NSW GOVERNMENT | Planning & Infrastructure

MAJOR PROJECT ASSESSMENT: West Wallsend Colliery Continued Operations Project

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

January 2012

Cover Photo: Cliff terrace within northern extent of continued underground mining area

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EXECUTIVE SUMMARY

Oceanic Coal Australia Pty Ltd (OCAL), a wholly owned subsidiary of Xstrata Coal Pty Limited, owns and operates the West Wallsend Colliery west of Lake Macquarie within the Newcastle Coalfield.

West Wallsend is an underground coal mine that has been operating since 1969. Mine workings associated with West Wallsend are located beneath the townships of Killingworth, Holmesville and Barnsley and adjacent to a range of other mining operations in the region. Mining has previously, and continues to be, undertaken beneath the Sugarloaf State Conservation Area (Sugarloaf SCA).

The mine currently operates under four separate development consents and a Subsidence Management Plan approval, which do not limit the amount of coal that can be extracted from the two underground mining areas. West Wallsend is currently producing between 2.7 to 4.4 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Extracted coal is transported to the mine's existing Pit Top Facilities where it is processed (crushed) prior to transfer, via an existing private haul road, to the Macquarie Coal Preparation Plant (MCPP). The transportation and processing of this coal at the MCPP is undertaken under separate development consents, which are not subject to this application.

OCAL is proposing to:

- continue underground mining operations at a rate of up to 5.5 Mtpa for a further 12 years;
- continue to use existing mine infrastructure, including underground main headings, surface facilities and ventilation shafts;
- construct and operate additional surface services facilities; and
- consolidate all four existing development consents into a single, contemporary planning approval.

This proposal, known as the West Wallsend Colliery Continued Operations Project, has a capital investment value of $1.5 million, and would ensure continued employment for up to 390 workers.

The Department exhibited the project's Environmental Assessment (EA) from 27 July 2010 until 27 August 2010 and received 7 submissions, including 6 from public authorities and 1 from a special interest group. All of the submitters either supported or did not object to the project. However, several public authorities raised concerns in relation to subsidence, water resources, biodiversity, Aboriginal heritage, visual and noise impacts.

The Department has carried out a detailed assessment of the merits of the project, in accordance with the requirements of the EP&A Act. This assessment has found that the project would not result in significant air, biodiversity or visual amenity impacts. However, the project has the potential to generate adverse noise impacts and would result in subsidence, which has the potential to result in adverse impacts on cliffllines and similar features, significant Aboriginal cultural heritage sites and water resources.

The Department has recommended a range of conditions to ensure that these impacts are suitably mitigated, managed and/or offset. These conditions include requirements for OCAL to:

- comply with a range of subsidence impact performance measures;
- implement additional measures to minimise the water and noise impacts of the project;
- provide a compensatory water supply to any landowner whose water supply is adversely affected by the project;
- complete noise compliance investigations;
- undertake stream remediation works within Sugarloaf SCA over the life of the project;
- implement a multi-faceted management strategy for Aboriginal heritage sites of very high or extremely high cultural significance;
- rehabilitate the site to meet a range of performance measures;
- monitor and regularly report on its environmental performance; and
- commission an independent audit of its operations every three years, to ensure that it is complying with its conditions of approval and implementing best practice on site.

The Department's assessment has found that the project would represent a logical continuation of the existing mine, would make efficient use of existing facilities and equipment, and would provide significant economic and social benefits to both the Newcastle region and NSW, including:

- continued direct employment for up to 390 employees;
- capital investment of $1.5 million;
- average annual economic contribution of $448 million to the regional economy over the life of mining operations;
- average annual economic contribution of $644 million to the NSW economy over the life of mining operations; and
- royalties and payroll taxes for the State Government.

On balance, the Department believes that the project's benefits sufficiently outweigh its residual costs and that it is in the public interest, and should therefore be approved subject to strict conditions.

1. BACKGROUND

Oceanic Coal Australia Pty Ltd (OCAL), a wholly owned subsidiary of Xstrata Coal Pty Limited, owns and operates the West Wallsend Colliery west of Lake Macquarie within the Newcastle Coalfield (see **Figure 1**).

***Figure 1**: Project location*

1.1 Existing Operations

West Wallsend is an underground coal mine that has been operating since 1969. The key surface components of the mine include the Pit Top Facilities, the No. 2 and No. 3 vent shafts and the ballast borehole facility (**Figure 2**). Mining is currently being undertaken in Longwall 38 in the Western domain and producing 2.7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. This is forecast to increase up to 4.4 Mtpa in the next reporting period.

All coal from West Wallsend is transferred to the Macquarie Coal Preparation Plant (MCPP) at the nearby Westside Mine via an existing private haul road. The Westside mine is located adjacent to the southern boundary of the Pit Top Facilities (see **Figure 2**).

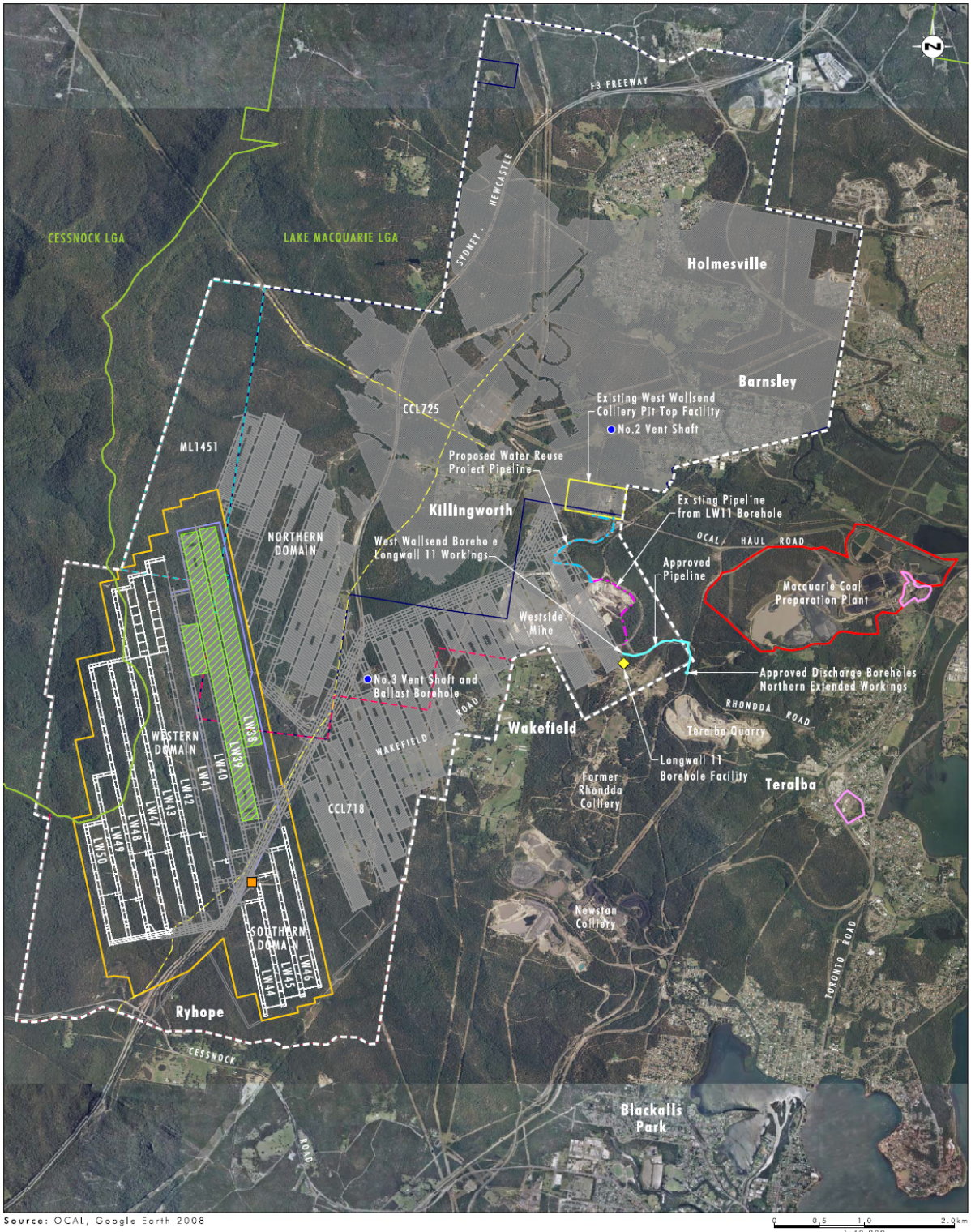

Figure 2: *Existing Operations*

1.2 Project Setting

Extensive underground mining operations have been undertaken in the vicinity of West Wallsend since the mid-1960s. Underground mining has previously extended beneath the townships of Holmesville, Barnsley, Killingworth, Wakefield and Teralba (see **Figure 3**).

Mining has previously, and continues to be, undertaken beneath the Sugarloaf State Conservation Area, which covers an area of 3,937 hectares (ha) and contains significant biodiversity, Aboriginal and historic features. Declaration as a SCA in 2007 specifically provided for the co-existence of conservation and underground mining activities. The majority of surface land (ie 86%) within the project area is undeveloped bushland within the Sugarloaf SCA.

All existing surface infrastructure is located on land owned by OCAL, with the residential areas of Killingworth and Barnsley located approximately 1 kilometre (km) to the west and 1.3 km to the north-east, respectively (**Figure 4**). Two private rural landholdings are located above the proposed mining area.

The majority of the mine lies in the Lake Macquarie Local Government Area (LGA) with a small portion in the Cessnock LGA. The F3 Freeway and an associated services easement transect the southern portion of the project area.

The project site includes the upper reaches of the catchments Cockle, Diega, Ryhope, Central and Palmers Creeks, which originate from steep upper slopes of the Sugarloaf Range and drain eastwards into Lake Macquarie. A small section of Bangalow Creek drains westwards into Wallis Creek.

1.3 Current Consents

OCAL currently operates West Wallsend under four separate development consents (see **Table 1**). The current consents do not limit the amount of coal that can be extracted from the underground mining leases. The consents allow underground mining in two main areas known as the Western and Southern domains, and the use of the Pit Top Facilities, the No. 2 and No. 3 vent shafts and the ballast borehole facility (see **Figure 2**).

Table 1: *Existing Development Consents and Other Key Approvals*

Approval	Description	Approval Authority	Approval Date
DA B66-69	West Wallsend Pit Top Facilities and No. 2 Ventilation Fan	Lake Macquarie City Council (LMCC)	1969
DA 90 0725	Lachlan/Waterfield Colliery Consent – No. 3 ventilation Shaft	LMCC	1990
DA 2434/2005	Longwall 11 Borehole Facility	LMCC	2005
DA 1221/2007	Saline Water Transfer Pipeline	LMCC	2009
Subsidence Management Plan (SMP) Approvals	Longwalls 38-40 within the Western Domain and Longwalls 45-46 within the Southern Domain	Division of Resources and Energy (DRE)	2007

However, coal extraction from two areas within Consolidated Coal Lease (CCL) 725 and Mining Lease (ML) 1451 has relied on longstanding exemptions for existing mines from requiring development consent under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). Consent was not required due to provisions in the *Lake Macquarie Local Environmental Plan 2004*, which reflected the *Environmental Planning & Assessment Model Provisions 1980*, with the effect that consent was not required for development carried out on a mine for the purposes of a mine, and also due to similar provisions then in place under the *Mining Act 1992*.

However, due to the introduction of Part 3A of the EP&A Act on 1 August 2005 and the related passage of both the former *State Environmental Planning Policy (Major Development) 2005* and amendments to the *Environmental Planning & Assessment Regulation 2000*, the mine requires either development consent under Part 4 or project approval under Part 3A to continue operations after 31 March 2012. OCAL therefore requires a new project approval for mining within these areas.

Whilst the need for a new approval only relates to these two relatively small areas, OCAL is also seeking to consolidate all four of its existing development consents into a single, contemporary planning approval.

Haulage of coal to the MCCP and coal preparation are covered by other existing development consents (ie the 1981 Stockton Borehole Colliery consent and DA-89-0012), to which no changes are proposed as part of this project.

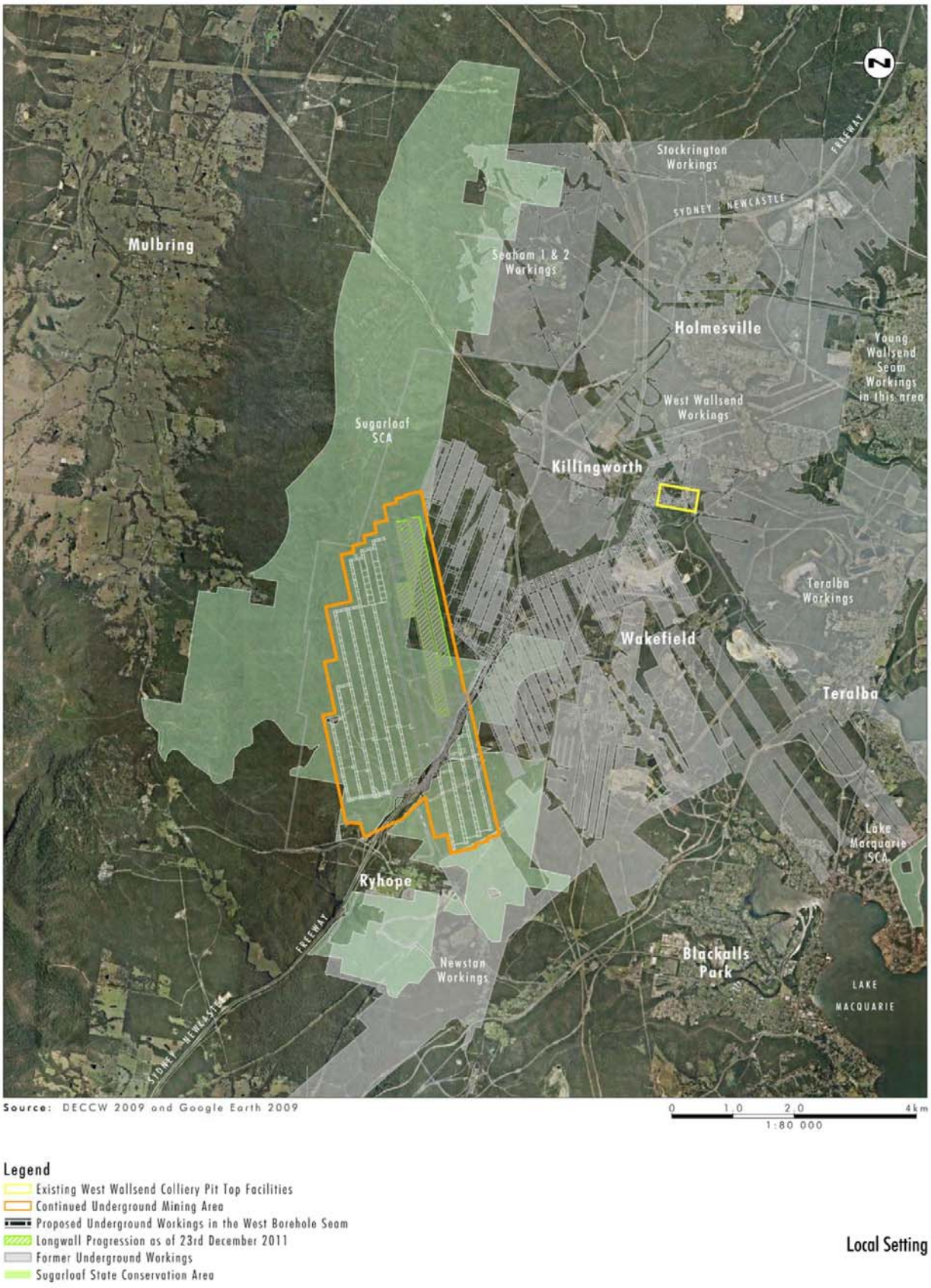

Figure 3: *West Wallsend Colliery – Local Setting*

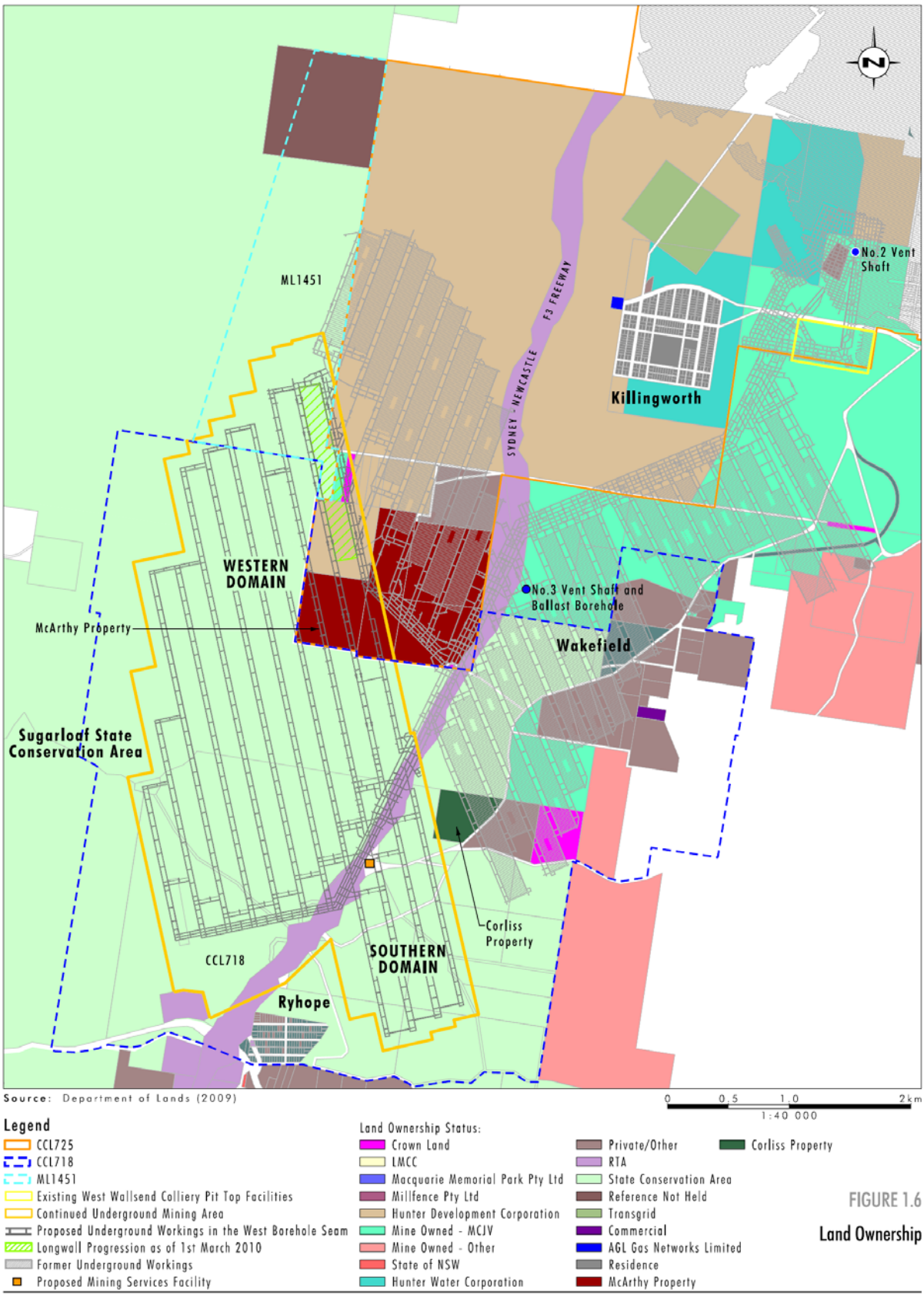

Figure 4: *Land Ownership*

2. PROPOSED PROJECT

OCAL is seeking approval to continue underground mining operations at the West Wallsend Colliery for a further 12 years, extracting up to 5.5 Mtpa of ROM coal. The proposal, which is known as the West Wallsend Colliery Continued Operations Project, is described in detail in the environmental assessment (EA) for the project, which is attached as **Appendix A**.

