review.

As discussed in Section 6.5.3 of the EA an XP-Storm model was developed of Palmers Creek as part of the Surface Water Assessment for the WWCCOP EA (Umwelt 2010c). The XP-Storm model included the first and second order watercourses. XP-Storm model nodes were placed along the watercourses at points of interest, including watercourse confluences, and the locations where streams crossed the proposed locations of the middle of each longwall and the centre of each chain pillar. The elevations of the nodes and links and the watercourse cross sections for the existing (i.e. pre-mining) and predicted post-subsidence landform were generated directly from digital terrain models.

The XP-Storm package models a watercourse as a series of nodes along a channel that are connected by drainage links. Model nodes provide locations for sub-catchment information to be included into a model, including sub-catchment area, slope and percentage impervious area. Drainage links describe the dimensions of each reach of the modelled watercourse, by way of channel length, slope, cross section, top of bank, upstream and downstream channel inverts and surface roughness ('Mannings n').

The XP-Storm model was used to estimate the potential changes to flows within Palmers Creek in response to the predicted subsidence associated with the Project. The model included the predicted subsidence associated with approved LW 44 and LW 45 within the reaches of the modelled tributaries downstream of the subsidence affectation zone for the Project. The XP-Storm model was used to estimate the response of Palmers Creek and its tributaries to four design storm events, specifically the 2 year Average Recurrence Interval (ARI), 10 year ARI, 20 year ARI and 100 year ARI, critical duration design storm events.

The sub-catchment areas used in the XP-Storm model were derived from a LiDAR based digital terrain model (DTM) of the Palmers Creek catchment area developed for the WWCCOP EA (Umwelt 2010c).

The hydrology layer in XP-Storm was used to estimate the runoff response of each of the sub-catchments with design rainfall depths sourced from the BOM IFD webpage and design rainfall temporal patterns sourced from Australia Rainfall and Runoff (Pilgrim 1987).

Runoff from each of these catchments in response to the four design storm events was modelled using the Laurenson equation and Hortonian infiltration models included in XP-Storm.

The key parameters used in the XP-Storm model were:

- Laurenson Equation $S = BQ^{n+1}$
  where: S = catchment storage (m^3)
  B = time delay parameter (derived from n*)
  Q = instantaneous runoff (m^3/s)
  n = -0.285

- Mannings Roughness n = 0.04 to 0.10 (watercourse roughness)
  n* = 0.40 (overland flow roughness)

- Horton Infiltration $Fp = Fc + (Fo + Fc).e^{-kt}$
  where: Fp = Horton Infiltration (mm/hr)
  Fo = 10.14 mm/hr
  Fc = 0.38 mm/hr
  k = 0.00115 1/sec
  t = time (sec)

2.3 Department of Primary Industries

2.3.1 Crown Lands

It is recommended should the project be approved, that the proponent be required to monitor the impact that their activities are having on Crown road reserves for the duration of the project. If any mine subsidence or other impact is identified, Trade & Investment, Crown Lands is to be notified immediately. Any damage to the Crown land is to be rectified by the proponent. Any Crown roads significantly affected by the project are to be closed and acquired by the proponent.

OCAL will consult with Crown Lands as part of the Extraction Plan/Subsidence Management Plan process prior to undermining any Crown roads. Subsidence impacts will be remediated in accordance with the requirements of the Project Approval and the Extraction Plan/Subsidence Management Plan. OCAL will consult with Crown Lands as the owners of the land during the implementation of the Project, including should any adverse, unpredicted subsidence events occur.

2.3.2 NSW Office of Water

Attachment A

Riparian Management

1. **A survey plan and monitoring program must be devised which will enable medium term monitoring verification of predicted subsidence resulting from longwall extraction. This should include pre- and post- photographic records of channel widths, sand infill and bedrock exposures which may be affected by changed long profile gradients or fractures. Surface fracture propagation should be minimised, and remediated if detected in the watercourse. Remediation may include hand grouting surface cracks should identified flows in the watercourse be lost, or become contaminated within the basal fracture network. Should levels decline (i.e. by slumping or headcut initiation), woody debris may be used to form debris barriers or lateral sills (keyed into both banks) installed to prevent headward migration of incision or development of headcuts.**

OCAL has an existing comprehensive monitoring regime which will continue to be implemented to monitor drainage lines for potential subsidence impacts. Monitoring procedures include:

- monitoring of vertical and horizontal subsidence along second order drainage lines;
- monitoring, measuring and recording (e.g. photographic records) of the extent and magnitude of any surface cracking along second order drainage lines and first order drainage lines in depths of cover less than 100 metres that may occur during and post mining operations. If works are required (sealing of cracks), methods approved by the OEH and DRE would be used;
- visual inspection and recording of stream bed and bank condition and riparian vegetation along targeted sections of second order drainage line, including collection of baseline data and monitoring during and post mining operations;
- monitoring of geomorphological response of each watercourse to the predicted subsidence, as follows:
    - prior to mining review the potential geomorphological response of each watercourse to the predicted subsidence using the guidelines included in *River Hydrology and Energy Relationships – Design Notes for the Mining Industry published by Department of Water and Energy* (November 2007) and the methods described below;
    - for each watercourse within the proposed mining area:
        - describe the existing (i.e. pre-mining) watercourse characteristics including bed controls using approaches outlined in AUSRIVAS (Australian River Assessment System);
        - calculate the stream power for the existing and predicted subsidence conditions;
        - determine threshold limits of stream power for incision and bed load deflation, taking into consideration existing stream stability, surface and substrate soil conditions and stream grades;
        - refine the monitoring program, including monitoring of:
            - any bed control points;
            - areas where subsidence may increase the stream power above the determined threshold limits potentially causing channel erosion/instability;
            - monitoring may include long section and cross section surveys, photographic records and/or methods outlined in AUSRIVAS;
        - investigate and implement any remediation required to mitigate potential impacts of changes in stream power as a result of underground mining activities;
    - during and post mining, monitor watercourses, in accordance with the developed monitoring program; and
- ongoing monitoring and maintenance will be undertaken for any areas requiring surface mitigation works to facilitate effective rehabilitation.