During the course of the assessment, OCAL has made a series of amendments to the mine plan to address issues raised through the consultation process. This report describes and assesses the project as revised. Key changes made to the mine plan to reduce impacts include:

- avoid mining in three areas to protect sites of Aboriginal cultural heritage significance;
- avoid mining in areas of low depth of cover in the southern end of Longwalls 48, 49 and 50 within the Ryhope Creek catchment to reduce the risk of impact on surface water resources;
- avoid mining in areas of less than 80 metres depth of cover in Longwalls 42, 43 and 47 within the Diega Creek catchment to reduce the risk of impact on surface water resources and associated potential impacts on endangered ecological communities (EECs); and
- reduce the longwall void width within Longwalls 42 and 43 to reduce the predicted subsidence impact to significant and potentially visible cliff lines.

The revised mine plan is shown in **Figure 5** and the revised project is summarised in **Table 2**.

Table 2: *Key Components of the West Wallsend Colliery Continued Operations Project*

Aspect	***Description***
Project Summary	• **Consolidate all existing development consents for surface activities and underground mining at West Wallsend;** • **Continue underground mining for a further 12 years, using longwall mining methods;** • **Extract up to 5.5 Mtpa of ROM coal;** • **Continue using existing mine infrastructure, including underground main headings, surface facilities and the No. 2 ventilation shaft;** • **Construct and operate additional surface service facilities; and** • **Rehabilitate the site.**
Mining and Reserves	Extraction of coal from the Western and Southern Domains using underground longwall mining methods, with longwall panel widths of 180 metres (m) and heights of 4.8 m. Overburden depths are typically 120 to 280 m.
Coal Handling	Coal to be transferred via a drift conveyor from underground to the Bradford breaker at the Pit Top Facilities for initial sizing. It is then delivered to a 2000 tonne storage bin via enclosed surface conveyors.
Water Demand and Supply	Underground dewatering activities and surface water runoff would result in water surpluses of up to 1141 megalitres per annum (MLpa). The water management system would involve: • continued discharge from Licensed Discharge Point 2 into Burkes Creek (up to 145 MLpa); • continued extraction of water from borehole at Longwall 11 and continued transfer to Westside Mine (up to 985 MLpa); and • continued transfer of sewage effluent to MCPP for re-use (11 MLpa). In addition, OCAL is proposing to transfer excess mine water to Teralba Quarry for re-use.
Mining Sequence	The mining sequence involves mining from Longwall 38 in the east to Longwall 50 in the west in the Western Domain. Mining would then commence at Longwall 44 in the west and progress to Longwall 46 in the east of the Southern Domain.
Project Life	12 years
Employment	Continued employment of 390 full time employees.
Support Facilities and Utilities	Existing facilities and utilities would be utilised and modified where possible. Upgrades and new facilities would include: • a new Mining Services Facility and associated new road intersection (see **Figure 6**); • minor upgrades to the Pit Top Facilities including a demountable training building, service boreholes, water re-use works and noise mitigation measures; and • access tracks, service boreholes, gas drainage and flaring facilities.
Hours of Operation	Operations would take place 24 hours a day, 7 days a week.
Mine Access	The existing two vehicle access points (one for heavy vehicles and one for light vehicles) from The Broadway to the Pit Top Facilities would be used. An additional site access to the Mining Services Facility would be established off Wakefield Road at the southern end of the site.
Rehabilitation	At the completion of mining all surface infrastructure would be decommissioned and the surface disturbance areas would be rehabilitated.
Capital Value	$1.5 million.

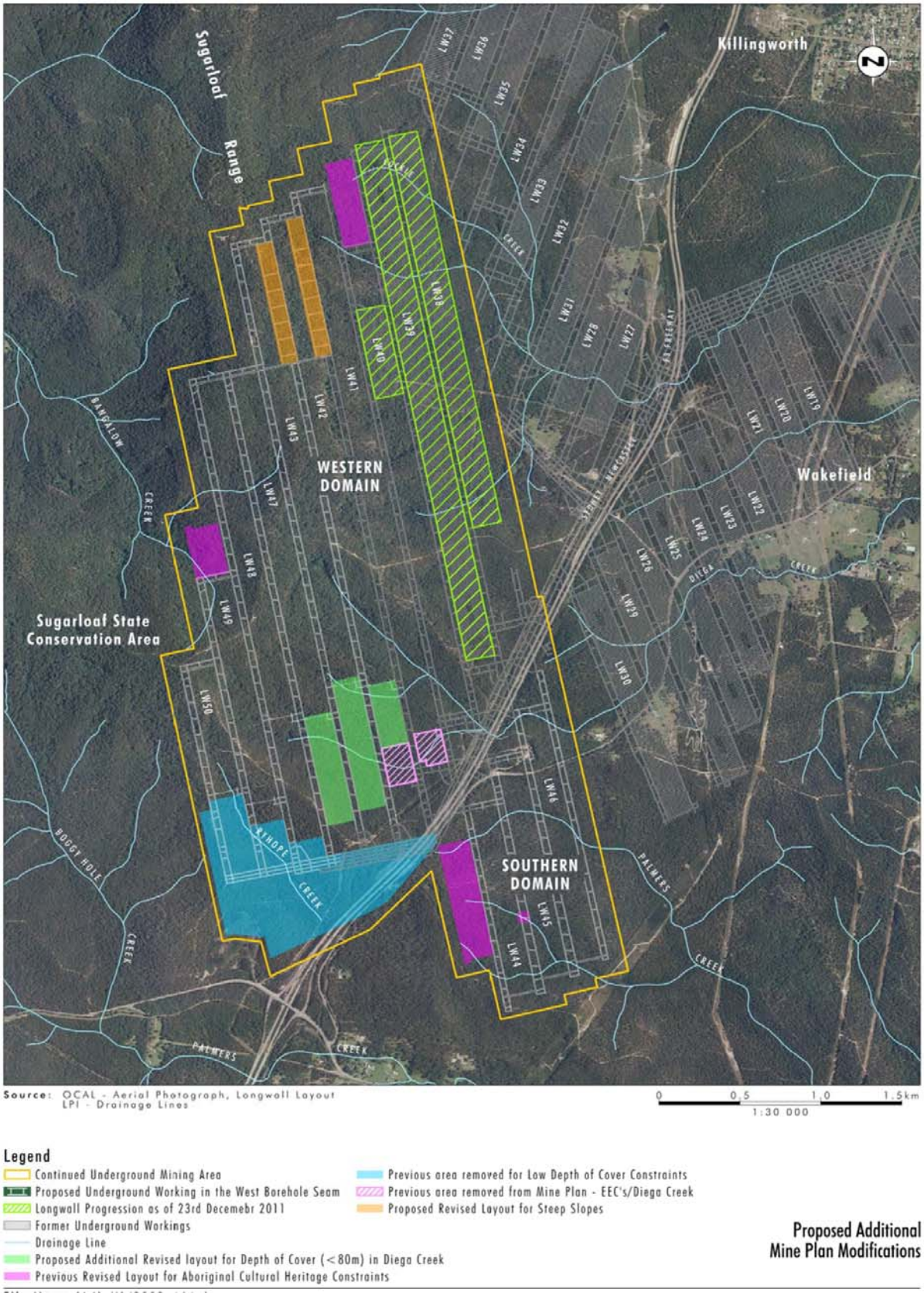

Figure 5: *Proposed Mine Plan*

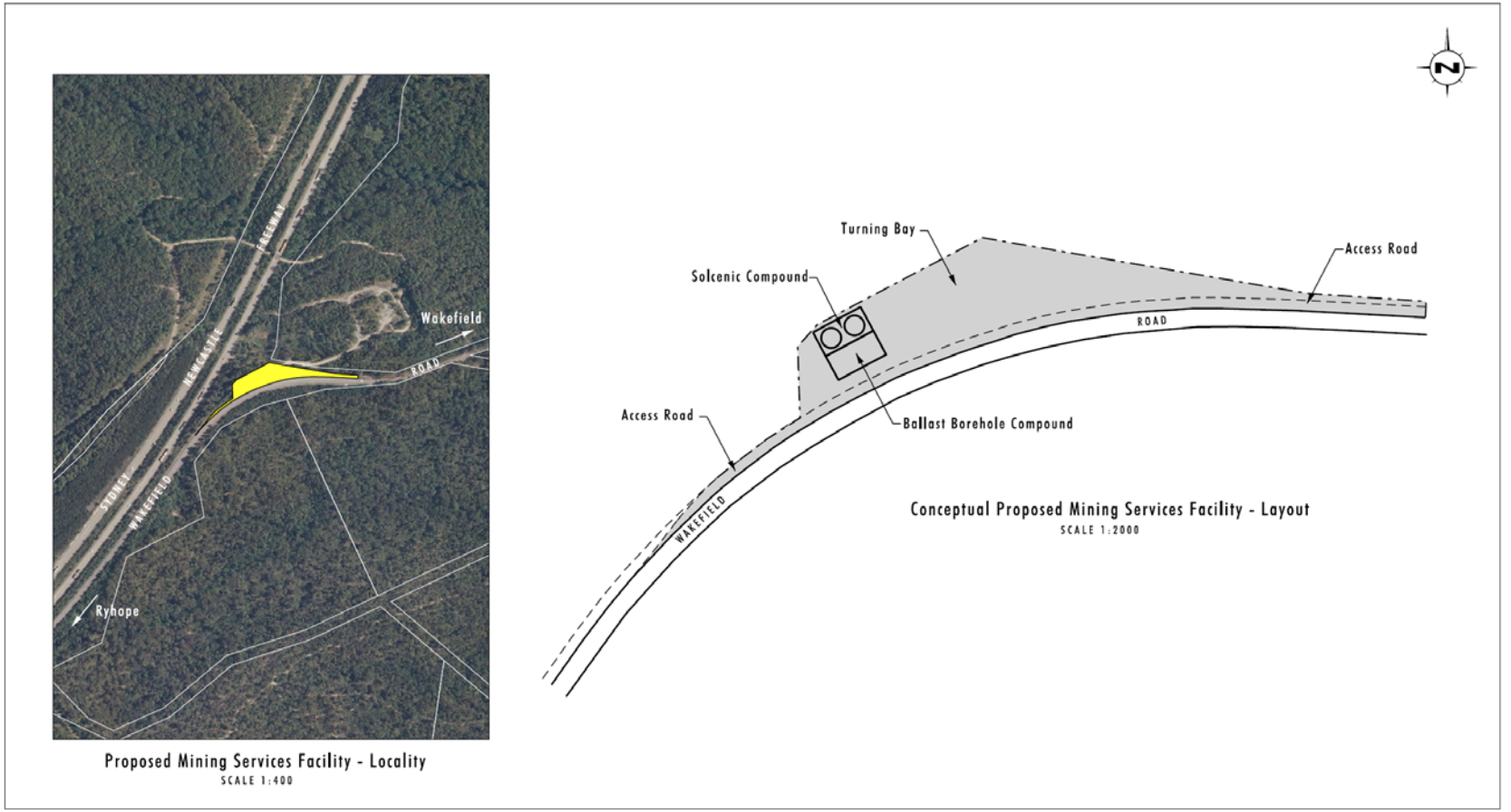

Figure 6: *Proposed Mining Services Facility Location and Layout*

3. STATUTORY CONTEXT

3.1 Major Project

The project was declared to be a major project under Part 3A of the EP&A Act because it constitutes development for the purposes of coal mining, and therefore met the criteria in clause 5 of Schedule 1 of the former *State Environmental Planning Policy (Major Development) 2005.*

Part 3A of the EP&A Act, as in force immediately before its repeal on 1 October 2011 and as modified by Schedule 6A to the Act, continues to apply to the project application, since it is a "transitional Part 3A project" for the purposes of Schedule 6A. Consequently, the Minister for Planning and Infrastructure is the approval authority for the project application. However, the Deputy Director-General, Development Assessment and Systems Performance, may determine the project application under the Minister's delegation of 14 September 2011, as:

- there were less than 25 submissions in the nature of objections; and
- neither of the local Councils has objected to the application.

3.2 Permissibility

The project is permissible with consent under both the *Lake Macquarie Local Environment Plan (LEP), 2004* and the *Cessnock LEP 2004*.

Consequently, the Minister or his delegate may approve the carrying out of the project.

3.3 Landowner's Consent

A significant part of the project site is located within the bounds of the Sugarloaf SCA. Under Clause 8F of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation), the consent of the Minister of the Environment (as "landowner" of the SCA) is required before the project approval can be granted within any part of the SCA.

The Minister for the Environment granted landowner's consent for the project application on 19 December 2011 (see **Appendix B**). The statutory requirement under clause 8F of the EP&A Regulation has therefore been met, and the Minister's delegate is able to determine the project application.

3.4 Other Approvals

Section 75U of the EP&A Act provides that a number of other statutory approvals are integrated into the Part 3A assessment and approval process, and are therefore not required to be separately obtained for the project. These include:

- water-related approvals under the *Water Management Act 2000*; and
- heritage-related approvals under the *National Parks and Wildlife Act 1974* and *Heritage Act 1977*.

Under Section 75V of the Act, a number of other approvals are required to be obtained, but these approvals cannot be refused and must be "substantially consistent with" any Part 3A approval for the project. These include:

- a new mining lease required under the *Mining Act 1992* for the proposed Mining Services Facility;
- variations to the existing environment protection licence (EPL) granted under the *Protection of the Environment Operations Act 1997*;
- a permit under the *Roads Act 1993* to undertake road works on Wakefield Road; and
- approvals under the *Mine Subsidence Compensation Act 1961* for any improvement erected within a mine subsidence district.

The Department has consulted with the relevant public authorities responsible for these other approvals (see Section 4.1), and considered the relevant issues relating to these approvals in its assessment of the project (see Section 5). None of the relevant authorities object to the project on grounds related to these other approvals.

3.5 Exhibition and Notification

Under Section 75H(3) of the EP&A Act, the Director-General is required to make the EA (see **Appendix A**) for a project publicly available for at least 30 days. After accepting the EA for the project the Department:

- made the EA publicly available from 27 July 2010 until 27 August 2010:
  - on the Department's website; and
  - at the Department's Information Centre, Lake Macquarie Council's offices, and at the office of the Nature Conservation Council of NSW;
- notified relevant State Government authorities and local councils by letter; and
- advertised the exhibition in the Newcastle Herald.

This satisfies the requirements in Section 75H(3) of the EP&A Act.

During the assessment process, the Department also made a number of documents available on its website, including the project application; Preliminary Environmental Assessment; Director-General's environmental assessment requirements; the EA; public and agency submissions; and OCAL's Response to Submissions.

3.6 Environmental Planning Instruments

Under Section 75I of the EP&A Act, the Director-General's report is required to include a copy of, or reference to, the provisions of any environmental planning instruments that substantially govern the carrying out of the project.

The Department has considered OCAL's assessment of the project against the relevant provisions of several *State Environmental Planning Policies* and other environmental planning instruments, and carried out its own assessment of these matters (see **Appendix C**). Based on this assessment, the Department is satisfied that none of the relevant instruments substantially govern the carrying out of this project.

3.7 Objectives of the EP&A Act

The Minister's delegate should consider the objects of the EP&A Act when making decisions under the Act. The objects of most relevance to the decision on whether or not to approve the project are found in Section 5(a)(i),(ii),(vi)&(vii) of the Act. They are:

> *"(a) to encourage:*
>
> *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
>
> *(ii) the promotion and co-ordination of the orderly and economic use and development of land,*
>
> *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
>
> *(vii) ecologically sustainable development"*

The Department is satisfied that the project encourages the proper use of resources (Object 5(a)(i)) and the promotion of orderly and economic use of land (Object 5(a)(ii)), particularly as the Minister for the Environment has provided landowner's consent, the project is a permissible land use in existing mining leases and the project would make efficient use of existing mining facilities and infrastructure.

The encouragement of environmental protection (Object 5(a)(vi) is considered in Section 5 of this report. Following this consideration, the Department is satisfied that the potential impacts of the project can be suitably mitigated, managed and/or offset to ensure an acceptable level of environmental performance.

The Department has considered the encouragement of ecologically sustainable development (ESD) (Object 5(a)(vii)) in its assessment of the project application. This assessment has sought to integrate all significant economic and environmental considerations, and avoid any serious or irreversible damage to the environment, based on an assessment of risk-weighted consequences.

3.8 Statement of Compliance

Under Section 75I of the EP&A Act, the Director-General's report is required to include a statement relating to compliance with the environmental assessment requirements with respect to the project. The Department is satisfied that the environmental assessment requirements of the project have been complied with.

4. CONSULTATION

The Department exhibited the EA from 27 July until 27 August 2010. During the exhibition period, the Department received a total of 7 submissions on the project, including 6 from public authorities and 1 from a special interest group (ie the Construction Forestry, Mining and Energy Union). A copy of these submissions, as well as additional correspondence received from agencies during the assessment process, is attached as **Appendix D**. No submissions were received from the general public.

OCAL has subsequently provided formal responses to the issues raised in these submissions and additional submissions from agencies (see **Appendix E**).

A summary of the issues raised during the consultation process is provided below.

4.1 Public Authorities

All of the public authorities either support or do not object to the project.

Following OCAL's commitments to revise the mine plan to reduce water, biodiversity and Aboriginal heritage impacts, the Department of Environment, Climate Change & Water (now the **Office of Environment & Heritage**, OEH), indicated its support for the project, subject to the adoption of a series of recommendations in relation to noise, Aboriginal heritage, subsidence and associated biodiversity impacts. The Minister for the Environment has also granted landowner's consent for the project within the Sugarloaf SCA (see **Appendix B**).

The **NSW Office of Water** (NOW), part of the Department of Primary Industries, did not object to the project but recommended conditions in relation to surface water investigations, groundwater dependent ecosystem monitoring and the submission of water-related management plans.

The **Division of Resources and Energy** (DRE), part of the Department of Trade & Investment, Regional Infrastructure & Services and formerly part of the Department of Industry & Investment, did not object to the project but raised concerns over potential public visibility of possible cliff line collapses (see Section 5.1). DRE also requested that existing subsidence management strategies being employed to management impacts on major infrastructure (particularly the F3 Freeway) are maintained and that a Rehabilitation Management Plan is prepared.

The Roads & Traffic Authority, now part of **Roads and Maritime Services** (RMS), did not object to the project provided that future mining continues to implement existing management measures, particularly in relation to subsidence near the F3 Freeway.

Hunter-Central Rivers Catchment Management Authority (CMA) did not object to the proposal but questioned the extent and magnitude of baseflow losses from watercourses and requested monitoring of sediment within waterways and the preparation of an Erosion and Sediment Control Plan.

Lake Macquarie City Council (Council) did not object to the project but requested that the frequency of subsidence monitoring be defined in monitoring programs and that measures be introduced to ensure that watercourse erosion does not affect downstream waterways. Council requested that road works proposed on Wakefield Road be designed in accordance with the RMS's Road Design Guideline and are submitted to Council for approval. Council also requested that the Pit Top Stormwater Management Plan be submitted to Council prior to construction.

4.2 Other Submissions

A special interest group, the **Construction, Forestry, Mining and Energy Union** (Mining and Energy Division) Northern District Branch (CFMEU), indicated its strong support for the project. The CFMEU considered the community consultation program to be appropriate; the assessment of impacts to be sound; and the proposed monitoring, management and mitigation strategies to be adequate. However, the CFMEU requested that OCAL investigate additional opportunities to supplement noise reduction measures at Killingworth.

5. ASSESSMENT

5.1 Subsidence

Potential Subsidence Impacts

The project would involve the extraction of coal from two underground mining domains, known as the Western and Southern Domains, using longwall mining methods. Coal would be extracted with extraction thickness averaging 4.8 m. Underground mining would involve 13 longwalls in total, with 10 of these longwalls in the Western Domain (LW 38-43 and LW 47-50) and the remaining 3 longwalls in the Southern Domain (LW 44-46) (see **Figures 2 and 6**). The longwall panels are proposed to be approximately 180 m wide. The typical depth of the longwalls is 115-180 m, with a minimum depth of 80 m and a maximum depth of 360 m.

The project would cause surface and sub-surface subsidence impacts, which would affect a range of built and natural features. Ditton Geotechnical Services Pty Ltd (DGS) was engaged by OCAL to undertake a subsidence impact assessment (SIA) of the project. OCAL also engaged Mine Subsidence Engineering Consultants Pty Ltd (MSEC) to conduct an independent peer review of the assessment. The SIA and peer review are included as Appendix 5A of the EA (see **Appendix A**).

In order to address issues raised by DRE in relation to potential public visibility of steep slopes and cliff lines within the Sugarloaf SCA, an additional subsidence assessment was undertaken by DGS to specifically identify the likely and credible worst-case impact of the proposal on steep slopes and cliff lines. The assessment was peer reviewed by Newcastle Geotech Pty Ltd. The assessment and peer review are included as **Appendix F** to this report.

The SIA reports that the land surface overlying the proposed underground mining domains would subside by a maximum of 2.8 m over the central part of each longwall panel and a maximum of 1.0 m over chain pillars. Maximum tilts of 5 to 167 millimetres per metre (mm/m) and maximum horizontal (tensile and compressive) ground strains of 2 to 38 mm/m are predicted over most of the mining area. Fracturing of overburden is expected to occur at the surface, with surface cracks ranging from 10 mm to 380 mm in width within the limits of extraction.

DGS initially predicted that the potential for direct hydraulic connection to the surface, due to fracturing, was possible where the depth of cover was between 70 m and 100 m. In response to concerns raised by both OEH and NOW, OCAL undertook additional monitoring and analysis within existing secondary extraction areas of the mine to better define the height of fracturing relevant to the project. This additional monitoring indicated that the fractured zones above the mine workings ranges between 64 m and 71 m.

The Department notes that the SIA's predictions are based on "maximum" or worst case scenarios, which is considered appropriate. It also notes that they are underpinned by empirical data from previous mining operations. The Department is satisfied that the previous monitoring data provides a sound basis for the subsidence predictions, but considers that there is still scope for localised anomalies due to geological structures and other effects that are not necessarily fully predictable in natural systems. Consequently, the Department has recommended conditions requiring OCAL to validate the SIA's subsidence predictions during mining operations.

DGS assessed the likely subsidence impacts of the project on a range of natural and man-made features, including:

- cliffs, minor cliffs, cliff terraces, rock face features and steep slopes;
- public safety, including users of the Great North Walk;
- public infrastructure and utilities;
- property fences;
- abandoned bord and pillar workings;
- groundwater and surface water resources - see Sections 5.2 and 5.3, respectively;
- fauna and flora – see Section 5.4; and
- Aboriginal heritage sites – see Section 5.6.

Steep slopes and cliff lines

The additional subsidence report undertaken by DGS (**Appendix F**) defines and then separately considers cliffs, minor cliffs, cliff terraces, rock outcrops, very steep slopes and steep slopes. The Department broadly supports these definitions and notes that they are generally consistent with definitions accepted by the Planning Assessment Commission for other recently approved longwall mining projects, including Metropolitan Colliery and Bulli Seam Operations.

DGS defines a cliff as a continuous rock face >20 m in length, >10 m high and slope > 63.4°. DGS estimates that approximately 1.7 km of discontinuous, single and multi-tiered cliff faces are located above the proposed mining areas (see **Figure 7**). DGS notes that the cliff formations in the project area are mainly relatively low height (ie <20m high) and short length and are a minor portion of the overall cliff formations that occur across the region. Minor cliffs and cliff terraces are much more extensive (see **Figure 7**). DGS indicates that the short, relatively low cliffs in the project area have far less risk of rock falls than long, continuous cliff lines. Nonetheless, it first estimated that the proposed longwalls may cause rock falls along 13% to 23% of the 1.7 km of cliff lines within the mining area.

DRE raised concerns in relation to public visibility of rock falls along steep slopes and cliff lines within the project area, particularly in the northern areas of the Western Domain. DRE indicated that these cliffs are regionally significant topographic features as part of the Sugarloaf Range. DGS considers that the only cliff lines that may be publicly visible are located in the northern extent of Longwalls 41, 42 and 43, and the mid-panel area of Longwalls 41 and 42 (see **Figure 7**). Potential views to these cliff lines are generally restricted to commuters along sections of the F3 Freeway. Potential views also exist from residential areas (including West Wallsend and Edgeworth), however these are very long distance views (ie > 10 km) and are well-shielded by topography and vegetation (see **Figure 8**).

However, in order to address the public visibility issue raised by DRE, OCAL has committed to reducing the void widths at the northern extent of Longwalls 42 and 43 from 178 m to 115 m, which DGS predicts would reduce the risk of cliff falls at the potentially visible cliff lines from high to low. This modification sterilises approximately 0.5 Mt of coal, worth between $37 - 72 million (depending on the fluctuating value of the resource). Although DRE accepted that these modifications would reduce the degree of risk of rockfall on visible cliff faces, it recommended that a number of other mine layout options be considered. These include avoiding secondary extraction under the northern extent of Longwalls 41 to 43 or further minimising panel widths in this area.

The Department is satisfied that the revised mine plan would result in a significant reduction in the risk of mining-induced rock falls along publicly visible cliff lines. However, it does not agree that the public visibility of cliff lines should be the predominant factor in assessing and regulating impacts from rockfalls. Nor does it consider that protection should be offered only for the highest rock faces (ie “cliffs”, or continuous rock faces that are over 10 m in height and >20 m in length). “Minor cliffs” (continuous rock faces with heights between 5 and 10 m and >20 m in length) and “cliff terraces” (combinations of between 2 and 5 minor cliffs in close proximity that result in a stepped profile) are also key landscape features of the mining area and the Sugarloaf SCA more generally. These landscape features have important scenic values for bushwalkers in the Sugarloaf SCA, as well as habitat value and intrinsic value, and are deserving of appropriate standards of protection. However, the Department does not consider that any of the cliffs, minor cliffs or related landscape features at West Wallsend are deserving of being considered as “cliffs of special significance” (as identified by the Planning Assessment Commission in its assessment of major clifflines on river gorges affected by the Bulli Seam Operations Project as being worthy of protection from greater-than-negligible impacts).

The Department’s recommended conditions therefore include subsidence impact performance measures to ensure that the project causes not more than “minor environmental consequences” on all cliffs, minor cliffs, cliff face features, rock face features and steep slopes (as defined) within the proposed mining area. “Minor environmental consequences” are defined as “occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing”. The Department proposes that the rigour of this “minor environmental consequences” standard should be applied variously according to the scale, significance and sensitivity of each of these types of features, as follows:

- ***Cliffs*** – impacts that in total do not exceed **3%** of the total face area of these features;
- ***Minor cliffs and cliff terraces*** - impacts that in total do not exceed **5%** of the total face area of these features; and
- ***Rock face features and Steep slopes*** - impacts that in total do not exceed **7%** of the total face area of these features.

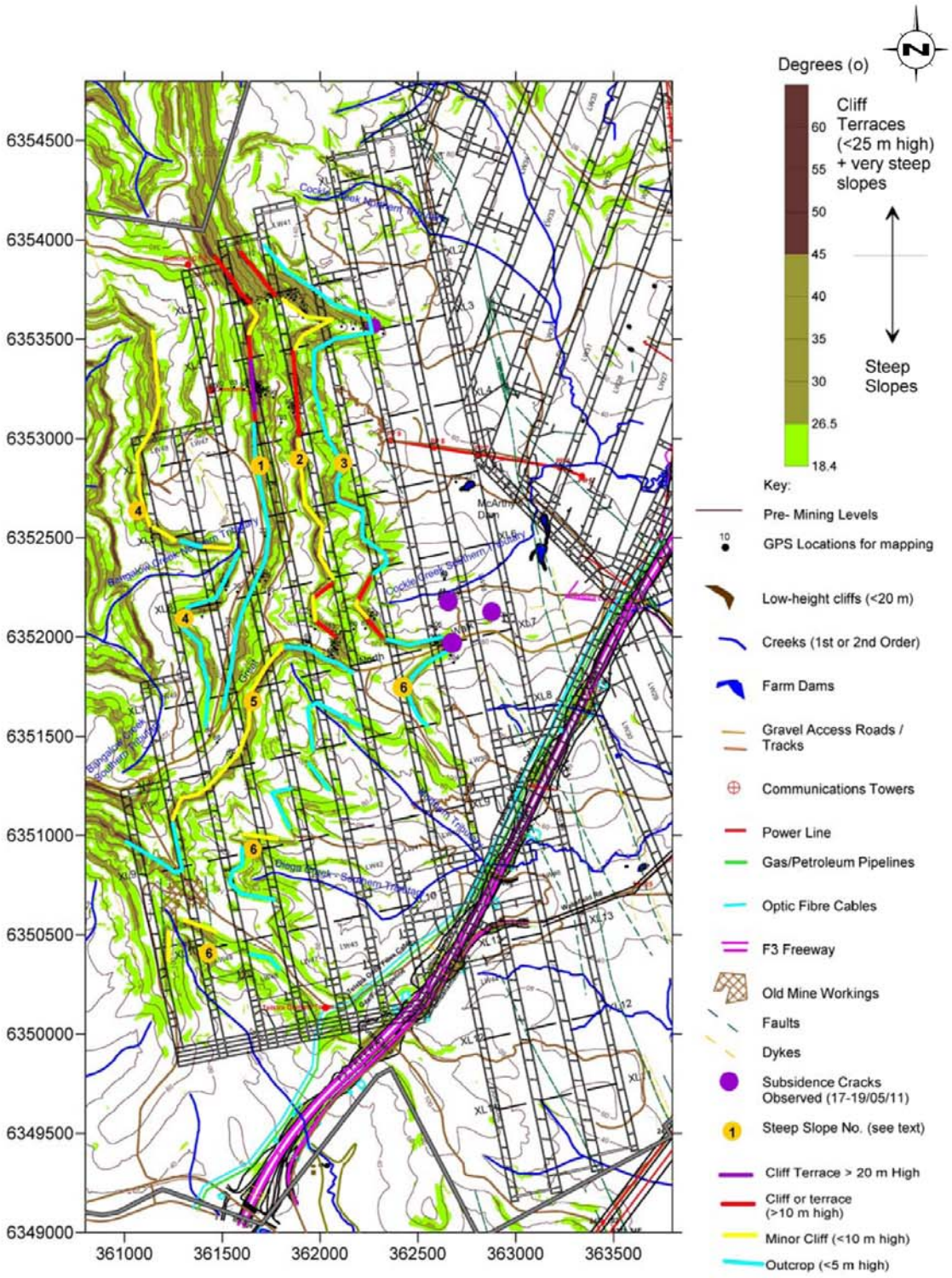

FIGURE 1

Cliffline Locations

Source: Ditton Geotechnical Services Pty Ltd (2011)

Figure 7: *Location of Cliffs, Cliff Terraces and Steep Slopes*

Figure 8: *View to Cliff Lines from Edgeworth*

The Department considers that these performance measures are rigorous, and would provide a satisfactory standard of protection for these key landscape features. The tighter standards applicable to the features with greater height would also act to limit public visibility of any potential impacts.

Public Safety

Underground mining is proposed to be undertaken beneath the Sugarloaf SCA. This area is used for recreational purposes, including bushwalking along the Great Northern Walk, located above Longwalls 38 to 50 within the Western Domain (see **Figure 9**). The EA indicates that tensile surface cracks in the order of 30 to 140 mm may form along the walking track. In addition, the potential exists for instability of steep slopes and isolated boulders that exist adjacent to or upslope of the track.

OCAL has committed to implementing a monitoring and response plan for the Great Northern Walk, based on consultation with OEH, to manage impacts and ensure safe conditions during and after mining. Additional management measures committed to by OCAL include:

- filling of deep, longitudinal cracks above extracted panels with an approved pumpable grout mix with low strength and resistance to erosion;
- warning signs along access roads and walkways with mine site contact numbers to report damage;
- restriction of access to vulnerable locations along the walk during mining; and
- strategic removal or stabilisation of loose boulders along clifflines and slopes above the walk.

Mining would also be undertaken beneath Wakefield Road, which is a local road located above Longwalls 45 and 46 in the Southern Domain (see **Figure 9**). The EA indicates that the road is predicted to be exposed to subsidence in the order of 1.76 m and possible surface cracking of between 60 to 90 mm. To effectively manage public safety concerns in relation to Wakefield Road, OCAL has committed to conducting 24-hour surveillance of the road and embankment by a road crew while the road is being undermined and to repair any damage to the road caused by subsidence.

The Department considers that these proposed management measures are appropriate. Similar measures have been applied at other times, particularly when public roads have been undermined. The Department has recommended public safety performance measures and a condition requiring OCAL to update its existing Public Safety Management Plan as part of the Extraction Plan to ensure public safety in the mining area.

Public Infrastructure and Utilities

Mining would occur either under or close to a range of public infrastructure, including (see **Figure 9**):

- Gencom communications towers;
- proposed power lines;
- Wakefield Road and the F3 Freeway;
- Caltex/Jemena Petroleum and natural gas pipelines;
- Telstra/Nextgen/Optus optic fibre cables;
- Telstra communications tower;
- Transgrid Transmission Towers; and
- State survey marks.

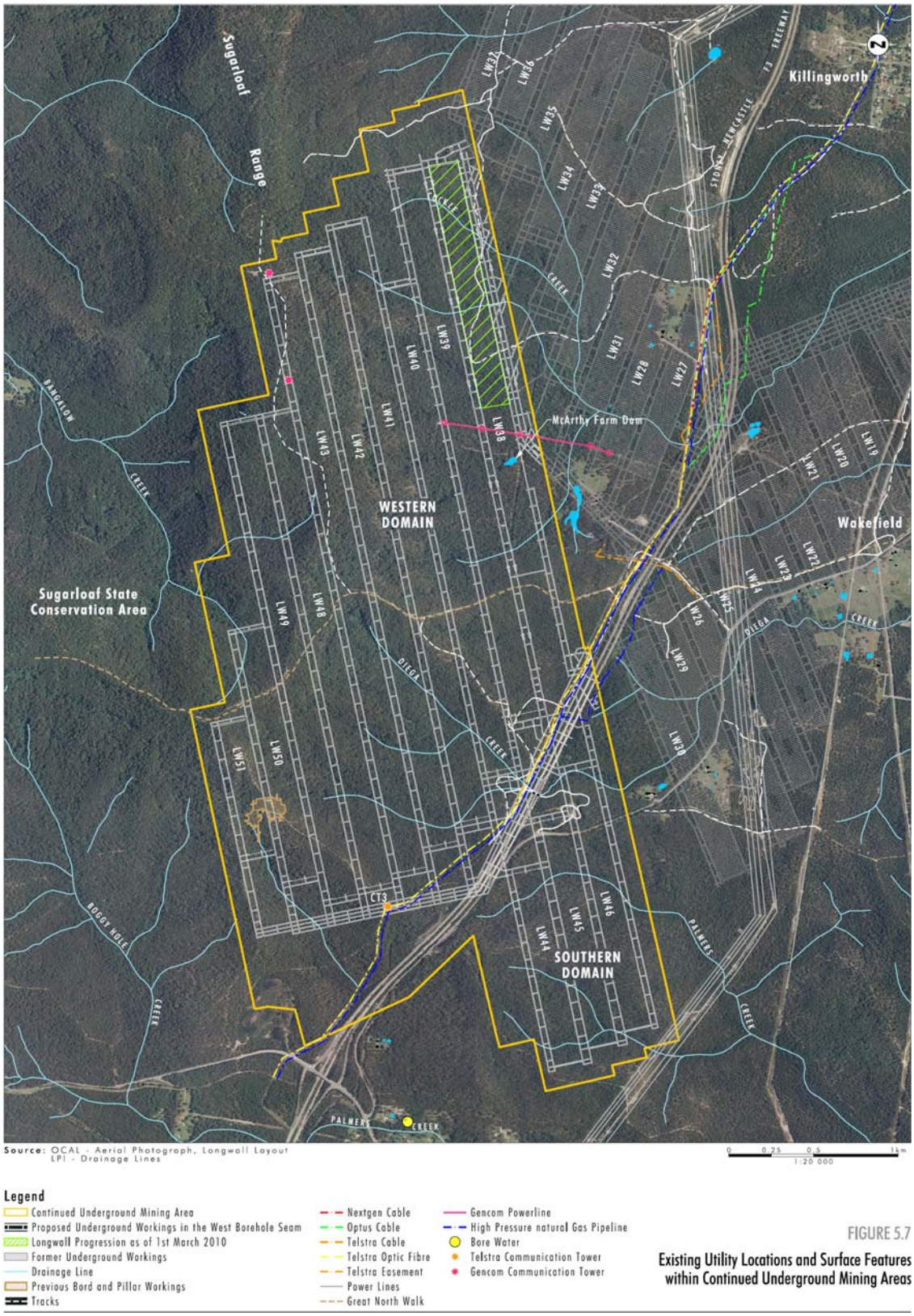

Figure 9: *Existing Utility Locations and Surface Features within the Mining Area*

The EA indicates that the overall mine layout has been designed to minimise subsidence impacts on this infrastructure and utilities. This especially includes the F3 Freeway and associated services easement, where a significant barrier of coal would be retained between the Western and Southern Domains to ensure the Freeway is outside the angle of draw. In addition, to manage the potential for far-field impacts beyond the angle of draw, OCAL has developed a management plan in consultation with the RMS. This should ensure that the Department's proposed performance measure, that this key

public infrastructure always be kept both "safe and serviceable", is maintained. As requested by the RMS, in order to ensure that the existing management practices continue to be implemented, the Department has recommended a condition requiring the management plan to be updated as part of the project's Extraction Plan.