The NOW submission notes remediation methods that could be applied at WWC. The specific remediation methods applied are determined by WWC on a case by case basis in accordance with the measures outlined in the Extraction Plan/SMP for each mining area.

2. Standard erosion control measures for any access and/or remediation actions are recommended as conditions of approval of the proposed extraction.

OCAL currently implements a range of erosion and sediment controls at WWC for access and remediation works, as required. These include:

- ensuring the erosion and sediment controls are installed as a first step within the works program;
- limiting access tracks into works areas, including use of existing access tracks where possible;
- where disturbance is required ensure that the disturbance is as small as practicable;
- construction and regular maintenance of sediment fences downslope of disturbed areas;
- prompt revegetation of disturbed areas;
- where new access tracks are required, construction of these in accordance with Guidelines for the planning, construction and maintenance of tracks published by Department of Land and Water Conservation (1994), including:
    - construction of access tracks along the contour where possible (i.e. limit grade changes);
    - minimising disturbance of existing ground, e.g. where possible limiting works to slashing vegetation when constructing tracks;
    - limiting construction of access tracks across existing drainage lines;
    - maintaining vegetation buffers between access tracks and watercourses where possible;
    - ensuring tracks are free draining; and
    - including cross fall and outfall drainage, where required, to prevent concentration of runoff.

These controls will be implemented for the Project.

3. The minor nature of the headwater, and its relative inaccessibility reduces the level of risk associated with potential loss of flow. However, the undisturbed nature of the watercourse, and its contribution to Palmers Creek and riparian landholders downstream, should be considered in the recommendation of conditions of approval.

4. Clarification is required regarding the proposed protection measures for the headwaters of Palmers Creek, including reductions in extraction height in LW 51/52.

As noted by NOW, the minor nature of the headwater, and its relative inaccessibility, reduces the level of risk associated with potential loss of flow. Notwithstanding, a detailed assessment has been undertaken by Aurecon of the potential impacts of the Project on the Palmers Creek alluvial aquifer and on private bores.

Condition 1 of Schedule 3 of the WWC Project Approval requires '*no connective cracking between the surface and the mine*'. To achieve this outcome for LW51 and LW52, OCAL has designed the mine plan to prevent interconnected fracturing (i.e. cracking that connects the surface to the mine). To manage the risk of interconnected fracturing occurring and to protect the headwaters of Palmers Creek, OCAL has committed to reduce extraction heights where depth of cover is shallower and there is a higher risk of interconnected fracturing. The maximum mining height within LW 51 and LW 52 will typically range from approximately 4.2 metres to 4.5 metres. Based on the concept mine plan, extractions heights are likely to be reduced to heights between 3.6 metres and 3.8 metres in sections of LW 51 in areas with a depth of cover of less than 90 metres to minimise potential for connective cracking.

Groundwater Management

The two additional longwall panels are positioned outside the alluvial boundaries which would likely limit the amount of water take from the North Lake Macquarie Water Source and limit impact on water users. However, the Groundwater Impact Assessment (GIA) undertaken by the proponent was done without a groundwater model and has primarily relied upon interpretation of impacts based on the potential extent of the goaf fracturing. This methodology is insufficient to provide the information that would adequately address the Aquifer Interference Policy requirements.

The Groundwater Impact Assessment (GIA) completed by Aurecon concurs with NOW's statement that *'the two additional longwall panels are positioned outside the alluvial boundaries which would likely limit the amount of water take from the North Lake Macquarie Water Source and limit impact on water users'*. Because the impact is likely to be negligible, the GIA used existing mining and hydrogeological experience to validate this contention. It was considered that the very low risk to the North Lake Macquarie Water Source did not justify the implementation of a complex numerical groundwater model.

The assessment approach taken for the Project is consistent with that previously used for the WWC Continued Operations Project which received Project Approval (PA 09_0203) in 2012, under Part 3A of the EP&A Act. It is also noted that as the proposed Project is a relatively small scale addition to an existing major underground mining operation, and that no Director-General's Requirements were issued requiring an assessment in accordance with the NSW Aquifer Interference Policy (AIP), Aurecon did not consider it necessary to prepare a numerical model to assess the impacts of the Project on groundwater. It is noted that the AIP does not provide any specific guidance on the assessment approach to be undertaken for modifications to existing projects (which may range from very minor changes to moderate changes to approved projects), nor identify the scale of risk to groundwater at which a numerical model is required. It is noted that for certain projects the AIP provides for assessment to be undertaken based on desktop analysis.

The predicted groundwater impacts associated with the Project have been assessed in relation to the NSW Aquifer Interference Policy which states that any mining activity must consider 'Minimal Harm Criteria' with respect to groundwater sources.