The EA provides a list of specific management measures that would be implemented to ensure that subsidence impacts to other infrastructure remain within standard "safe, serviceable and repairable" criteria. The majority of these measures are based on existing subsidence management measures that have been developed in consultation with respective stakeholders and that are currently applied by OCAL. The EA indicates that these measures have been progressively refined over the last 20 years of longwall mining at the site. However, OCAL has committed to monitor impacts throughout the mining operations, and effect repairs if required. OCAL has also committed to communicating the results of the monitoring program to the respective stakeholders.

The Department has recommended performance measures requiring OCAL to ensure public infrastructure and utilities are maintained in a safe and serviceable condition and, if required, any damage is fully repaired or else replaced or fully compensated. In addition, the Department has recommended that OCAL be required to prepare and implement a Built Features Management Plan as part of the Extraction Plan.

Other Features

An area of old abandoned bord and pillar mine workings, dating back to the 1880s, is located above Longwalls 49 and 50 in the Western Domain. The EA indicates that there is potential for longwall extraction to reactivate or initiate subsidence in these old workings and therefore the potential for increased (ie cumulative) subsidence impacts at the surface in this area. OCAL has committed to monitoring subsidence impacts in this area and implementing remedial works if required.

Several post and wire fences exist within the continued underground mining area, which are mainly related to private properties. Project-related subsidence is expected to cause minor impacts on these fences. The EA concludes that any impacts are manageable through the implementation of monitoring and repair procedures.

The Department notes that the project area is located within the Killingworth/Wallsend Mine Subsidence District and approval of the MSB is required for the construction of new surface infrastructure, including the proposed Mining Services Facility.

Conclusion

The Department is satisfied that OCAL has adequately assessed the potential subsidence-related impacts of the project, using conservative assumptions, and has designed the project to avoid and/or minimise impacts to sensitive features. The Department is also satisfied that the impacts of the project can generally be mitigated, managed and/or offset to ensure an acceptable level of environmental performance. To ensure this occurs, the Department has recommended conditions requiring OCAL to:

- ensure the project complies with a range of strict subsidence impact performance measures;
- prepare detailed Extraction Plans prior to undertaking second workings, with the plans required to include a detailed:
  - subsidence monitoring program;
  - performance indicators (including impact assessment criteria);
  - Built Features Management Plan;
  - Public Safety Management Plan;
  - F3 Freeway Management Plan;
  - Water Management Plan;
  - Biodiversity Management Plan;
  - Heritage Management Plan;
- pay the Department's costs to engage independent experts to review the adequacy of any aspect of an Extraction Plan; and
- mitigate, manage and/or offset any impacts in the unlikely event that they do occur.

With these measures, the Department is satisfied that the project is able to be managed in a manner that would not result in significant subsidence-related impacts.

5.2 Groundwater

The project has the potential to impact on local and regional groundwater resources in respect of:
- loss of groundwater supply to local users;
- loss of baseflow to creeks and rivers; and
- cumulative impacts on regional groundwater resources.

OCAL engaged Aurecon to undertake a detailed hydrological assessment for the project, which incorporates information from previous studies at West Wallsend and broader studies within the Newcastle Coalfield. The assessment indicated that three potential sources of groundwater exist within the Lake Macquarie area, including:
- near-surface weathered rock aquifers;
- fractured rock aquifers (including coal seam aquifers); and
- alluvial aquifers.

Groundwater Resources and Usage
The EA indicates that the weathered rock aquifers do not contain significant quantities of groundwater due to extremely low permeability of the rock material. These aquifers are considered to be largely non-existent or of minor significance within the proposed mining area. The fractured rock aquifers have potential for higher flows, but are considered to be a poor resource potential, primarily due to the high levels of salinity in the groundwater.

The EA indicates that the alluvial aquifers are the most important potential source of groundwater in the local area. However, as shown in **Figure 10**, alluvial aquifers are confined to very small areas within the actual mining area, along Cockle Creek, Diega Creek, Central Creek (mislabelled on Figure 10 as "Palmers Creek") and their tributaries. Cockle Creek is primarily affected by Longwall 38, which has already been mined. Diega Creek and Central Creek are primarily affected by Longwalls 45-46.

The EA indicates that there are no registered groundwater bores within the proposed underground mining area. It is also considered unlikely that unregistered bores exist within the mining area due to the limited groundwater resources and the fact that most of the area is covered by the Sugarloaf SCA.

Both Cockle Creek and Palmers Creek have much more extensive areas of alluvium to the east and south of the mining area, respectively. These areas of alluvium contain a total of six registered bores which exploit the aquifers for both stock and domestic purposes. The distances between the areas of proposed extraction and these larger areas of alluvium are substantial (some 1300 m to the nearest bore in the case of Palmers Creek, and more than 2 km to the bores in Cockle Creek). Owing to this distance, the EA concludes that these bores are outside the zone of groundwater drawdown and would not be impacted by the proposal.

Groundwater Flow to Creeks (Baseflow)
The hydrological assessment indicates that fracturing of overburden strata caused by subsidence has the potential to drain aquifers in the alluvial deposits and affect groundwater discharges (ie baseflow) to local creek systems. The probability of the underground mining resulting in an adverse impact on baseflow is dependent on the height of the fractured zone. As discussed previously, DGS predicted that the height of the fractured zone in the proposed underground mining areas is between 70 m and 100 m. Recent additional monitoring in areas currently being mined at West Wallsend has suggested that this height may be limited to between 64 m and 71 m in practice.

OCAL had previously committed to avoid longwall extraction in areas of the Ryhope Creek catchment where depth of cover was < 70 m (see **Figure 5**). In response to concerns raised by both NOW and OEH in relation to loss of baseflow and associated biodiversity impacts in areas of low depth of cover, OCAL has revised its initial mine plan to avoid areas with less than 80 metres depth of cover (see **Figure 11**). This includes an additional 30 ha area at the southern end of Longwalls 42, 43 and 47 within the Diega Creek catchment (see **Figure 5**).

In addition, OCAL has committed to undertaking further monitoring to provide increased confidence of the height of fracturing above Longwall 40 within a small area of the Cockle Creek catchment with a depth of cover < 100 m. Once this information becomes available, OCAL would review its mine plan, in consultation with OEH and the Department, and if necessary, further modify the mine plan to avoid adverse baseflow impacts to areas where depth of cover < 100m.

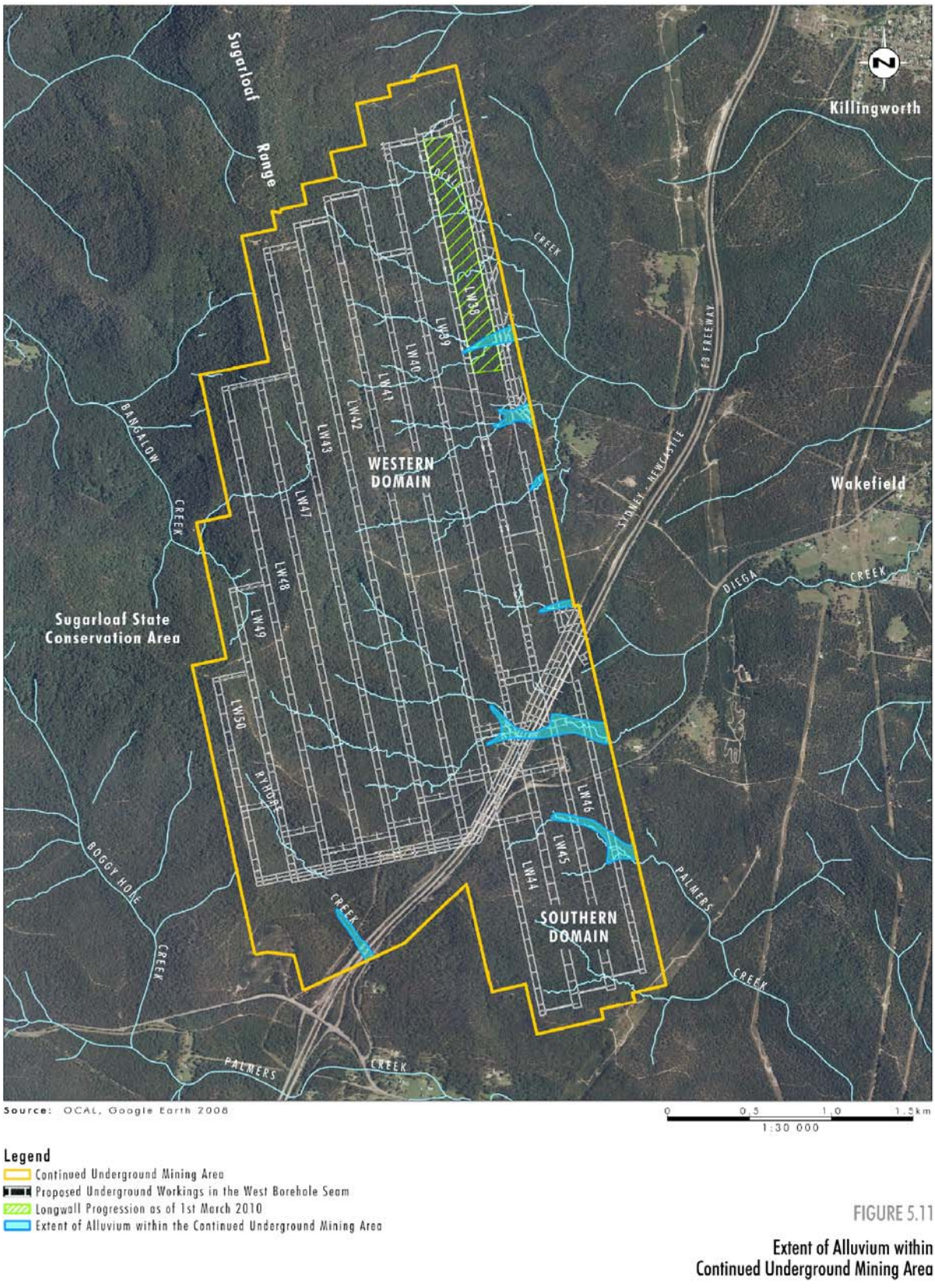

Figure 10: *Extent of Alluvium within the Site*

The NOW, OEH and the Department have accepted this approach and are satisfied that the revised mine plan and additional monitoring and review would ensure that potential impacts to baseflow as a result of mining are negligible.

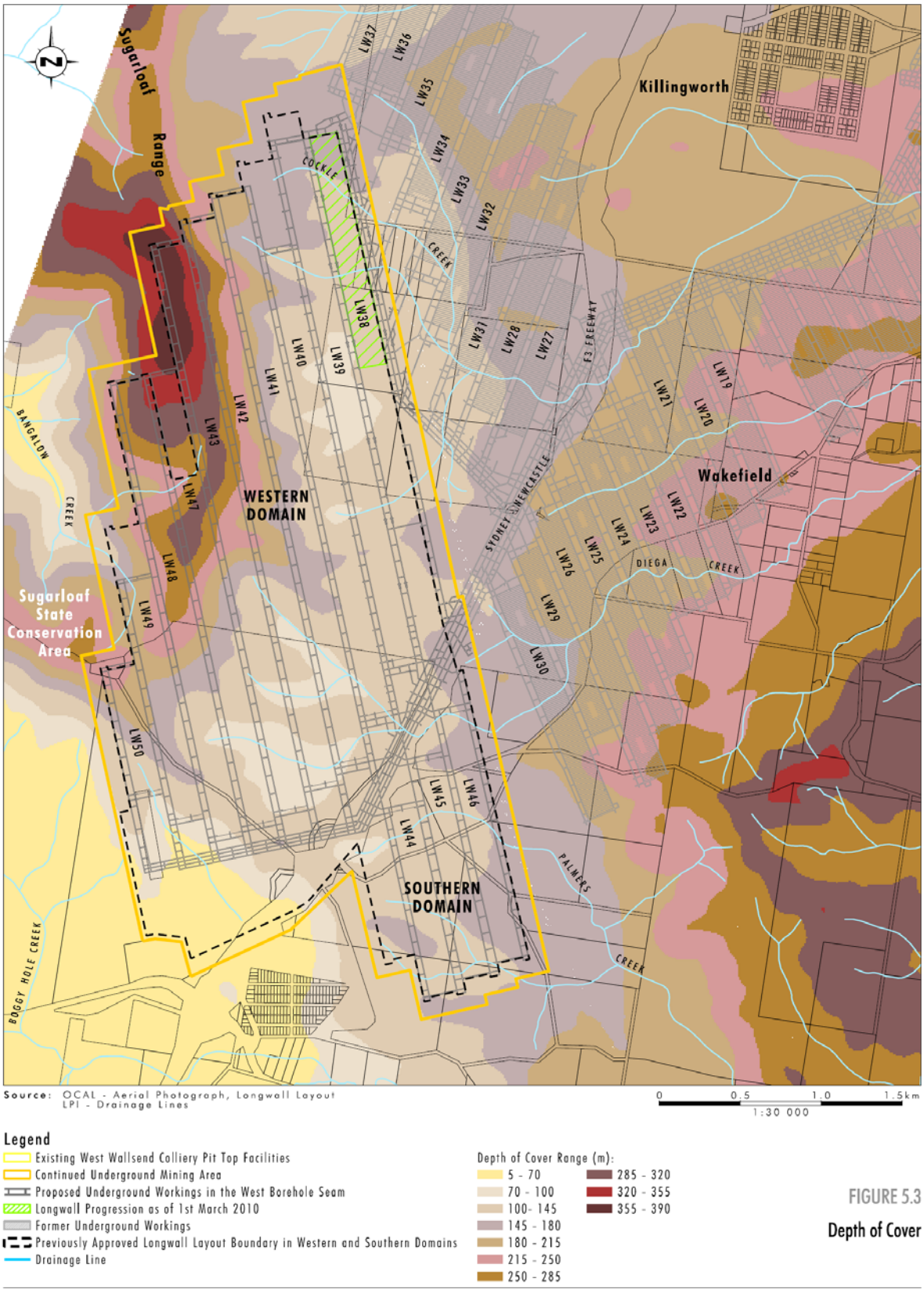

Figure 11: *Depth of Cover*

The Department has recommended performance measures requiring negligible environmental consequences and no connective cracking between the mine and the surface in the streambeds of Diega Creek and Cockle Creek, where depth of cover beneath the creek is <80 m and <100 m, respectively. For sections of these two creeks with deeper depth of cover and for both Bangalow and Palmers Creeks, it has recommended performance measures requiring no greater environmental consequences than predicted in the EA and no connective cracking.

Cumulative Impact

The EA assessed the potential risks to the regional (cumulative) hydrological regime. Regional impacts were confined to potential reductions in baseflow (discussed above) and groundwater inflows from fractured rock (ie coal seam) aquifers into the underground mine workings.

The assessment predicts that groundwater inflows would be in order of 1000 MLpa, primarily from the fractured rock (ie coal seam) aquifers. The EA concludes that the regional risk to coal seam aquifers from these inflow rates is not significant as:

- no significant aquifers have been identified in the overburden above the mining area;
- coal seam aquifers in the region do not provide an important source of groundwater due to poor quality;
- there has already been significant extraction in this seam in the region, which has depleted the groundwater resource;
- the affected seams sub-crop immediately west of the proposed mining area, so there is minimal chance for drainage of groundwater resources up-dip; and
- the proposed mining area covers a relatively small area when compared to the total coal basin, so any additional regional impacts would be negligible.

The Department accepts that regional groundwater impacts are unlikely to be significant.

Conclusion

The Department accepts the findings of the hydrological assessment, and is satisfied that the project can be managed to avoid any significant groundwater impacts. To ensure this occurs, the Department has recommended conditions requiring OCAL to achieve performance measures of negligible environmental consequences on baseflows in areas of low depth of cover in Diega and Cockle Creeks. These conditions also require a detailed monitoring regime designed to inform OCAL whether subsidence effects were such that greater-than-negligible environmental consequences might result. OCAL would have to then apply adaptive management measures (such as limiting the amount of coal taken) to continue to avoid breaching the performance measures.

The Department has also recommended conditions requiring OCAL to:

- obtain appropriate water licences from NOW for groundwater inflows to the mine; and
- develop a comprehensive Water Management Plan as part of the Extraction Plan, in consultation with relevant authorities and including:
    - groundwater monitoring program;
    - impact assessment criteria or trigger values (within the context of a Trigger Action Response Plan (TARP)); and
    - a contingency plan that provides for adaptive management.

With these measures, the Department is satisfied that the proposed mining can be managed such that it would not result in any significant impacts on groundwater resources.

5.3 Surface Water

The project has the potential to impact on surface water resources in the following ways:

- changes to the existing site water balance;
- reduction in the quality of water returned to local tributaries, creeks and ultimately Lake Macquarie or the Hunter River; and
- reduction and/or modification to surface water flows in local creeks within the Cockle, Diega, Palmers, Boggy Hole and Bangalow Creek Catchments.

The project is located in the headwaters of the Cockle Creek, Diega Creek, Palmers Creek, Boggy Hole Creek and Bangalow Creek Catchments. The existing Pit Top Facilities at Killingworth are located within the catchment of Burkes Creek. With the exception of the Bangalow Creek Catchment, all of these creek systems drain east and ultimately drain into Lake Macquarie. Bangalow Creek drains west of the Sugarloaf Range and ultimately drains into the Hunter River. All creeks and tributaries within the project area are ephemeral (ie flow intermittently), however pools of permanent or semi-permanent water are present in the downstream reaches of most streams.

OCAL's existing operations are supported by an extensive mine water management system, which includes mine dewatering systems, water storages, sediment dams, drains and earth bunding around the laydown hardstand areas and fuelling areas.

A comprehensive surface water assessment for the project was undertaken by Umwelt. The assessment included an analysis of baseline conditions in local creeks, a site water balance, assessment of the capacity of water supply and management infrastructure, and proposed monitoring, mitigation and management measures.

Subsidence Impacts

The EA assesses subsidence-related impacts on streamflows in the vicinity of the project, including loss of surface water runoff (ie environmental flows) due to surface cracking. The EA considers that potential reductions in environmental flows would be negligible, for the following reasons:

- the most recent modifications to the mine plan result in avoiding mining in areas of low depth of cover (ie <80m in Diega Creek and <100m in Cockle Creek) and therefore limit areas where subsidence cracking with direct hydraulic connection could occur;
- the ephemeral nature of the creeks and tributaries within the project area means that, even if connective cracking occurred, runoff would only be captured for a very short period of time and only during storm events;
- the relatively small catchment areas upstream of the areas with a depth of cover of <100m total just 232 ha, which equates to substantially < 1% of the area of the Lake Macquarie water source;
- this small volume of water would be readily offset by the existing water management system discharges; and
- the success of previous and proposed subsidence management strategies undertaken at West Wallsend which involve remediation works (including natural self healing mechanisms, surface tilling and grouting) to fill surface cracks and limit ingress of runoff.

The Department and OEH are satisfied that the risk of significant reductions in environmental flows, even at the local scale, has been largely avoided by recent and previous modifications to the mine plan. In order to address residual concerns raised by OEH regarding potential impacts in the areas with a depth of cover < 100 metres, OCAL has committed to undertaking additional monitoring in these areas, regularly reviewing monitoring results and height of fracturing during mining operations and assessing the need or otherwise to further modify mining operations (see Section 5.2).

The Department and OEH support this approach, and the Department has recommended conditions requiring OCAL to achieve performance measures of negligible reductions in environmental flows in Diega and Cockle Creek where depth of cover is low. These conditions also require a detailed monitoring regime designed to inform OCAL whether subsidence effects are such that greater-than-negligible environmental consequences might result. OCAL would have to then apply adaptive management measures (such as limiting the amount of coal taken) to continue to avoid breaching the performance measures.

Mine subsidence also has the potential to alter parts of the longitudinal grade of watercourses, resulting in potential increases in flow velocities and greater potential for erosion and sediment laden water to enter downstream waterways. In response to requests by OEH, the CMA and NOW, OCAL undertook additional modelling in order to determine potential changes in peak velocities that may occur as a result of subsidence. The modelling indicated that particular sections of some creek lines are at risk of becoming unstable as a consequence of mining (see **Figure 12**). The Department notes that the longest affected reach (in Diega Creek) would now be avoided under the modified mine plan.

For other areas, OCAL has committed to conducting frequent inspections of the creeks both prior to and post mining to ensure that they remain stable, with no additional erosion of the creek bed or banks. If instability is identified, OCAL has committed to implementing a stability program, which would involve placement of controls such as coir logs, tree logs, or hard rip rap within creek beds and along creek banks to reduce flows and stabilise the system, where necessary.

OEH and NOW accepted this approach, however NOW requested that OCAL undertake more detailed investigations along creek lines to be undermined to more accurately define their geomorphic character, nature of the bed load material, predicted stream velocities, and nature and location of any controls required to minimise degradation of stream channels. The Department has recommended a condition requiring OCAL to detail this information in the Water Management Plan component of the Extraction Plan.

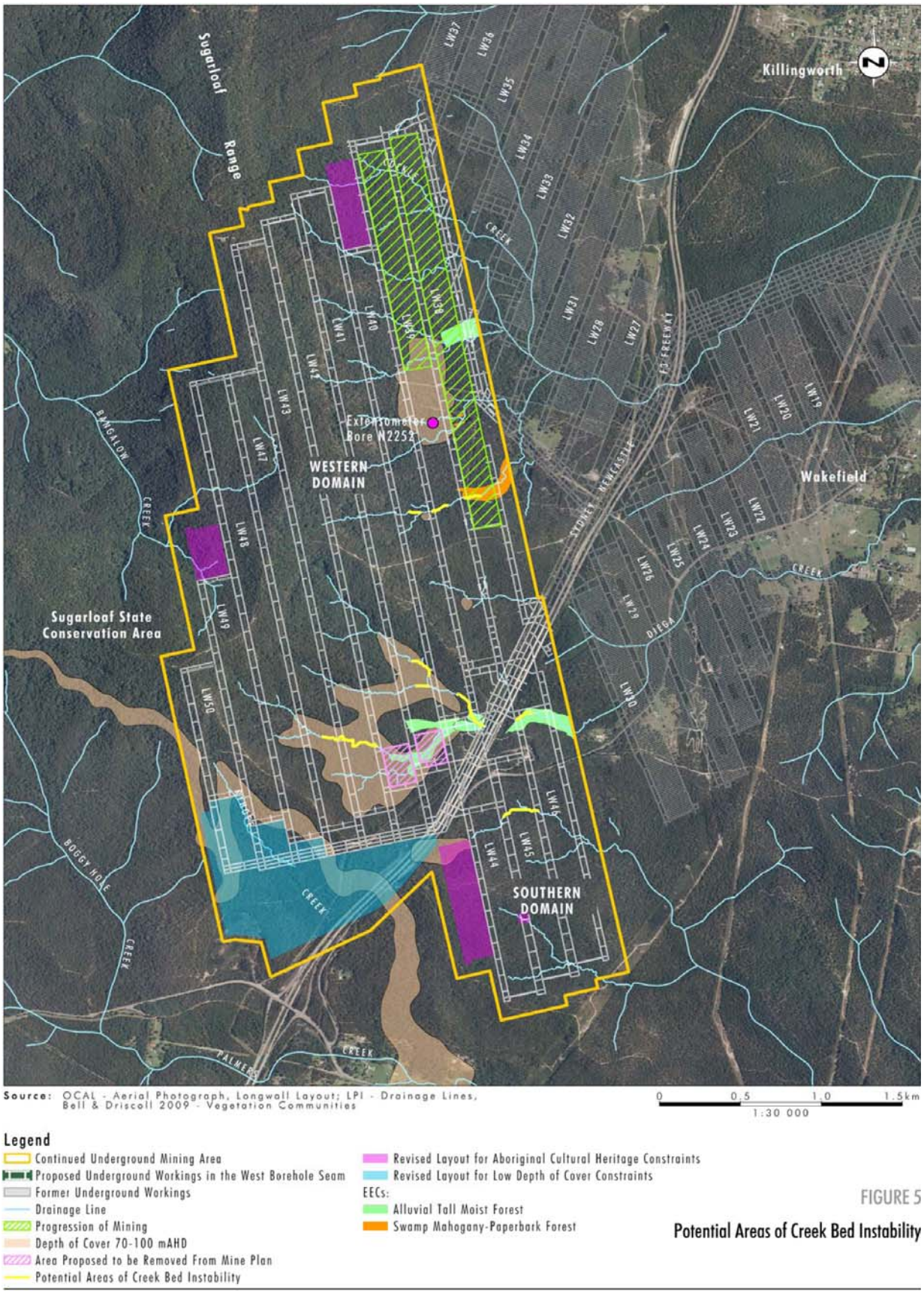

Figure 12: *Potential Areas of Creek Bed Instability*

The Department is satisfied that these measures would result in continued creek stability in the mining area.

Water Balance

A predictive water balance model, based on the model developed for existing reporting requirements, was developed for future mining years and for a maximum production scenario. The results of the modelling are summarised in **Table 3**.

Table 3: *Predicted Water Balance*

Component		**Volume (MLpa)**			
		Year 1	**Year 4**	**Year 8**	**5.50 Mtpa**
Water Sources	Rainfall/runoff	64	64	64	64
	Groundwater inflows	900	900	900	900
	Potable water import	331	324	274	403
	Total inflows	**1295**	**1288**	**1238**	**1367**
Water Losses	Lost to ROM coal	-225	-220	-185	-275
	Equipment washdown and dust suppression	-3	-3	-3	-3
	Evaporation from surface dams	-9	-9	-9	-9
	Lost to humidity / ventilation in the underground	-29	-29	-29	-29
	Total losses	**-265**	**-260**	**-225**	**-316**
GROSS WATER BALANCE		**1030**	**1028**	**1031**	**1051**

The water balance indicates that the mine would continue to produce excess water, and would therefore need to continue discharging water offsite. The great majority of this surplus derives from groundwater inflows to the mine (see **Table 3**). The model predicts that a peak water surplus of approximately 1051 ML would be experienced when coal production is at a maximum of 5.50 Mtpa. The predicted volumes of excess mine water are not significantly greater than are currently being generated (ie <100MLpa). The Department notes that the water balance model was based on historical water balances and data, and is satisfied that it provides robust predictions.

Excess Mine Water and Licensed Discharges

OCAL intends to use its existing water management system to manage off-site water discharges associated with the project. A summary of the proposed discharge arrangements is provided in **Table 4** and shown in **Figure 2**.

Table 4: *Off-Site Water Discharge Allowances*

Water Source	**Receiving Water / Discharge Point**	**Predicted Discharge Volume (MLpa)**	**Approved Discharge Volume (MLpa)**
Underground mine dewatering	Transferred to Westside Mine and discharged to Cockle Creek via OEH LDP 4 (EPL 4033)	947-985*	No volumetric limit
Excess rainfall/runoff from surface facilities and surplus water from underground mining operations	Discharged to Burkes Creek via OEH LDP 2 (EPL 1360)	55	1460
Surface Water Runoff at Pit Top Facilities		20-90	
Sewage effluent	Transferred to MCPP for re-use	11	-
TOTALS		**1033 – 1141**	**>1460**

* *May be discharged to Burkes Creek via LDP 2 during equipment maintenance periods.*

The Department is satisfied that the volume of excess mine water would not increase substantially from existing volumes and that the existing and proposed discharge facilities have significant extra capacity to provide flexibility in the management of any excess water.

OCAL proposes to discharge between 947-985 MLpa of surplus underground mine water into Burkes Creek via Licensed Discharge Point 2 (LDP 2) (see **Table 4**). The EA indicates that these waste water discharges, while being similar in quality to the existing water in Burkes Creek, would cause continued exceedances of the relevant ANZECC water quality criteria. OEH indicated that the existing EPL contains volume and concentration limits and monitoring requirements similar to those proposed in the EA. However, OEH expressed concerns about the quality of the mine water proposed to be discharged and indicated its intention to include a pollution reduction program (PRP) on EPL 1360

requiring OCAL to identify and implement measures to reduce concentration limits to ensure discharges meet the ANZECC default trigger values, or else to establish site-specific trigger values for Burkes Creek. In particular, OEH intends to vary the discharge limit for electrical conductivity from 10,000 µS/cm to 5,570 µS/cm.

In response, OCAL has committed to undertaking additional water quality and flow monitoring in Burkes Creek to assist in the identification of appropriate site-specific trigger values and to undertake desktop investigations of saline water treatment methods used at other mines, such as reverse osmosis.

In response to previous requests from OEH to reduce the amount of mine water being discharged from the site, OCAL has been granted consent (see **Table 1**) to construct two pipelines to transfer mine water from the borehole at Longwall 11 to Metromix's nearby Teralba Quarry (see **Figure 2**). It is understood OCAL is discussing with OEH and Metromix obtaining the appropriate licences to operate this system. Metromix proposes to use the transferred mine water as process water, which would result in a reduction in the discharge of saline mine water to the Lake Macquarie catchment.

The Department notes that, in response to an OEH request, OCAL has also committed to investigate options for reducing the use of potable water on site, thereby further reducing overall discharges to Cockle Creek. This trial would involve shandying potable water with mine water for re-use.

Conclusion

The Department is satisfied that OCAL has adequately assessed the project's potential impacts to surface water resources. Following its assessment, the Department is satisfied that the project can be managed such that it would not have significant impact on surface water resources. The Department has recommended conditions requiring OCAL to develop a comprehensive Surface Water Management Plan, in consultation with relevant authorities, which includes:

- a surface water monitoring program;
- a site water balance and erosion and sediment control plan;
- impact assessment criteria or trigger values (within the context of a Trigger Action Response Plan (TARP)); and
- a contingency plan that provides for adaptive management of the mining operations (eg by restricting mining height or increasing pillar width to reduce subsidence) if actual impacts exceed those predicted.

With the implementation of these measures, the Department is satisfied that the project can be managed such that it would not result in any significant impacts on surface water resources.

5.4 Flora and Fauna

The proposed underground mining area covers approximately 1085 ha and is located almost entirely beneath an expansive tract of native vegetation associated with the Sugarloaf SCA. The area is heavily vegetated, with existing disturbance limited to linear corridors associated with the F3 Freeway and vehicular and walking tracks within the Sugarloaf SCA.

OCAL engaged Umwelt to undertake a flora and fauna assessment for the project. The assessment included database searches, literature reviews and field surveys. In response to issues raised by OEH, OCAL provided extensive additional information in relation to the biodiversity survey effort conducted over the project area. The Department and OEH are satisfied with the assessment.

Flora

There is a total of 17 vegetation communities within the underground mining area (see **Figure 13**). Two of these vegetation communities, *Alluvial Tall Moist Forest* (12 ha) and *Swamp Sclerophyll Forest* (3 ha), qualify as EECs under the *Threatened Species Conservation Act 1995* (TSC Act). These communities, as well as *Riparian Paperback Peppermint Forest* (10 ha), are also considered to be groundwater dependant ecosystems (GDEs). In addition, two threatened flora species were recorded in the underground mining area - black-eyed susan (*Tetratheca juncea*) and small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*). Both these species are listed as vulnerable under the TSC Act and also under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The EA indicates that the project has direct impacts as a result of clearing associated with access track construction and anticipated subsidence remediation works, and potential indirect impacts on vegetation as a result of surface cracking and ponding associated with subsidence impacts. **Table 5** provides a summary of the revised project's predicted direct impacts on vegetation communities.

Table 5: *Summary of Direct Impacts on Vegetation Communities*

Vegetation Community	Area to be Disturbed (ha)		
	Potential Ponding Impacts	Potential Access Tracks	Total
Coastal Wet Gully Forest	2.81	0.24	.305
Alluvial Tall Moist Forest*	1.29	0.01	1.30
Freemans Peppermint Apple	0.48	0.17	0.65
Coastal Foothills Spotted Gum-Ironbark Forest	0.14	-	0.14
Coastal Ranges Dry Blackbutt Forest	0.10	-	0.10
Coastal Warm Temperate Rainforest	0.27	-	0.27
Hunter Valley Moist Spotted Gum-Ironbark Forest	0.88	-	0.88
Mesic Paperbark Thicket	0.22	-	0.22
Riparian Paperbark-Peppermint Forest	0.63	-	0.63
Sugarloaf Uplands Smooth-barked Apple Forest	0.73	-	0.73
Swamp Mahogany – Paperbark Forest*	0.23	-	0.23
Disturbed – Regrowth	0.28	-	0.28
Cleared Lands	0.65	-	0.65
Total	**8.71**	**0.42**	**9.13**

* Endangered Ecological Community as defined by the *TSC Act*

The project would result in potential direct disturbance of approximately 9 ha of land, including 1.5 ha of EEC (see **Table 5**). This does not include disturbance associated with construction of the Mining Services Facility, which would be built on 0.5 ha of land owned by OCAL and outside of Sugarloaf SCA. This site was previously disturbed by construction of both Wakefield Road and the F3 Freeway.

OCAL's modifications to the mine plan to avoid areas with depth of cover < 80 m would minimise potential indirect impacts from surface cracking and ponding on EECs and GDEs, particularly near Diega Creek (see **Figure 5**). The Department and OEH are satisfied that the revised mine plan greatly reduces the extent and magnitude of predicted subsidence impacts on native vegetation, including EECs and GDEs, and that the overall direct impacts on vegetation are small.

However, OEH raised concerns about potential subsidence impacts on other EECs outside Diega Creek catchment but within the underground mining area, and on threatened species such as the black-eyed susan. In order to address these concerns, OCAL has committed to monitoring this vegetation during the life of the project and, if any adverse impacts are identified, to investigate appropriate remediation and mitigation requirements in consultation with OEH and the Department. If impacts cannot be adequately remediated, OCAL has committed to providing an appropriate offset.

The Department and OEH are satisfied with this approach, and the Department recommends subsidence impact performance measures that require OCAL to ensure that the project has negligible impacts on threatened species and populations and EECs within the project area. If adverse impacts occur, then OCAL would be required to undertake remediation, and implement adaptive management measures to ensure that further impacts are avoided. If these impacts cannot be remediated, then recommended conditions require that they are instead offset.

The Department has also recommended a condition requiring OCAL to prepare a Biodiversity Management Plan as part of the Extraction Pan for the project, to the satisfaction of the Director General. The plan must include management measures, monitoring procedures, performance indicators and reporting frameworks to demonstrate achievement of these performance measures.

The Department notes OCAL's commitment and OEH's support for the establishment of an Independent Review Committee to assess potential impacts of subsidence and the risks to threatened biodiversity. The Department is satisfied that the preparation and implementation of the Extraction Plan and the Biodiversity Management Plan provides for the same outcome and has therefore not recommended specific conditions in relation to the establishment of such a Committee.