The GIA found that there will be no measurable impacts on the groundwater level, flow or water quality in the Palmers Creek alluvial aquifer from the extraction of LW 51 and LW 52 due to the separation distance of the aquifer from the proposed extraction. Consequently, the minimal impact criteria will be met for the alluvial aquifer in Palmers Creek. No impacts were predicted for any other alluvial aquifers.

The GIA also concludes that the Project will meet the minimal impact criteria for the fractured rock aquifer.

Given the low risk to significant groundwaters as a result of the Project and considering that it is a relatively minor extension to a much larger approved mining operation and that a numerical groundwater model was not required for the currently approved operations at WWC, OCAL considers the request to prepare a numerical groundwater model for the current Project to be unreasonable.

1. Water take and licensing requirements

The proponent holds licence 20BL469793 with an allocation of 360 ML/yr from the Sydney Basin Porous Rock Aquifer. The proponent states that the water discharged from the mine is licensed and is almost entirely comprised of groundwater from the coal measure strata. At the end of June 2012, the total discharge from the mine averages nearly 3 ML/day, most of which was coal measure groundwater. The proponent's Water Management Plan predicts this could increase to 5 ML/day in the future. Hence, the proponent does not hold sufficient licensed allocation to cover the volume of take, as stated.

However, an application was made in 2009 to increase the entitlement (to 1000 ML) and the Office of Water requests that the proponent contact the Newcastle office to discuss additional information that is required to process this application.

OCAL notes that this issue is related to the existing WWC operations, not the proposed Project. OCAL would welcome assistance from NOW to resolve this long-standing application which was lodged with NOW in 2009. Although not related to this current application, a response is provided below.

On 1 June 2009, WWC applied to the then Department of Water and Energy (DWE) (now NSW Office of Water (NOW)) to vary licence 20BL169793 to increase the limit of water extraction to 1000 ML per 12 month period. In addition, in this application WWC requested to vary the licence to permit water extracted under this licence to be supplied to Metromix Quarry. The volume covered by the application was based on WWC's predictive water balance model and extraction of groundwater since this time has confirmed this need.

Following submission of the variation application, OCAL received correspondence from NOW on 5 June 2009 requesting additional information regarding groundwater extractions, specifically in relation to the licence conditions. The information requested by DWE was provided on 19 June 2009. OCAL then received subsequent correspondence on 12 August 2010 indicating that '*NOW accepts that the situation is difficult for OCAL to demonstrate compliance with the licensing arrangement, and grants approval to continue operations until such time as the variation in the licence volume is granted*'.

So whilst the GIA refers to the WWC as a relatively dry mine, the Office of Water needs to better understand why a three-fold increase in allocation is required and the proportion of water taken from different water sources. Having been undertaken without using a groundwater model and based primarily upon interpretation on the potential extent of goaf fracturing, the GIA has not resolved the Office of Water's requirements.

As discussed above, the 2009 licence application which remains outstanding, is a separate issue to the current Project. OCAL does not agree with the retrospective application of the AIP requirements to this outstanding application. Although related to the existing operations and not the Project, a response is provided below.

NOW notes the WWC application for a three-fold increase in the discharge license, and perhaps misinterprets this as being due to a significant increase in the impacts on the groundwater systems. It is noted that the Project does not require a three-fold increase in allocation.

The assessment of the groundwater discharge from the mine over the recent past indicates a slowly increasing groundwater inflow as the footprint of the mine expands. This is entirely consistent with normal inflow behaviour. There is no sudden increase in inflows expected from the proposed modification.

As discussed in the GIA, WWC is not considered a 'wet' mine. Even with the increased allocation of 1000 ML/yr (~3 ML/day), the groundwater inflows are an order of magnitude less than so-called 'wet' mines where the inflows are of the order of 20-30 ML/day. As outlined in the WWC Continued Operations Project EA, the average groundwater inflows for the current approved operations were predicted to be 901 ML. It is also noted that WWC pumps into the mine approximately 250 ML of potable water a year for use in longwall equipment and as dust suppression which would be contributing to water pumped from the mine. A discharge rate of approximately 3 ML/day from a mine with over 40 extracted longwall panels at reasonably shallow depth of cover is considered very low, and indicative of very low permeability overburden strata with no significant aquifers.

The proposed modification is predicted to result in minimal incremental increases in groundwater make. The outstanding licence application, once processed by NOW, is anticipated to be adequate for the take of water from all sources.

An independent review has been undertaken by Noel Merrick. In point 7, Appendix C of GIA, he alluded to the proponent that other methods, such as Tammetta (2012) equation, would identify groundwater impacts not constrained to just the goaf fracturing and likely extent further than what is being processed. The point has been disregarded by the proponent. Utilising the equation presented by Tammetta (2012) using the WWC inputs indicated that complete groundwater drainage would extend to ground surface. Simply, there is a component of the 3 ML/day derived from the North Lake Macquarie Water Source that is yet to be quantified from a numerical model. Longwalls 51 and 52 will be in hydrological connection with the other longwalls and is part of the cumulative impact.

The 3 ML/day inflow discussed in the above comment by NOW relates to the existing operations, with minimal changes predicted to groundwater inflow due to the Project in a cumulative sense. The existing operations have been assessed in detail and approved and OCAL does not believe that any further assessment in addition to the LW51 and LW52 GIA is required.

NOW mentions the Tammetta method as being able to identify groundwater impacts beyond the goaf, and states that the GIA ignores this fact which was brought to attention by Noel Merrick. In fact, Dr Merrick in his peer review states that:

> 'The reviewer has conducted a comparative assessment using an alternative model [Tammetta] and has investigated the sensitivity of the height of the fractured zone to mining height, panel width and cover depth. The reviewer is of the opinion that the Ditton model [DgS] provides the best estimate'.

As indicated in the GIA, it is Aurecon's opinion that the Tammetta methodology has two major flaws:

- it is based on local data as well as international data from areas where there is a significant difference in the geological conditions to those found in NSW. This will produce inaccurate results; and

- some of the Tammetta data does not differentiate between interconnected fracturing and discontinuous fracturing, so that height of the zone of interconnected fracturing is overestimated.

NOW has stated that using the Tammetta model *'indicates that complete groundwater drainage would extend to the surface'*. This is an incorrect interpretation of the methodology. As indicated in the second dot point above, the Tammetta data does not differentiate between interconnected fracturing and discontinuous fracturing in the overburden, but indicates only the zone where some depressurisation occurs. Some of this measured depressurisation is due to drainage of the strata into the mine. In the upper strata (Ditton's B-Zone) some depressurization can be measured, but this is due to vertical dilation as the strata sag over the goaf. Groundwater flow in this zone is horizontal (mostly along bedding planes) and the vertical permeability is unchanged or possibly decreased due to compression over the goaf. Due to the increased vertical hydraulic gradient, there will be some minor increase in groundwater drainage in this upper zone, but it will certainly not result in *'complete groundwater drainage'*. The data supports this finding. If the Tammetta model is used to estimate the height of fracturing over LW 27 and LW 28 (which were extracted under Cockle Creek at a depth of cover in the order of 110 m), it would suggest that the zone of depressurization extends to the surface above these panels. Monitoring of the groundwater in the Cockle Creek alluvium showed no permanent impact from the extraction, and hence, significant drainage has not occurred. This data was presented in a previous Aurecon report, *West Wallsend Colliery, Hydrogeological Assessment for Continuing Operations Project* (2010).

WWC is a large mine that has been operational for such a period of time where it would be reasonable to assume that a calibrated numerical groundwater model should be readily available to guide an understanding of the licensing requirements and address the AIP requirements. It is requested that the proponent liaise with the Office of Water to determine how to satisfy these requirements.

As discussed above, no current numerical groundwater model exists for the current operations as it was not required for past approvals. It is also noted that considering the relatively short projected life of mine for the current operations, OCAL does not consider that retrofitting a groundwater model to the existing approved operations would be a productive use of resources. Groundwater assessments for WWC in the past have been based on analysis of monitoring data and desktop assessments and this approach has been accepted and approved.

Refer also to above comments in relation to groundwater modelling and licensing requirements.

2. Groundwater Dependent Ecosystems (GDE)

The proponent states that 'in the vicinity of longwalls 51 and 52, no groundwater dependent ecosystems were identified in the field studies, so that no further consideration of this aspect is required'. However, no detail or reference is provided for the GDE field studies mentioned.

The statement referenced by NOW is from the Groundwater Impact Assessment (GIA) (Aurecon 2013). The detail on GDE field studies is provided in the Ecological Assessment (Appendix 5 of the EA) and the main text of the EA (Section 6.3). No GDEs were recorded in the Project Area.

A detailed survey methodology was designed and completed in order to gain a thorough understanding of the ecological features of the Project Area. As detailed in Appendix 5 of the EA, none of the vegetation communities recorded in the Project area are considered to be GDEs and none conform to the descriptions of listed Threatened Ecological Communities (TECs).

Recommendations

1. **The proponent develops a numerical groundwater model to support an assessment of the AIP requirements and resolve their outstanding licensing arrangements.**

Refer to above comments in relation to groundwater modelling and licensing requirements.

2. **The proponent undertakes a floristic mapping above and enveloping longwalls 51 and 52 to identify GDEs and where such a GDE is listed as an EEC, added to the BMP.**

As noted above, a comprehensive ecological survey has been undertaken for the Project Area and was provided in Appendix 5 of the EA. No GDEs were recorded within the Project area. If approval is granted for the proposed modification, OCAL will update the WWC Biodiversity Management Plan (BMP) to include floristic mapping for the LW 51 and 52 Project Area as part of the SMP/Extraction Plan process.

3. **Water Licensing**

The Office of Water require WWC:

1. **To identify the volumes of water they are taking from the fractured rock groundwater source and from surface water sources; and**

2. **To account for all water coming into the mine from all difference water sources.**

The proposed mining of LW 51 and LW 52 results in minimal change to groundwater make at the WWC underground mine. The information requested relates to existing water make, not to the proposed mining of LW51 and LW 52. In 2009, OCAL requested adequate licensing from NOW, and a groundwater impact assessment and site water balance was provided in the EA provided for the existing operations which was approved on January 2012.

The current GIA has been peer reviewed, and shows negligible loss of baseflows from alluvial aquifers and satisfies the minimal impact criteria of the AIP. OCAL believe that adequate information has been provided to assess the impacts of the Project on groundwaters. NOW also acknowledge in their submission that impacts to alluvial aquifers will be negligible.