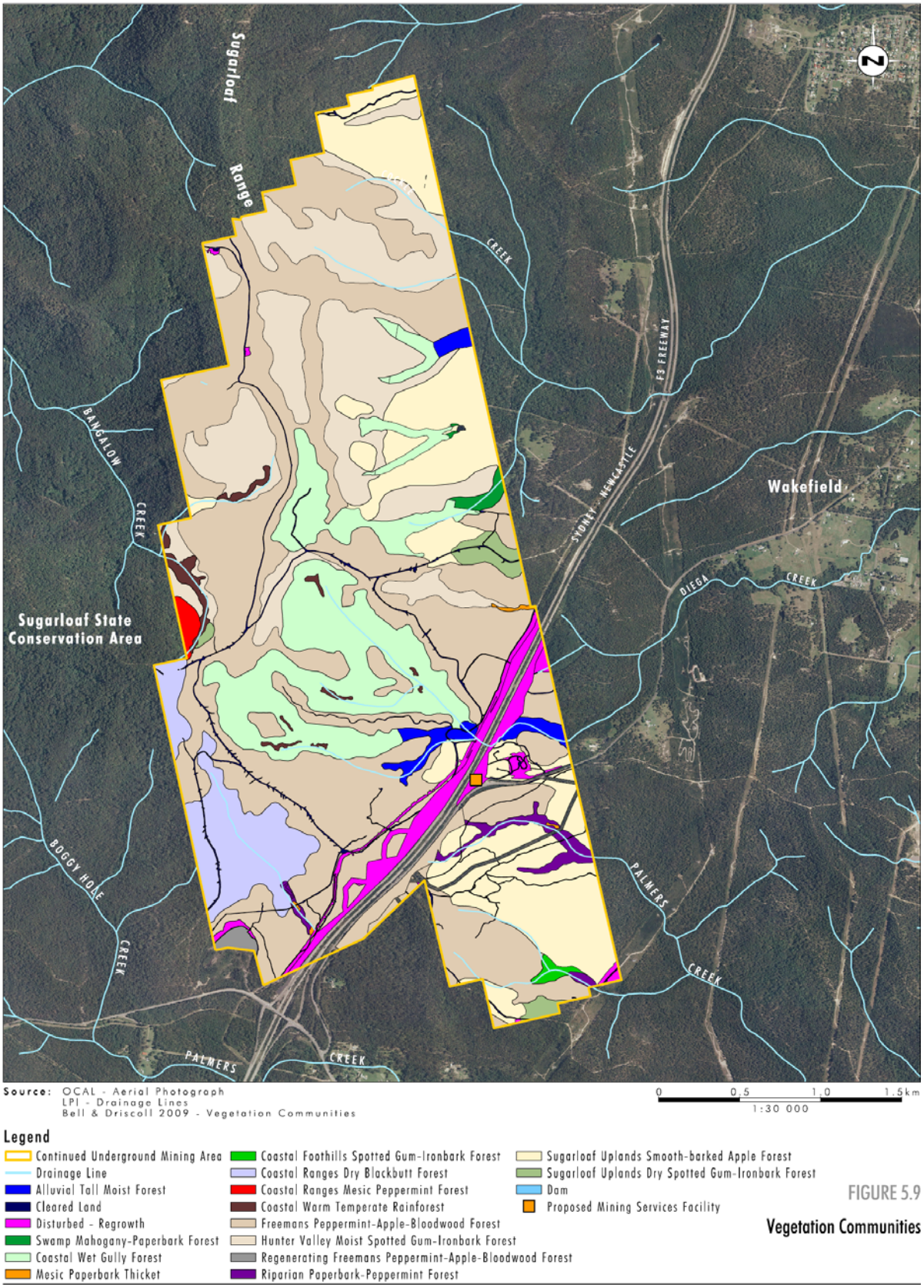

Figure 13: *Vegetation Communities*

Fauna

A total of 112 vertebrate fauna species were recorded during surveys of the project area. Of these, 17 are listed as threatened under the TSC Act, including 3 which are also listed as migratory species under the EPBC Act. Of the threatened species, 12 are mammals (including 8 species of bats) and 5 are birds.

Apart from the impacts of direct clearing of habitat (9 ha), the fauna assessment indicated that rockfalls along cliff lines may affect potential habitat for bat species dependent on caves and rock crevices. However, the assessment also noted that no evidence of breeding or roosting caves for any bat species was recorded during surveys in the project area, and there is no certainty that they actually occur. It concluded that the project would not result in the loss of fauna species diversity or abundance due to the small areas of disturbance predicted. It also concluded that no significant impacts on cave-dependent bat species are likely due to the limited area potentially affected by rockfalls (see Section 5.1) and the presence of extensive cliff lines in surrounding areas, which are likely to provide comparable habitats.

The Department is satisfied that both direct and indirect surface disturbance associated with the project is limited and that the project is therefore unlikely to result in significant adverse impact to fauna species, populations or their habitat.

Biodiversity Offsets

The assessment concludes that the project would not have a significant impact on threatened species or populations or their habitats or on EECs, and that there is no requirement for a biodiversity offset.

In place of proposing a biodiversity offset strategy based on alternative provision of additional land for conservation management, OCAL has committed to undertake stream stability and remediation works within Sugarloaf SCA (but outside of the area directly impacted by mining) to the value of $50,000 per annum, for the life of the project. These works would involve improving the geomorphic and ecological value of drainage lines, which have been impacted by past land use practices and by predicted subsidence impacts. The OEH has supported this proposal and the Department is satisfied that the remediation works would result in the improved ecological and landscape values in the SCA

Rehabilitation

The EA includes a rehabilitation strategy for the mine. OCAL has committed to rehabilitating disturbed areas within the project site to provide a stable landform. This includes the 14 ha of land within the existing Pit Top Facilities, No. 2 and No. 3 ventilation shafts, the Longwall 11 borehole facility and the proposed Mining Services Facility. The EA indicates that the final land use options for these areas may include residential, light industrial or a return to native bushland. The land above the continued underground mining area would remain part of the Sugarloaf SCA.

The Department is satisfied that OCAL's rehabilitation strategy provides the basis for achieving successful overall rehabilitation outcomes for the project. The Department has recommended a condition requiring that a Rehabilitation Management Plan is prepared and implemented in consultation with relevant stakeholders. OCAL would also be required to meet a series of agreed rehabilitation objectives.

Conclusion

The Department is satisfied that OCAL has adequately considered the potential biodiversity impacts of the project, and that these impacts are not significant. To minimise flora and fauna impacts, the Department recommends that OCAL should be required to prepare a detailed Biodiversity Management Plan as part of the Extraction Plan, which includes:

- a description of the short, medium and long term measures to manage biodiversity on site, with particular reference to EECs, GDEs and threatened flora and fauna species (particularly black-eyed susan);
- procedures to monitor biodiversity;
- performance measures; and
- reporting frameworks.

5.5 Noise

The project has the potential to generate construction, operational and road traffic noise impacts. Umwelt undertook a noise assessment for the project in accordance with applicable guidelines, including the *NSW Industrial Noise Policy* (INP), the *Environmental Criteria for Road Traffic Noise* (ECRTN) and the *Environmental Noise Control Manual* (ENCM). The assessment included attended and unattended noise monitoring and predictive modelling of potential noise impacts, including the potential cumulative noise impacts in conjunction with the Westside Mine, industrial sources, local traffic and traffic on the F3 Freeway.

Operational Noise

The assessment indicates that potential noise impacts would occur in the vicinity of the mine's surface facilities. Specifically, noise generated during the operation of the Pit Top Facilities and the No. 2 Vent Fan could potentially affect residents at both Killingworth and Barnsley. However, it is important to note that the activities and operations currently being undertaken at these facilities would not change dramatically as a result of this project, ie the predicted impacts are equivalent to existing impacts. The Pit Top Facilities and the No. 2 Vent Fan would continue to operate 24 hours a day, 7 days a week. Noise generated during the construction and operation of the new Mining Services Facility has the potential to impact residences in the Wakefield area. This facility would also operate 24 hours a day, 7 days a week. The location of these facilities in relation to the nearest receivers is shown in **Figure 14**.

The EA provided noise measurements and data used to derive proposed rating background levels (RBLs) and project specific noise levels (PSNLs) for the project (**Table 6**). However, the Department was not satisfied that this data was sufficient to reliably calculate noise criteria. As a result, OCAL provided more detailed noise data to the Department, which then calculated PSNLs to reflect the more stringent of the noise levels derived from both intrusive and amenity criteria, in accordance with the INP. The PSNLs provide initial target noise levels used to derive achievable noise limits based on the implementation of feasible and reasonable control measures. Both the Department and OEH have reviewed the PSNLs adopted in the EA and are satisfied that they are appropriate.

The existing and predicted worst-case noise levels at all key receiver locations are shown in **Table 6**. To interpret the locations referred to in **Table 6**, see **Figure 14** and the lists in **Appendix G**. The noise modelling results indicate that, under worst-case meteorological conditions, noise generated from the Pit Top Facilities and the No. 2 Vent Fan would result in exceedances of the PSNLs in both Killingworth and Barnsley. However, the operation of the Mining Services Facility would not cause adverse noise impacts on the residences in the vicinity of Wakefield.

Table 6: *Predicted noise levels*

Receiver / Location	Rating Background Levels dB(A)			Project Specific Noise Levels dB(A)			Predicted Noise Levels dB(A) $LA_{eq\ 15\ minute}$ (worst case)			Predicted Noise Levels with Noise Mitigation dB(A) $LA_{eq\ 15\ minute}$		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
R1 - Killingworth (main)	33.7	38.9	34.4	39	39	39	33	39	39	-	-	-
R2 - Killingworth (north)	35.2	36.8	34.4	40	40	39	**42 (+2)**	**43 (+3)**	**44 (+5)**	39	40	**41 (+2)**
R3 - Barnsley (west)	36.1	37.6	33.5	41	41	39	39	36	40 **(+1)**	-	-	40
R4 - Barnsley (southwest)	36.1	37.6	33.5	41	41	39	41	37	**41 (+2)**	-	-	**41 (+2)**
R5 - Barnsley (south)	36.1	37.6	33.5	41	41	39	37	34	37	-	-	-
R6 - Barnsley (main)	41.4	37.5	35.5	46	43	41	34	30	35	-	-	-
R7 - Barnsley 59 Charlton Street	36.1	37.6	33.5	41	41	39	**46 (+5)**	**45 (+4)**	**46 (+7)**	**44 (+3)**	**44 (+1)**	**44 (+2)**
R8 - Any residence in Wakefield	45	40	40	50	45	40	<30	<30	<30	-	-	-

Bold *text indicates predicted exceedances of PSNLs*

The noise generated from activities at the Pit Top Facilities exceeds the PSNLs at 122 residences located in the northern part of Killingworth (ie R2) and 52 residences in the west and southwestern parts of Barnsley (ie R3 and R4). The magnitude of the exceedances at the closest residential receiver is up to 5 dB(A) above PSNLs during night-time periods. The assessment indicates that the coal breaker is the highest contributor to these noise levels.

The noise generated from the No. 2 Vent Fan also results in noise levels of up to 7dB(A) above the PSNLs at the residential receiver located adjacent to the fan (ie R7). This prediction was made assuming that the fan would remain operating at 30% of its design capacity. The modelling indicates that operating the vent fan at full capacity would result in noise levels at this nearby receiver, the residences in Killingworth and the residences at Barnsley by 13 dB(A), 1 dB(A) and 4-5 dB(A) above the PSNLs, respectively. The Department notes that these noise levels are currently being experienced, and that no noise complaints have been received by OCAL over the last two years. However, the Department and OEH believe that OCAL should reduce future noise levels in order to meet contemporary noise criteria and ensure the future amenity of residents in neighbouring areas.

Figure 14: *Noise Receiver Locations*

OCAL therefore committed to reducing noise levels from the coal breaker by 10 dB(A) through measures such as enclosures, and to maintaining the operation of the ventilation fan at 30% of its design capacity. As indicated in **Table 6**, the noise assessment indicated that this would achieve the PSNLs during the day and evening periods in both Killingworth and Barnsley but result in marginal

exceedances of the PSNLs (ie 1-2 dB(A)) during the night-time period. The Department notes that noise level changes of between 1-2 dB(A) are generally not perceivable to the human ear. The Department and OEH are therefore satisfied that, once the coal breaker has been noise mitigated, the predicted noise levels at Killingworth and Barnsley would be acceptable.

OCAL has further committed to investigating the feasibility of further reducing noise levels at Killingworth by:

- implementing noise mitigation of the service conveyors from the coal breaker through the systematic replacement of noisy conveyor idlers;
- implementing noise mitigation for bin loadout operations by managing the level of raw coal in the bin or by providing sound attenuation on the bin;
- reviewing loading procedures and operator training; and
- reviewing bin design and the coal truck loading facility.

The Department and OEH support these additional measures.

Moderate exceedances of the PSNL (ie 3 dB(A)) would also be experienced at the residential receiver nearest to the ventilation fan (ie R7) during the day-time period. The Department notes that OCAL has formalised a noise agreement with this landowner to allow the fan to continue to operate under existing capacity (ie 30%). Therefore, no further noise mitigation measures are required at this property during the term of the agreement, which is valid until 28th August 2015. If an acceptable noise agreement cannot be reached between the landowner and OCAL after this time, the Department has recommended a condition requiring OCAL to provide appropriate mitigation of the residence (eg double glazing, air conditioning, etc) at the request of the landowner.

The Department also notes that, if OCAL proposes to operate the No. 2 Vent Shaft fan above the existing 30% capacity, additional noise control measures would need to be implemented in order to achieve the recommended noise criteria at residential properties in Killingworth and Barnsley.

The Department has therefore recommended conditions allowing OCAL to operate at existing noise levels for an interim period of 12 months, while the coal breaker is being attenuated. Once attenuation of the coal breaker is complete, OCAL would be required to undertake a noise compliance investigation to assess compliance with more stringent criteria recommended by OEH and the Department and, if necessary, investigate additional noise mitigation measures.

Finally, the Department has also recommended a condition requiring OCAL to prepare and implement a detailed Noise Management Plan for the project, which is to include ongoing investigations into further reducing noise levels generated by the Pit Top Facilities and by the No. 2 Vent Fan.

Construction Noise

Construction of the Mining Services Facility would be limited to day-time hours, Monday to Friday and also Saturday 8 am to 1 pm if required. Construction of the Mining Services Facility would be undertaken over a period of 3 to 6 months. The noise assessment indicates that the predicted construction noise levels from these works are well below the construction noise goals derived from the ENCM, as well as the criteria derived by the INP.

The Department is therefore satisfied that the noise generated during the construction of the Mining Services Facility would not impact on residential receivers in the Wakefield area. Nevertheless, the Department has recommended a condition restricting construction hours to those proposed.

Sleep Disturbance and Cumulative Noise

The EA includes an assessment of the potential for sleep disturbance associated with operations of the various surface facilities during the night-time period. The assessment indicates that the predicted noise levels meet the sleep disturbance noise goals at all residential receivers.

The EA also includes a cumulative noise assessment of the project operating in conjunction with the Westside Mine, industrial sources, local traffic and traffic on the F3 Freeway. This assessment indicates that the cumulative noise levels are less than the recommended acceptable noise levels at all potential receiver locations in the region, except at receiver R7 immediately adjacent to the No. 2 Vent Fan. The Department is satisfied that the existing noise agreement and subsequent additional mitigation requirements outlined above are adequate to protect this landowner from excessive noise.

Road Noise

The EA indicates that the only additional traffic movements associated with the project are those required during construction and operation of the new Mining Services Facility. The maximum predicted traffic increase in the vicinity of this facility is 10 vehicle movements per day, which equates to an increase in traffic noise levels of 0.03 dB(A). This increase is well below the applicable road traffic noise criteria under the ECRTN.

The Department acknowledges that the haulage of coal from West Wallsend is covered under a separate existing development consent, which does not form part of this project application.

Conclusion

The Department and OEH are satisfied that OCAL has assessed the potential noise impacts of the project in accordance with relevant OEH guidelines. The Department proposes that West Wallsend should be allowed to continue operating at existing noise levels for an interim period of 12 months. Once attenuation of the noise breaker is complete, OCAL would be required to demonstrate compliance with stricter noise criteria and, if necessary, investigate additional noise mitigation measures. The Department also proposes that OCAL should be required to:

- comply with interim and long-term operational, cumulative and traffic noise criteria and goals;
- prepare and implement a Noise Management Plan for the project detailing noise mitigation measures, a noise monitoring program and a continual improvement program for reducing project noise;
- undertake additional noise mitigation measures where monitoring indicates an exceedance of the noise criteria; and
- independently investigate noise complaints.

5.9 Aboriginal Heritage

The EA contains a comprehensive Aboriginal heritage assessment that was carried out by Umwelt in consultation with five registered local Aboriginal stakeholder groups. The assessment involved extensive field surveys with participation of the Aboriginal stakeholders over a period of 21.5 days. Following the surveys an additional 13 days of detailed face-to-face consultation was undertaken with the Aboriginal stakeholders.

The Department and OEH are satisfied with the level of assessment undertaken in relation to Aboriginal heritage, including the scope and extent of consultation with the Aboriginal stakeholders.

Identified Sites

The assessment indicates that the Sugarloaf Range area, including the entire project area, is of great cultural heritage significance to Aboriginal people, in particular the Awabakal people. This view is reflected in the correspondence from all Aboriginal stakeholder groups which was received during the preparation of the EA.

The project has to potential to indirectly impact on 57 Aboriginal heritage sites and 13 Aboriginal cultural features. A total of 50 Aboriginal cultural heritage sites and 13 Aboriginal cultural features were identified during the surveys associated with the EA. An additional 7 Aboriginal cultural heritage sites were identified during due diligence surveys undertaken as part of an exploratory drilling program in 2010. In summary, the sites and features include:

- 19 sets of grinding grooves;
- 30 artefact scatters and isolated finds;
- 8 rock shelters;
- 2 stone arrangements;
- 3 scarred trees (plus 1 potential scarred tree);
- 3 cultural features / landmarks;
- an artefact scatter with an associated wet soak;
- a rockshelter with artefacts and a Potential Archaeological Deposit (PAD);
- a wet soak; and
- a pigment site.

All of the sites are located above the proposed underground mining areas (**Figure 15**). Overall, the Aboriginal groups assessed the majority of the identified sites and landscape features as being of high to extremely high Aboriginal cultural significance with some of the artefact scatters and isolated finds

as moderate to high significance. Umwelt assessed the archaeological significance as varying from low to high. A full list of the sites and their assessed significance is provided in **Appendix H**.