The GIA prepared by Aurecon identifies that the majority of the water make in the mine comes from drainage of the fractured overburden strata. This statement is based on the following facts:

- there are no perennial streams crossing the lease area from which surface water could be drained;

- there are only three intermittent streams, Diega Creek, Cockle Creek and Burkes Creek, which flow occasionally after very heavy or consistent rainfall. These streams have alluvial deposits, but no major aquifer where they are undermined in the lease area. Monitoring has shown that the groundwater within these alluvial deposits is apparently unaffected by the extraction of longwall panels directly beneath the streams, so that drainage from this source is negligible. Although depressurization of the strata beneath the alluvium has the potential to affect baseflow, the monitoring data does not indicate any measurable impacts; and

- the estimated height of the zone of interconnected fracturing above the longwall panels (based on the results of monitoring) does not exceed the depth of cover, so that there is no direct flow of runoff into the mine via mining-induced fractures.

It is recognised that due to the increased vertical hydraulic gradient above the extracted longwall panels, there will be an increase in groundwater flow from the alluvium into the mine following extraction. Since the monitoring of the alluvial groundwater shows no detectable impacts from mining, this inflow is considered to be negligible. In addition, the alluvial areas above the mine form only a small proportion of the total area.

In accordance with WWC's Project Approval, the existing mine and the Project have been designed to avoid interconnective cracking, avoiding the risk of surface water flows entering into the minor workings.

Normal rainfall infiltration rates may increase where subsidence-induced cracking occurs at the ground surface, but there is no evidence to suggest that this water flows directly to the mine opening. Aurecon has identified that, in fact, there is some evidence from the analysis in the water management report that there is a delay of some months before the impacts of large rainfall events become evident in the mine water inflows.

Given the above, it is considered by Aurecon that it is entirely reasonable to assume that the mine water inflows are essentially from the fractured strata above the longwalls.

Recommendations:

1. WWC liaise with the Office of Water to provide relevant information to finalise outstanding water licensing issues.

Refer to previous comments in relation to groundwater modelling and licensing requirements.

2. WWC obtain all relevant water licences under the *Water Management Act 2000*/*Water Act 1912* to cover all take of water from all relevant water sources.

OCAL will continue attempts to obtain all relevant water licenses to cover take of water from relevant water sources, in consultation with NOW. This includes OCAL's desire for the licence application made to NOW in 2009 to be processed as soon as possible.

OCAL will consult with NOW to develop a strategy to address the apportionment of water take from the hard rock and the alluvial aquifers in order to resolve the outstanding request for a water licence.

Attachment B

Attachment B contains the NOW assessment of the Project against the AIP. The issues contained within Attachment B relating to the AIP largely relate to NOWs request for a numerical groundwater model which has been addressed in the responses above.

OCAL will continue attempts to obtain all relevant water licenses to cover take of water from relevant water sources, in consultation with NOW. This includes OCAL's desire for the licence application made to NOW in 2009 to be processed as soon as possible.

2.4 Division of Resources and Energy

Mining Title

Under the *Mining Act 1992*, mining and rehabilitation are regulated by conditions included in the mining lease, including requirements for the submission of a Mining Operations Plan (MOP) and a Subsidence Management Plan (SMP) (if required) prior to the commencement of operations, and subsequent Annual Environmental Management Report (AEMR). As shown in the EA, DRE requires that the proponent submit a revised MOP to include this modification if approved.

Noted.

Subsidence

Based on the information provided in the EA, DRE considers that the proposed modification does not substantially change the overall subsidence risks at the site and should be manageable through the Extraction Plan process/SMP process.

Noted.

Recommended Conditions of Approval

It is noted that DRE recommends several conditions of approval. These recommendations are generally consistent with the existing approval and OCALs commitments.

DRE has no objection to this modification.

Noted.

3.0 Response to Public and Environment Group Submissions

3.1 Public Submissions

As discussed in **Section 1.2**, three public submissions were made on the Project. Both objected to the Project. The main issues raised in these two submissions are included below along with responses.

The subsidence events associated with LW 41, including comments that no further approvals should be granted until previous damage has been repaired.

A detailed review of the LW41 subsidence incidents has been completed by OCAL and also by a high-level interagency working group, the Sugarloaf Safety and Remediation Committee (SSRC) consisting of DP&E, OEH, DRE and the EPA.

The SSRC report (March 2013) found that '*while two of the three incidents at WWC are considered significant, the scale and significance of the incidents are not as serious as some media report have suggested*'. In regard to the larger VBM feature, the SSRC found that while the scale and significance of the VBM feature exceeded the predictions of subsidence impacts expected, it is not large in itself. It also found that the greatest impact of the VBM is not in its environmental, visual or landscape significance, but in the current and future risks it may present to public safety. Controls have been implemented by OCAL in consultation with relevant government agencies to address this public safety issue.

As outlined in the EA, the LW41 subsidence event occurred as a result of anomalous subsurface fracturing due to unknown geological conditions, with these features resulting in unpredicted movement as mining progressed through the area. As also discussed in the EA, underground and surface geological mapping work has not detected any significant geological structure of concern in the Project Area and therefore the geological conditions that led to the unpredicted subsidence events above LW41 are not predicted to occur in the Project Area.

It is also noted that to avoid higher-than-predicted subsidence incidents at WWC in the future, the SSRC have requested OCAL to provide specific additional information with all future Extraction Plans and Subsidence Management Plans, including the plans that would be required as part of the implementation of LW 51 and LW 52. OCAL has also updated its subsidence remediation procedures in consultation with relevant government agencies, including OEH regarding works in the SSCA, to address the grouting incidents that occurred and general subsidence remediation practice.

On the basis of the above, in particular the differences in geological and topographic conditions in the LW41 incident area compared to the Project Area and the recent further improvements to OCALs rehabilitation procedures and practices; OCAL believes that these risks can be effectively managed through the range of measures that OCAL has committed to and in accordance with the requirements of NSW government agencies.

Comments relating to LW 49 and LW 50, in particular, removing the two longwalls from the mine plan due to previous subsidence events and the proximity to Aboriginal archaeological sites.

LW 49 and LW 50 are part of the approved operations at WWC and are not the subject of the Project.

Subsidence to Sugarloaf Range Road or Brunkerville fire trail, which is the only access for fire vehicles for residents living in Leiberts Lane.

Neither Sugarloaf Range Road nor Brunkerville fire trail are located within the Project Area and will not be affected by the Project.

OCAL has subsidence monitoring and management controls in place to maintain access along fire trails to provide access for any emergency situations. These measures have been determined in consultation with relevant government agencies.

3.2 Environment Group Submissions

3.2.1 National Parks Association of NSW

...the integrity of the SCA, and the Green Corridor generally in this area, is threatened by ongoing impacts from both illegal activities, such as off-road vehicle use and rubbish dumping, and approved activities, such as coal mining. The latter is especially concerning where such approved activities have resulted in significant impacts to the land due to either unpredicted subsidence or inadequate management processes, as occurred during 2012 and 2013 in the mining of Longwall 41 under the eastern escarpment of the Sugarloaf Range. This serves to demonstrate that not even incorporation of high conservation value land into the State's reserve system is an adequate mechanism for protection under these circumstances.

The SSCA, formerly Awaba and Heaton State Forests, was formed as part of the implementation of the Lower Hunter Regional Strategy (Regional Strategy) and Lower Hunter Regional Conservation Plan (Conservation Plan) in 2007.

The Conservation Plan clearly provides for underground mining, as outlined below:

> The State Conservation Area category under the *National Parks and Wildlife Act* will be used in areas that retain potential for underground mining (or for current operations). This category recognises that mining may generate some surface impacts (mainly of a temporary nature) including subsidence and where ventilation or access infrastructure is required. The Government's intent has been to ensure that the new reserves do not sterilise economic mineral and coal resources that can be extracted through underground methods. Page 35 Lower Hunter Regional Conservation Plan 2007

The purpose of classifying areas as a SCA is to allow for the co-existence of conservation and underground mining activities. This demonstrates that mining beneath the SCA was envisaged at the time the SCA was implemented. Section 47(J) of the *National Parks and Wildlife Act 1974* allows for this outcome.

It is also noted, as discussed in **Section 2.1**, a detailed review of the LW41 subsidence incidents has been completed by OCAL and also by a high-level interagency working group, the SSRC, consisting of DP&E, OEH, DRE and the EPA. The SSRC report (March 2013) found that '*while two of the three incidents at WWC are considered significant, the scale and significance of the incidents are not as serious as some media report have suggested*'.

Following significant subsidence and subsidence management impacts experienced from the mining of Longwall 41, we remain concerned about the accuracy and validity of subsidence predictions for the proposed extension into Longwalls 51 and 52 and particularly about improvements to the management of subsidence remediation activities.

We acknowledge the statement in section 6.2.5 Subsidence Management Strategies of the Environmental Assessment that OCAL is revising and improving its approach to subsidence management, however the information contained in the Environmental Assessment does not address this in detail and does little to improve public confidence in this aspect of the mining operation's management.

As outlined in the EA and as discussed above, the LW41 subsidence event occurred as a result of anomalous subsurface fracturing due to unknown geological conditions, with these features resulting in unpredicted movement as mining progressed through the area. As also discussed in the EA, underground and surface geological mapping work has not detected any significant geological structure of concern in the Project Area and therefore the geological conditions that led to the unpredicted subsidence events above LW41 are not predicted to occur in the Project Area.

As also discussed in the EA, the subsidence prediction model has been updated using the measured subsidence data from previous mining at WWC, including the subsidence impacts of LW41. This ensures that the predictions made for the current Project are the most accurate possible.

To avoid higher-than-predicted subsidence incidents at WWC in the future, the SSRC have requested OCAL to provide specific additional information with all future Extraction Plans and Subsidence Management Plans, including the plans that would be required as part of the implementation of LW 51 and LW 52. OCAL has also updated its subsidence remediation procedures in consultation with relevant government agencies including OEH regarding the SSCA to address the grouting incidents that occurred and general subsidence remediation practice.

On the basis of the above, in particular the differences in geological and topographic conditions in the LW41 incident area compared to the Project Area and the recent further improvements to OCALs subsidence prediction, and rehabilitation procedures and practices; OCAL believes that these risks can be effectively managed through the range of measures that OCAL has committed to and in accordance with the requirements of NSW government agencies.

We find the statement in section 6.2.4.1 Surface Cracking of the Environmental Assessment, that surface cracking and vertical block movement of up to 830mm may occur on ridge crests and steep slopes as a result of the proposed mining, both concerning and unacceptable.