Potential impacts on Aboriginal heritage sites and features from the project arise from subsidence and subsidence remediation works. In relation to artefact scatters, isolated finds, scarred trees and the stone arrangements, direct impacts are possible from ground surface cracking and subsequent remediation works. Cracking of the rock platforms, benches, or creek beds could impact grinding groove sites. Similarly, cracking of the walls, floor and/or roof could impact rock shelters. Indirect impact in the form of increased erosion and/or sedimentation is also possible for all site types.

Proposed Management Strategies

In consultation with the Aboriginal stakeholders, Umwelt developed a multi-faceted approach to avoid, minimise and manage Aboriginal heritage sites and features within the project area. This approach is summarised below and described in detail in the EA.

Avoidance

Throughout the consultation process, the Aboriginal stakeholders identified several sites as having a high priority for protection. These included:

- 2 grinding groove sites (the Palmers Creek Grinding Groves 1 #38-4-1007 and 2 #38-4-1279) of extremely high Aboriginal cultural and high archaeological significance;
- a wet soak and artefact scatter site (Western Domain 5 #38-4-0993) of very high Aboriginal cultural and low to moderate archaeological significance; and
- 4 landscape features (a stone arch and 3 rockshelter sites) of high to extremely high Aboriginal cultural value.

Consequently, OCAL has committed to modifying the mine plan to avoid impact to these sites and landscape features (see **Figure 15**). These mine plan changes have resulted in the sterilisation of approximately 2.04 Mt of coal resource, which is valued at around $150 million. In addition, a further 3 sites of high to very high Aboriginal significance are proposed to be avoided as a result of mine plan modifications designed to reduce impacts on EECs and environmental flows in the vicinity of Diega Creek. These sites include a scarred tree (#38-4-1278), an artefact scatter (#38-4-1227) and an isolated find (38-4-1230).

The Department and OEH support these Aboriginal heritage avoidance measures. The Department has recommended a subsidence impact performance measure that requires OCAL to ensure that the project has negligible impact on these sites.

Potential Avoidance

A cluster of grinding groove sites is located in the upper catchment of Bangalow Creek (Bangalow Creek Grinding Grooves 1 to 6 #38-4-1234 to 38-4-1239 and Grinding Groove #38-4-0461). These sites have been assessed as having very high to extremely high Aboriginal cultural significance and moderate to high or high archaeological significance (see **Appendix H**). The EA indicates that clusters of grinding grove sites such as this are rare.

In its assessment, Umwelt noted that further modifying the mine plan to avoid this cluster would have a major impact on the viability of the proposed continued underground mining operations at West Wallsend. However, it also states that, unless it can be demonstrated that there are similar sites with similar values within the Sugarloaf Range area that can be conserved for the benefit of future generations, it would not be possible for the project to achieve the ESD Principle of Intergenerational Equity if damage/destruction of these sites occurs.

Consequently, OCAL has proposed a conservation offset strategy to provide funding for further survey within the Sugarloaf SCA to confirm whether sites of a similar nature and similar significance exist and whether they can be managed for their long-term conservation, as an offset for any damage that may occur to these sites as the result of subsidence. It is proposed that the survey would include at least 20 days of fieldwork in consultation with Aboriginal stakeholders and would involve the compilation of site cards by a suitably qualified person. A statement in relation to the suitability of the sites located outside mining leases and within the Sugarloaf SCA as an offset is proposed to be prepared for consideration by OEH and the Department. If achievement of Intergenerational Equity can be demonstrated, and if the Bangalow Creek Grinding Groove sites are to be undermined, then mitigation would be undertaken in compliance with the Heritage Management Plan to be prepared as part of the Extraction Plan.

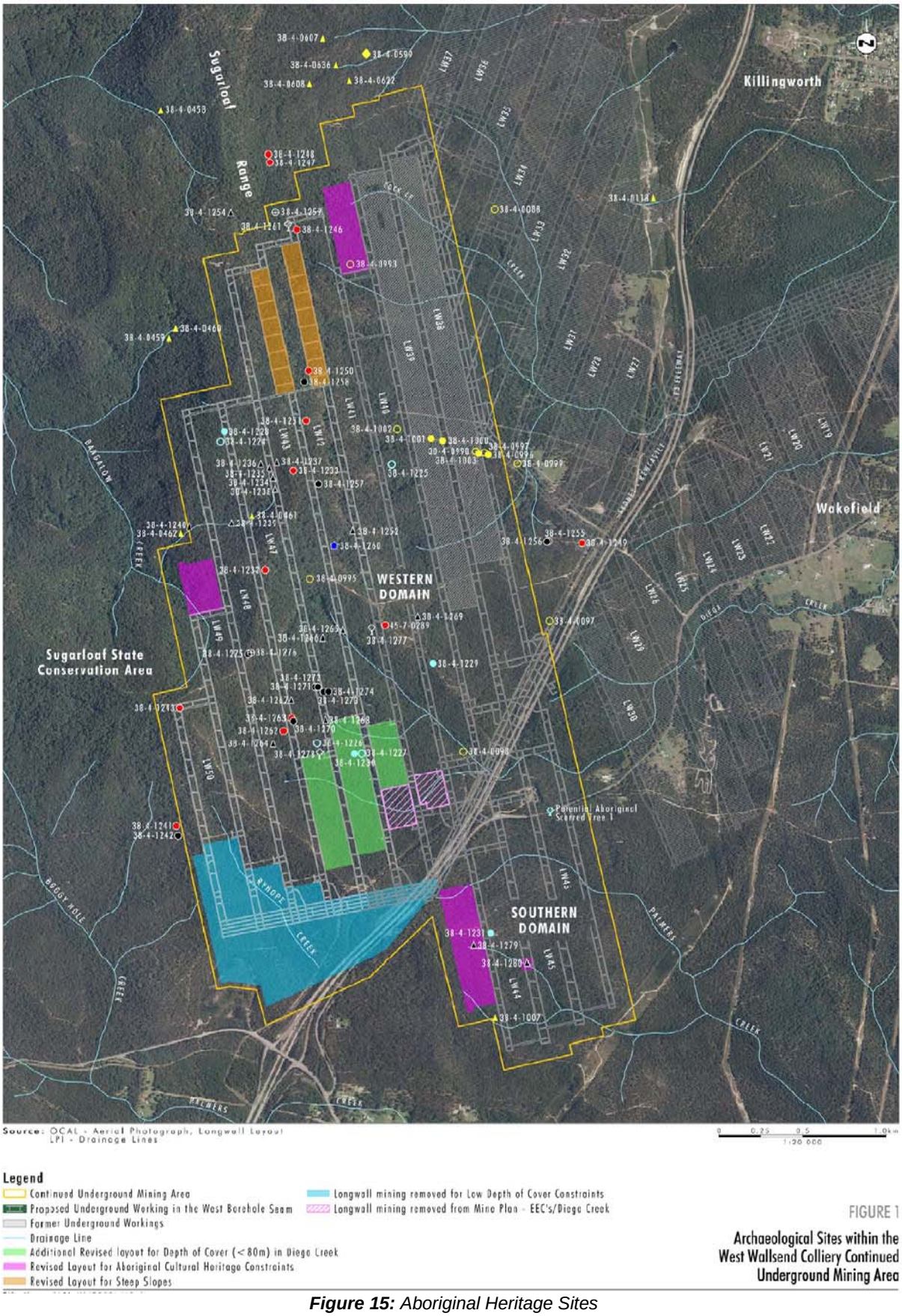

Figure 15: *Aboriginal Heritage Sites*

If Intergenerational Equity cannot be demonstrated as a result of the survey, OCAL has committed to modifying the management strategy in relation to these sites in consultation with the relevant registered Aboriginal stakeholders and agencies. Umwelt proposes that the management strategy revision would include further survey or other forms of appropriate offset.

The Department has recommended a subsidence impact performance measure that requires OCAL to ensure that the project has negligible impact on these sites unless OCAL can demonstrate, to the satisfaction of the Director-General, that similar sites can be conserved within the Sugarloaf SCA and outside of a mining lease area. If this is not the case, OCAL would be required to modify the mine plan to avoid the sites. OEH is satisfied with this approach.

Minimisation

Another cluster of grinding groove sites is located in the Diega Creek catchment (ie Diega Creek Grinding Grooves 1 to 6 #38-4-1264 to 38-4-1269). Diega Creek Grinding Grooves 1 has been assessed as having extremely high Aboriginal cultural significance and moderate archaeological significance. The remaining groove sites have been assessed as having very high to extremely high Aboriginal cultural significance and low to moderate archaeological significance (see **Appendix H**).

There has been ongoing investigation and consultation with the Aboriginal stakeholders about the most appropriate management option for the most significant of these grooves (ie Diega Creek Grinding Grooves 1). Following discussions with the Department, OCAL has proposed that:

> *"If monitoring finds that at least three of the Diega Creek Grinding Groove sites 2 through 6 do not suffer from impacts that cause cracking of the sandstone within the area of the sandstone platform containing the grooves and within 1 metre of any groove, WWC will proceed with subsidence of Diega Creek Grinding Grooves 1. If this is not possible because 3 or more of the Diega Creek Grinding Grooves 2 to 6 sites have cracked within the specified site area, WWC will commit to protecting Diega Creek Grinding Grooves 1 from damage related to subsidence."*

The Department accepts this approach. Consequently, the Department has recommended a subsidence impact performance measure that requires OCAL to ensure that the project has negligible impact on the Diega Creek Grinding Grooves 1 site unless OCAL can demonstrate that at least 3 of Diega Creek Grinding Grooves 2 – 6 sites have not been cracked by subsidence.

Management

OCAL has committed to implement a range of mitigation measures for the remaining 36 Aboriginal heritage sites and 8 cultural features located across the project area. These measures have been determined in consultation with the Aboriginal stakeholders. An updated list of measures, which reflects modifications to the mine plan made after the preparation of the EA, is included in **Appendix I**.

The majority of the measures involve monitoring of the sites by the registered Aboriginal stakeholders and a qualified archaeologist, following subsidence, to record and report any subsidence impacts to OEH and the Department. This information would be used to inform future assessments. In addition, OCAL has committed to:

- repair cracking of sandstone/grooves in a culturally appropriate manner, if required and if assessed as necessary by the relevant registered Aboriginal stakeholders; and
- employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creeklines with grinding grooves and similar sites; and
- for artefact and isolated find sites, replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works.

OCAL has also committed to implementing additional measures, such as detailed archaeological surveys for artefact and PAD sites and installing props in rockshelter sites. It is worth noting that OCAL has also committed to enlarging a chain pillar beneath the Palmers Creek Grinding Grooves 3 #38-4-1280 site (which was assessed as being of extremely high Aboriginal cultural and high archaeological significance) in order to minimise potential impacts.

The Department and OEH are satisfied with these mitigation and management measures and the Department has recommended a condition to ensure they are implemented to the satisfaction of the Director-General.

Additional Commitments

The EA indicates that OCAL has also committed to implement a range of other compensatory measures that have been requested and negotiated with the Aboriginal stakeholder groups and OEH. These include:

- provision of $200,000 to OEH over the life of the project to assist in the management of Aboriginal and archaeological sites/values within the Sugarloaf SCA;

- a program of monitoring and reporting of subsidence impacts on Aboriginal sites and landscape features within the underground mining area;
- the provision of funding up to a total of $250,000 for further Aboriginal cultural heritage values investigations. OCAL has suggested two ways in which these investigations may proceed, including funding of a tertiary level research project or research, preparation and publication of a series of booklets;
- providing each of the registered Aboriginal stakeholders with offset packages to the value of $25,000 for funding towards specific cultural heritage projects; and
- preparation of a Heritage Management Plan for the project.

The Department and OEH support these commitments.

Conclusion

The Department and OEH are satisfied that OCAL has comprehensively assessed the Aboriginal cultural heritage impacts of the project, and has consulted extensively and fully with the local Aboriginal community. The Department and OEH are also satisfied with the extent and nature of avoidance, mitigation, management and offset measures proposed by OCAL. The Department considers that these measures ensure that the level of impact to Aboriginal heritage sites, including those within the Sugarloaf SCA, is acceptable.

5.11 Other Impacts

The project is likely to generate a range of other benefits (including socio-economic) and environmental impacts (including air quality, greenhouse gas, visual, non-indigenous heritage impacts, traffic and waste). However, these impacts are not predicted to be significant, and the Department is satisfied that they can be controlled, mitigated and/or managed through appropriate conditions of approval. These impacts and benefits are addressed in **Table 7** below.

Table 7: *Other Impacts*

Issue/Impact	Impacts / Consideration	Conclusion / Recommendation
Socio-Economic	An economic analysis for the project was undertaken by Gillespie Economics. The analysis indicated that the project would deliver benefits to the local, regional and State economy, including: - $448 million in direct and $644 million in indirect business turnover; - $124 million in direct and $318 million in indirect annual value added; - $83 million in direct and $143 million in indirect household income; and - direct employment of 390 and indirect employment of 1634 people over the life of the project. The Department is satisfied that the continuation of the mining operations would not result in any additional strain on the community or infrastructure in the local area or region over and above the existing impacts.	The Department is satisfied that the project would result in socio-economic benefits to the local and regional community, and to the local, regional and State economies.
Air Quality	An Air Quality Assessment for the project was undertaken by Environ Australia Pty Ltd in accordance with OEH's *Approved Methods for the Assessment of Air Pollution Sources Using Dispersion Models*. The assessment indicated that dust emissions from the project are small, due to coal being sourced from underground operations and the limited surface activities. Predictive modelling identified that both the predicted worst case incremental and cumulative dust emissions are significantly less than OEH criteria for annual average dust deposition, annual average total suspended particulates (TSP), 24-hour PM_{10} and annual average PM_{10} at all receiver locations, including Killingworth, Barnsley and Wakefield. OCAL has committed to continue to implement standard dust control measures and monitoring dust levels at the site and surrounding areas.	The Department and OEH are satisfied that the air quality modelling results are robust. The Department and OEH acknowledge that dust emissions from the project would not cause significant air quality impacts for surrounding receivers. The Department has recommended that OCAL be required to comply with contemporary air quality criteria and prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project.

Greenhouse Gases	A Greenhouse Gas (GHG) Assessment was undertaken for the project by Umwelt. The assessment predicts that a total of 79.34 million tonnes of carbon dioxide equivalent ($MtCO_2$-e) would be generated over the life of the project. The assessment indicates that this level of emissions would make minor contributions to both the national (ie 1.48%) and the global (ie 0.03%) GHG inventories. The vast majority of the project-related emissions (ie 94%) are attributed to Scope 3 emissions associated with the indirect and downstream transport and use of coal mined at the site. The assessment concludes that, on a comparative basis, the total GHG emissions from the project represent a very small proportion of the current and global GHG emissions, and when considered in isolation, the project would have a negligible contribution to global warming/climate change.	The Department accepts that the GHG emissions predicted to be generated by the project are minor, on a national and international scale. However, the Department has recommended conditions requiring OCAL to implement measures to minimise the release of GHG and to prepare and implement an Air Quality & Greenhouse Gas Management Plan.
Visual	The project involves underground mining, which requires limited surface infrastructure. The only additional surface infrastructure associated with the project is the proposed Mining Services Facility, which would comprise a 20x30 m compound and an access road and intersection off Wakefield Road. The EA indicates that the local topography and dense vegetation restricts the visibility of the mine from public viewing points. Major viewing points are restricted to areas immediately surrounding the proposed Mining Services Facility and from commuters on the F3 Freeway and Wakefield Road. The visual assessment concludes that the Mining Services Facility would not significantly impact on the visual amenity of the surrounding area due to existing vegetation and topography, the short duration of construction and the general consistency of the facility with the surrounding visual environment. The Department is satisfied with this conclusion.	The Department is satisfied that visual impacts associated with the project's surface infrastructure, both existing and proposed, are not significant.
Non-Aboriginal Heritage	A Historic Heritage Assessment was undertaken for the project by Umwelt. The assessment was undertaken in accordance with the appropriate guidelines. The assessment identified 4 trees within the underground mining area with potential historical wounds, scars or surveyor's marks. These trees were assessed as having nil to low local significance with nil to low research potential, with the exception of one tree (Tree 6) considered to be of local significance. The subsidence assessment indicates that there is unlikely to be any surface cracking that would adversely affect these trees and, as a result, there are unlikely to be any significant impacts on them as a result of the project. OCAL has committed to a range of specific mitigation and management measures, including mapping and undertaking pre and post mining inspections of the sites. At the request of the Department, Umwelt undertook an additional assessment of the potential impacts of the project on Mt Sugarloaf and the Sugarloaf Range, which is on the Heritage Branch's State Heritage Inventory as being of low state significance, high regional significance and very high local significance (see **Appendix J**). The assessment concluded that the project would not impact on the heritage significance of	The Department is satisfied with the assessment undertaken in relation to historic heritage. The Department has recommended subsidence impact performance measures in relation to heritage items, including a requirement for no greater impact or environmental consequences than predicted in the EA. In addition, the Department proposes that a Heritage Management Plan is developed as part of the Extraction Plan in consultation with the Heritage Branch and local historical organisations, to monitor and manage historic heritage sites across the mine.

	Mt Sugarloaf or the Sugarloaf Range and that it would remain a "dominant geographical and visual feature in the district". The Department is satisfied with this conclusion and that the proposed subsidence impact performance measures would adverse impacts to Mt Sugarloaf and the Sugarloaf Range would be minimised.	
Traffic	A Traffic Assessment for the project was completed by Stapleton Transportation & Planning Pty Ltd. The assessment indicates that the project would not generate additional long term access, traffic or parking demand at West Wallsend, as there is no proposal to increase existing operational staff or services demand. The only increases in traffic are those associated with the construction and operation of the access road for the Mining Services Facility and its new intersection with Wakefield Road. It is estimated that this facility would generate up to 10 vehicle trips per day, consisting of 4 heavy vehicle trips and 6 staff vehicles. The traffic modelling indicates that this would have no impact on the operation of local roads or intersections. As requested by Council, OCAL has committed to ensuring that the design of this new intersection with Wakefield Road is approved by Council prior to construction. OCAL has also committed to preparing a Construction Traffic Management Plan for the Mining Services Facility.	The Department is satisfied that the project would not have a significant impact on the safety or capacity of the surrounding road network. The Department has recommended conditions requiring OCAL to obtain Council approval prior to the construction of the new intersection of the access road and Wakefield Road and to prepare and implement a Traffic Management Plan for the mine.
Waste	Inadequate management of construction and operational wastes may lead to contamination of surface water and groundwater, soils, bushfires, injury to wildlife, and aesthetic and local amenity impacts.	OCAL has committed to continuing to implement a hierarchical waste management system, with most waste either re-used or transported off-site by licensed waste management contractors. The Department has recommended conditions requiring OCAL to minimise, monitor and manage the waste generated by the project.