The Subsidence Assessment indicated that cracks of up to approximately 830 millimetres may occur on ride crests due to rigid body rotations of steep slopes. Similar size 'scarps' or VBM's could also develop as a result of subsiding a steep slope by the same order of magnitude. The intent of the Subsidence Assessment is to determine the range of subsidence impacts that could occur, including the upper range of subsidence impacts associated with a Project. Cracks of up to 830 millimetres are in the upper range of subsidence impacts that could occur within LW 51 and LW 52.

OCAL has advised that the maximum crack width for mining within LW 44 and LW 45 was approximately 0.5 metres with cracks being up to approximately 3 metres in depth. This is adjacent to the Project Area and in similar terrain.

OCAL has developed a range of mechanisms to provide for public safety during and after mining, and to remediate cracking impacts. These measures have been developed in consultation with government agencies and OCAL considers that these measures can be successfully implemented to mitigate subsidence impacts.

Following reports on the inaccuracies of subsidence predictions for Longwall 41 it is difficult to understand how subsidence of an undulating landscape, such as exists in the Longwall 51 & 52 project area, could possibly occur as uniformly as is shown in Figure 6.4 Predicted Subsidence of the Environmental Assessment.

Figure 6.4 of the EA shows the predicted subsidence contours for the Project. The figure has been developed from the subsidence predictions to provide a visual representation of predicted vertical subsidence. The figure is a representation of vertical subsidence predictions only and other subsidence impacts will also occur. The full range of potential subsidence impacts is described in the EA and Subsidence Assessment.

If the modification request is approved, it is understood that mine staff will regularly use tracks to and within the Sugarloaf SCA for monitoring purposes, as is the case for the existing operations, and will establish ancillary mine infrastructure as required to ensure mining is undertaken safely and in accordance with other approvals. This access and ancillary infrastructure establishment comes at some cost to the reserve, such as encouraging unauthorised users and transfer of weeds or pest species, and we are acutely aware that the NSW government has severely cut funding to departments and programs, to the detriment of management objectives for areas such as Sugarloaf SCA.

We therefore recommend that any approval of the modification be conditional on OCAL making a reasonable financial contribution to the operation and maintenance of the Sugarloaf SCA in order to adequately compensate for these impacts on the reserve. Such contribution should aim to assist management issues such as weed and pest species control and access, in addition to funding any direct impacts resulting from the mining operations under the reserve.

As discussed above, the SCA has been identified by the NSW Government as jointly providing high conservation value and significant mineral resources values. The SCA was defined to allow for the co-existence of conservation and underground mining activities. Mining beneath the SCA was envisaged at the time the SCA was implemented. OCAL believes that these activities can co-exist.

OCAL currently undertake and burden the cost of remediation works associated their operations within the SSCA. This includes track maintenance and weed management within areas of disturbance attributed to OCAL's operations.

As part of the existing Project, OCAL has an existing commitment to fund remediation works within the SSCA. Statement of Commitment 6.4.2 is reproduced below.

> 6.4.2 WWC will undertake remediation works within the SSCA to a value of $50,000 per annum over the life of the Project, in consultation with OEH.

The proposed modification will not change this commitment and OCAL will maintain this contribution for the life of its operations.

We recommend inclusion of a condition in any approval granted in respect of the modification to include representation on the mine's existing community consultative committee of a person nominated by peak conservation bodies, such as NPA or the NSW Nature Conservation Council (as is the case for such representation for other activities), to ensure the mining operations are conducted in a suitably transparent manner and this task is not left to the scrutiny of local media.

WWC currently operate a Community Consultative Committee (CCC) for its operations. The CCC is established in accordance with the Project Approval and the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Project* (Department of Planning, 2007). The CCC is comprised of an independent chair, currently LMCC Councillor Wendy Harrison and appropriate representation from OCAL, LMCC and the local community.

OCAL considers the current CCC as adequate and does not consider that Condition 6, schedule 6 of PA 09_0203 needs to be modified.

OCAL reiterate the point several times in the Environmental Assessment that the proposed mining of Longwalls 51 & 52 will offset production losses that have resulted from recent a review of operations. We make the point that approval of the proposed modification should in no way be seen as compensation for losses as a result of a review of operations by OCAL, as seems to be suggested, but the project should be judged on its merits.

OCAL does not suggest that the proposed mining of LW 51 and LW 52 should be granted as compensation for losses as a result of mine plan changes to improve protection for environmental features above the approved mining area and to ensure compliance with subsidence performance criteria. OCAL also notes that LW 51 and LW 52 are within CCL 718 which contains a condition that requires the leaseholder to maximise resource recovery.

The Project is an outcome of a detailed review undertaken of the WWC operations by OCAL, including review of the remaining coal resources within the WWC Mining Leases. It has been noted in the EA that the combination of coal previously excluded from mining and those now no longer planned to be mined, equates to approximately 3 Mt of ROM coal. The inclusion of the proposed LW 51 and LW 52 which will recover approximately 2.55 Million tonnes of ROM coal will not result in any changes to the approved mine life. The key reason for identifying that this is the case is to make it clear to the reader that the Project will not result in WWC continuing beyond the timeframe current approved.

It is also noted that the Project will provide for continued operations at WWC and will provide the following benefits:

- ongoing employment of approximately 390 people during the mining of LW 51 and LW 52, with many more indirect jobs created through flow-on effects. The mining of LW 51 and LW 52 will take approximately 12 months;

- payment of significant royalties to the State of NSW due to the extraction of this coal. The existing WWC operations paid approximately $18 million in royalties in 2012 and 2013 financial reporting periods, with the estimated royalties for the predicted coal sales for LW 51 and LW 52 being approximately $12.7M;

- efficient and economic recovery of a valuable coal resource that is unlikely to be economically extracted by any other mining operation. The existing mine workings and mining infrastructure at WWC provide the opportunity to economically extract this resource;

- continued export earnings for Australia; and

- significant economic benefits to the local community through ongoing local employment, corporate purchase of goods and services, corporate social involvement in the local community and local expenditure both directly and through employee wages during the mining of LW 51 and LW 52.

3.2.2 Nature Conservation Council of NSW

Subsidence impacts will likely occur as a result of this new project, as noted in the Environmental Assessment. Subsidence has, and with additional mining will continue to, damage key natural and heritage features of Sugarloaf State Conservation Area such as land surfaces, cliffs, rock features, water resources, biodiversity and heritage. There are already several large chasms in the park due to previous mining.

As outlined in the EA, there are no cliffs within the Project Area, however, there are other natural and cultural features that will be impacted by subsidence. The potential impacts of the Project on these features has been assessed in detail in the EA and detailed monitoring and management measures will be implemented as part of the Project.

In terms of the comment regarding 'several large chasms'; as discussed in **Section 2.1**, a detailed review of the LW41 subsidence incidents has been completed by OCAL and also by a high-level interagency working group, the SSRC, consisting of DP&E, OEH, DRE and the EPA. The SSRC report (March 2013) found that '*while two of the three incidents at WWC are considered significant, the scale and significance of the incidents are not as serious as some media report have suggested*'. Grout which was spilt within the SSCA has been removed in consultation with OEH.

The ecological assessment found that the project would have a negative impact on the ecological values at Sugarloaf State Conservation Area.

The Ecological Assessment (refer to Appendix 5 of the EA) concluded that some impacts to ecological values will occur, however, the majority of vegetation and fauna habitat in the Project Area will remain largely undisturbed. The assessment also found that the predicted impacts are not expected to result in a significant loss of floristic diversity or community composition, or fauna habitat within the Project Area, the SSCA or the region.

An assessment of the significance of the impact of the Project on threatened species found that the Project is unlikely to result in a significant impact on threatened flora and fauna habitat.

There have been two Aboriginal sites identified above the proposed mining area, and two grinding groove sites located east to the mining area. Subsidence in these Aboriginal areas has been identified as a risk. An isolated find is also located on an access track that has been identified as possibly needing subsidence remediation works.

As discussed in the EA, no direct impact is predicted for the two grinding groove sites (Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 #38-7-1279). The Project was designed by OCAL to avoid impacts on these sites.

Palmers Creek IF5 (artefact scatter) is located on an access track which may require remediation following subsidence. The WWC ACHMP (Umwelt 2012a) provides for temporary surface collection of artefacts identified on access tracks where vehicle use/track maintenance/subsidence remediation is assessed by the registered Aboriginal parties and a suitable qualified archaeologist as likely to result in harm to the artefacts. It was assessed in the Cultural Heritage Assessment that the most appropriate management option for Palmers Creek IF5 would be to collect the surface artefact in compliance with a revised version of the ACHMP that includes the management of Aboriginal archaeological sites in the Project Area. The artefact would be returned to the Palmers Creek IF5 site area following cessation of subsidence remediation works. The artefact would be returned as close as possible to its collection location. A new site card will be provided to OEH identifying the new location.

The proposed management and mitigation measures for the Aboriginal sites identified in the submission are considered to be appropriate.

4.0 Summary of Additional Management Controls and Commitments

In response the issues raised through the submissions received on the EA through the public exhibition period and addressed in this report, OCAL has committed to a number of additional management controls. The additional management controls committed to in this report are summarised below.

- OCAL will undertake monitoring of *Grevillea parviflora* subsp *parviflora* in accordance with the Interim Lake Macquarie *Grevillea parviflora* subsp. *parviflora* (Planning and Management Guidelines, Lake Macquarie City Council June 2013), where relevant. This would include seeking to conduct monitoring surveys in the *Grevillea parviflora* subsp. *parviflora* flowering period (nominally September to December), mapping the extent of individuals and groups of stems that are separated by at least 10 metres and determining the level of fruit set (LMCC 2013).

- In terms of access for routine reserve management operations and fire fighting, consistent with the approach for other major access tracks such as Sugarloaf Range Road, OCAL will commit to implementing an approved Public Safety Management Plan to provide for remediation works for the main access road (fire trail) through the LW 51 and LW 52 Project Area. The road would be subject to regular inspections during undermining and any cracking fixed as it appears so that the road remains open and available for routine operations and fire fighting.

- OCAL will work with OEH to develop a more robust information sharing system between the two organisations so that up-to-date information is held by OEH at all times in relation to subsidence impacts and remediation status.

- OCAL will consult with Crown Lands as part of the Extraction Plan/Subsidence Management Plan process prior to undermining any Crown roads. Subsidence impacts will be remediated in accordance with the requirements of the Project Approval and the Extraction Plan/Subsidence Management Plan. Should any adverse, unpredicted subsidence events occur, OCAL will consult with Crown Lands as the owners of the land.

- OCAL will update the WWC Biodiversity Management Plan (BMP) to include floristic mapping for the LW 51 and 52 Project Area.

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