6. RECOMMENDED CONDITIONS

The Department has drafted recommended conditions of approval for the project. These conditions are required to:

- prevent, minimise, and/or offset adverse impacts of the project;
- set standards and performance measures for acceptable environmental performance;
- ensure regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

OCAL has reviewed and accepted the recommended conditions.

7. CONCLUSION

The Department has carried out a detailed assessment of the merits of the project, in accordance with the requirements of the EP&A Act. This assessment has found that the project would not result in significant air, biodiversity or visual amenity impacts. However, the project has the potential to generate adverse noise impacts and would result in subsidence, which has the potential to result in adverse impacts on cliff lines and similar rock face features, significant Aboriginal heritage sites, the Sugarloaf SCA and water resources.

The Department has recommended a range of conditions to ensure that these impacts are suitably mitigated, managed and/or offset. These conditions include requirements for OCAL to:

- comply with a range of subsidence impact performance measures;
- implement additional measures to minimise the water and noise impacts of the project;
- provide a compensatory water supply to any landowners whose water supply is adversely affected by the project;
- complete noise compliance investigations;
- to undertake stream remediation works within Sugarloaf SCA over the life of the project;
- implement a multi-faceted management strategy for the project in relation to the Aboriginal heritage sites of very high to extremely high cultural significance;
- rehabilitate the site to meet a range of rehabilitation objectives;
- monitor and regularly report on its environmental performance; and
- commission an independent audit of its operations every three years, to ensure that it is complying with its conditions of approval and implementing best practice on site.

Finally, the Department's assessment has found that the project would represent a logical continuation of the existing mine, would make efficient use of existing facilities and equipment, and would provide significant economic and social benefits to both the Newcastle region and NSW, including:

- direct employment for up to 390 employees;
- a capital investment of $1.5 million; and
- average annual economic contribution of $448 million to the regional economy during mining operations;
- average annual economic contribution of $644 million to the NSW economy during mining operations; and
- royalties and payroll taxes for the State Government.

On balance, the Department believes that the project's benefits sufficiently outweigh its residual costs, and that it is in the public interest and should therefore be approved subject to strict conditions.

8. RECOMMENDATION

It is RECOMMENDED that the Deputy Director General, delegate of the Minister for Planning and Infrastructure:

- consider this report and its accompanying appendices;
- consider the report's conclusions and recommendations:
- approve the project application, subject to conditions, under Section 75J of the *Environmental Planning and Assessment Act 1979*; and
- sign the attached project approval (see **Appendix K**).

Howard Reed
A/Director Mining and Industry Projects

Chris Wilson
Executive Director, Major Projects Assessment

Richard Pearson
Deputy Director-General,
Development Assessment and Systems Performance

APPENDIX A – ENVIRONMENTAL ASSESSMENT

See separate files contained in folder entitled *Environmental Assessment*.

APPENDIX B – LAND OWNER'S CONSENT

The Hon. Robyn Parker MP
Minister for the Environment
Minister for Heritage

DOC11/42632

Mr Greg Pawley
Director
Oceanic Coal and
General Manager Eastern Operations
Xstrata Coal NSW
PO Box 4186
EDGEWORTH NSW 2285

19 DEC 2011

Dear Mr Pawley

Thank you for your letter requesting landowner's consent with respect to your application for project approval under Part 3A of the *Environmental Planning and Assessment Act 1979*.

I am advised that this application relates to mining associated with the West Wallsend Colliery, part of which is within lands reserved under the *National Parks and Wildlife Act 1974* as part of Sugarloaf State Conservation Area.

I am aware that the proposal has been the subject of on-going discussions between the Office of Environment and Heritage, Department of Planning and Infrastructure and representatives of Oceanic Coal, particularly with respect to the potential environmental impacts associated with underground mining in the Diega Creek Catchment within Sugarloaf State Conservation Area.

As a consequence of these discussions, the Office of Environment and Heritage has informed me that the proposal has been modified to reduce the potential for impacts on the environment, particularly with respect to the Diega Creek Catchment. I am advised that the changes to the project are detailed in a letter from Mr Charlie Spence, Operations Manager, Oceanic Coal to Mr Tom Bagnat, Regional Manager – Central Coast Hunter Range, of the Office of Environment and Heritage dated 20 October 2011.

Having considered your request, and noting the changes made to the project, I now grant landowner's consent in accordance with clause 8F of the *Environmental Planning and Assessment Regulation 2000* to Oceanic Coal with respect to the mining operations within Sugarloaf State Conservation Area, as detailed in Mr Spence's letter of 20 October 2011.

Should you have any questions in regards to this matter, Mr Bagnat can be contacted on 4320 4200.

Yours sincerely

19/12/11

Robyn Parker MP
Minister for the Environment

Level 32, Governor Macquarie Tower, 1 Farrer Place, Sydney NSW 2000
Phone: (61 2) 9228 5253 Fax: (61 2) 9228 5763 Email: office@parker.minister.nsw.gov.au

APPENDIX C – CONSIDERATION OF EPIS

State Environmental Planning Policy (Major Development) 2005
See discussion in Section 3.1.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)
Part 3 of the Mining SEPP lists a number of matters that a consent authority must consider before determining an application for consent for development for the purposes of mining, including:

- compatibility with other land uses;
- natural resource management and environmental management;
- resource recovery;
- greenhouse gas emissions
- transport; and
- rehabilitation.

This part of the SEPP does not apply in respect of the determination of project approvals under Part 3A. Nonetheless, the Department has considered all of these matters in its assessment report where appropriate. Based on this assessment, the Department is satisfied that the project can be managed in a manner that is generally consistent with the aims, objectives and provisions of the Mining SEPP.

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)
In accordance with clause 104 of the Infrastructure SEPP (and equivalent provisions of the now repealed SEPP 11 Traffic Generating Developments), the application was referred to the Roads and Traffic Authority (now part of Roads and Maritime Services, or RMS). RMS made a submission but did not object to the project.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)
The Department is satisfied that the project is not potentially hazardous or offensive, and that the proposal is generally consistent with the aims, objectives and provisions of SEPP 33.

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44)
SEPP 44 does not apply to land dedicated or reserved under the *National Parks & Wildlife Act 1974*, which includes the Sugarloaf SCA.

However, approximately 93 ha of the proposed underground mining area are located on private property. An assessment of potential koala habitat undertaken on this land determined that potential koala core habitat is limited to approximately 3 ha of *Swamp Mahogany Paperbark Forest* which contains swamp mahogany (*Eucalyptus robusta*) as a dominant species.

The EA indicates that the project would not result in direct clearing of this forest, and that indirect surface impacts are not expected to result in the disturbance of this vegetation community. To ensure this is the case, the Department has recommended a performance measure requiring negligible environmental consequences on core koala habitat.

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)
SEPP 55 is concerned with the remediation of contaminated land. It sets out matters relating to contaminated land that a consent authority must consider in determining an application for development consent. The Department has considered these matters and is satisfied that the land can continue to be used for mining purposes.

Lake Macquarie Local Environmental Plan 2004
The proposed mining area is zoned as 5 Infrastructure, 7(2) Conservation (Secondary), 7(3)m Environmental (General) and 9 Natural Resources. The majority of the underground mining area is zoned 9 Natural Resources. The LEP specifies that mining is permissible with development consent within this zone. Clause 19 of the Lake Macquarie LEP provides that nothing in the plan prevents a person, with development consent, from carrying out development for the purpose of a mine. Therefore, the project is permissible under the LEP.

Cessnock Local Environmental Plan 1989

The portion of the continued underground mining area within the Cessnock LEP is zoned 1(f) Rural (Forestry). Mining is permissible in this zone with development consent.

APPENDIX D - SUBMISSIONS

See separate folder entitled Submissions.

APPENDIX E – OCAL'S RESPONSE TO SUBMISSIONS

See separate folder entitled *Response to Submissions*.

APPENDIX F – ADDITIONAL SUBSIDENCE ASSESSMENTS

See separate file under the folder *Environmental Assessment,* entitled *West Wallsend Colliery Continued Operations Project – Proposed Mine Plan Modifications*.

APPENDIX G – NOISE RECEIVER LOCATIONS

Residential Receivers

Receiver Area	Address	Suburb
R2	7 Brooks Street	Killingworth
	9 Brooks Street	Killingworth
	11 Brooks Street	Killingworth
	13 Brooks Street	Killingworth
	15 Brooks Street	Killingworth
	17 Brooks Street	Killingworth
	2 The Broadway	Killingworth
	3 The Broadway	Killingworth
	4 The Broadway	Killingworth
	5 The Broadway	Killingworth
	6 The Broadway	Killingworth
	7 The Broadway	Killingworth
	8 The Broadway	Killingworth
	9 The Broadway	Killingworth
	10 The Broadway	Killingworth
	11 The Broadway	Killingworth
	12 The Broadway	Killingworth
	13 The Broadway	Killingworth
	14 The Broadway	Killingworth
	15 The Broadway	Killingworth
	16 The Broadway	Killingworth
	17 The Broadway	Killingworth
	18 The Broadway	Killingworth
	18A The Broadway	Killingworth
	20 The Broadway	Killingworth
	22 The Broadway	Killingworth
	1 Geordie Street	Killingworth
	3 Geordie Street	Killingworth
	4 Geordie Street	Killingworth
	5 Geordie Street	Killingworth
	6 Geordie Street	Killingworth
	7 Geordie Street	Killingworth
	8 Geordie Street	Killingworth
	9 Geordie Street	Killingworth
	10 Geordie Street	Killingworth
	11 Geordie Street	Killingworth
	12 Geordie Street	Killingworth
	13 Geordie Street	Killingworth
	14 Geordie Street	Killingworth
	15 Geordie Street	Killingworth
	16 Geordie Street	Killingworth
	17 Geordie Street	Killingworth
	18 Geordie Street	Killingworth
	20 Geordie Street	Killingworth
	1 Killingworth Road	Killingworth
	3 Killingworth Road	Killingworth
	5 Killingworth Road	Killingworth
	9 Killingworth Road	Killingworth

Receiver Area	Address	Suburb
	11 Killingworth Road	Killingworth
	13 Killingworth Road	Killingworth
	1 Throckmorton Street	Killingworth
	3 Throckmorton Street	Killingworth
	4 Throckmorton Street	Killingworth
	5 Throckmorton Street	Killingworth
	6 Throckmorton Street	Killingworth
	7 Throckmorton Street	Killingworth
	8 Throckmorton Street	Killingworth
	9 Throckmorton Street	Killingworth
	10 Throckmorton Street	Killingworth
	11 Throckmorton Street	Killingworth
	12 Throckmorton Street	Killingworth
	13 Throckmorton Street	Killingworth
	14 Throckmorton Street	Killingworth
	15 Throckmorton Street	Killingworth
	16 Throckmorton Street	Killingworth
	18 Throckmorton Street	Killingworth
	4 The Trongate	Killingworth
	6 The Trongate	Killingworth
	8 The Trongate	Killingworth
	10 The Trongate	Killingworth
	12 The Trongate	Killingworth
	14 The Trongate	Killingworth
	2 Brooks Street	Killingworth
	3 Brooks Street	Killingworth
	4 Brooks Street	Killingworth
	5 Brooks Street	Killingworth
	6 Brooks Street	Killingworth
	8 Brooks Street	Killingworth
	10 Brooks Street	Killingworth
	12 Brooks Street	Killingworth
	14 Brooks Street	Killingworth
	16 Brooks Street	Killingworth
	1 The Broadway	Killingworth
	19 The Broadway	Killingworth
	21 The Broadway	Killingworth
	23 The Broadway	Killingworth
	24 The Broadway	Killingworth
	25 The Broadway	Killingworth
	26 The Broadway	Killingworth
	27 The Broadway	Killingworth
	28 The Broadway	Killingworth
	29 The Broadway	Killingworth
	31 The Broadway	Killingworth
	33 The Broadway	Killingworth
	2 Geordie Street	Killingworth
	23 Geordie Street	Killingworth
	24 Geordie Street	Killingworth
	25 Geordie Street	Killingworth
	26 Geordie Street	Killingworth
	27 Geordie Street	Killingworth
	21 Killingworth Road	Killingworth

Receiver Area	Address	Suburb
	23 Killingworth Road	Killingworth
	3 Park Street	Killingworth
	8 Park Street	Killingworth
	10 Park Street	Killingworth
	12 Park Street	Killingworth
	14 Park Street	Killingworth
	16 Park Street	Killingworth
	18 Park Street	Killingworth
	20 Park Street	Killingworth
	21 Throckmorton Street	Killingworth
	23 Throckmorton Street	Killingworth
	24 Throckmorton Street	Killingworth
	25 Throckmorton Street	Killingworth
	26 Throckmorton Street	Killingworth
	27 Throckmorton Street	Killingworth
	28 Throckmorton Street	Killingworth
	29 Throckmorton Street	Killingworth
	20 The Trongate	Killingworth
	22 The Trongate	Killingworth
	24 The Trongate	Killingworth
	26 The Trongate	Killingworth
R3	31 Charlton Street	Barnsley
	33 Charlton Street	Barnsley
	35 Charlton Street	Barnsley
	37-39 Charlton Street	Barnsley
	40 Charlton Street	Barnsley
	41 Charlton Street	Barnsley
	42 Charlton Street	Barnsley
	44 Charlton Street	Barnsley
	46 Charlton Street	Barnsley
	48A Charlton Street	Barnsley
	48 Charlton Street	Barnsley
	50 Charlton Street	Barnsley
	5 Bendigo Street	Barnsley
R4	2 Bendigo Street	Barnsley
	4 Bendigo Street	Barnsley
	6 Bendigo Street	Barnsley
	7 Bendigo Street	Barnsley
	8 Bendigo Street	Barnsley
	9 Bendigo Street	Barnsley
	10 Bendigo Street	Barnsley
	11 Bendigo Street	Barnsley
	12 Bendigo Street	Barnsley
	13 Bendigo Street	Barnsley
	14 Bendigo Street	Barnsley
	15 Bendigo Street	Barnsley
	16 Bendigo Street	Barnsley
	18 Bendigo Street	Barnsley
	32 Bendigo Street	Barnsley
	43 Charlton Street	Barnsley
	45 Charlton Street	Barnsley
	47 Charlton Street	Barnsley
	49 Charlton Street	Barnsley

Receiver Area	Address	Suburb
	52 Charlton Street	Barnsley
R5	14 Charlton Street	Barnsley
	15 Charlton Street	Barnsley
	16 Charlton Street	Barnsley
	16A Charlton Street	Barnsley
	18 Charlton Street	Barnsley
	19 Charlton Street	Barnsley
	20 Charlton Street	Barnsley
	22 Charlton Street	Barnsley
	23 Charlton Street	Barnsley
	22 Charlton Street	Barnsley
	24 Charlton Street	Barnsley
	25 Charlton Street	Barnsley
	26 Charlton Street	Barnsley
	28 Charlton Street	Barnsley
	30 Charlton Street	Barnsley
	32 Charlton Street	Barnsley
	34 Charlton Street	Barnsley
	36 Charlton Street	Barnsley
	38 Charlton Street	Barnsley
R6	All residences not included within either R3, R4, R5 or R7	Barnsley
R7	59 Charlton Street	Barnsley

APPENDIX H – ABORIGINAL HERITAGE TABLES

Table 1: Negligible Impact

AHIMS	Site Name	Site Type	Aboriginal Significance	Archaeological Significance
Aboriginal heritage items				
38-4-1240*	Bangalow Creek Grinding Grooves 7	Grinding Grooves	Extremely high	Moderate to high
38-4-0462*	Grinding Grooves and Associated Rockshelter	Grinding Grooves	Extremely High	High
38-4-1007	Palmers Creek Grinding Groove 1	Grinding Grooves	Extremely high	High
38-4-1279	Palmers Creek Grinding Groove 2	Grinding Grooves	Extremely high	High
38-4-0993	Western Domain 5	Artefact Scatter associated with wet soak	Very high to extremely high	Low to moderate
38-4-1278	Diega Creek ST4	Scarred Tree	Very high	Moderate
38-4-1227	AS4	Artefact Scatter	High	-
38-4-1230	IF3	Isolated Find	High	-
Aboriginal cultural features				
-	Stone Arch	Cultural feature/ landmark	Extremely high	-
-	Kangaroo Rock	Landscape feature/ marker	Extremely high	-
-	Rockshelters 1, 2 and 8	Rockshelters	Extremely high	
* Sites located outside the mining area and subsidence impact zone, but in an area where indirect impact from sedimentation may occur.				

Table 2: Potential Avoidance

AHIMS	Site Name	Site Type	Aboriginal Significance	Archaeological Significance
38-4-1234	Bangalow Creek Grinding Grooves 1	Grinding Grooves	Very high to extremely high	High
38-4-1235	Bangalow Creek Grinding Grooves 2	Grinding Grooves	Extremely high	Moderate to high
38-4-1236	Bangalow Creek Grinding Grooves 3	Grinding Grooves	Very high to extremely high	Moderate to high
38-4-1237	Bangalow Creek Grinding Grooves 4	Grinding Grooves	Extremely high	Moderate to high
38-4-1238	Bangalow Creek Grinding Grooves 5	Grinding Grooves	Extremely high	High
38-4-1239	Bangalow Creek Grinding Grooves 6	Grinding Grooves	Extremely high	Moderate to high

38-4-0461	Grinding Grooves	Grinding Grooves	Extremely high	Moderate

Table 3(a): Minimisation

AHIMS	Site Name	Site Type	Aboriginal Significance	Archaeological Significance
38-4-1264	Diega Creek Grinding Grooves 1	Grinding Grooves	Extremely high	Moderate

Table 3(b): Minimisation

AHIMS	Site Name	Site Type	Aboriginal Significance	Archaeological Significance
38-4-1265	Diega Creek Grinding Grooves 2	Grinding Grooves	Very high to extremely high	Low to moderate
38-4-1266	Diega Creek Grinding Grooves 3	Grinding Grooves	Very high to extremely high	Low to moderate
38-4-1267	Diega Creek Grinding Grooves 4	Grinding Grooves	Very high to extremely high	Low to moderate
38-4-1268	Diega Creek Grinding Grooves 5	Grinding Grooves	Very high to extremely high	Low to moderate
38-4-1269	Diega Creek Grinding Grooves 6	Grinding Grooves	Very high to extremely high	Low to moderate

Table 4: Management

AHIMS	Site Name	Site Type	Aboriginal Significance	Archaeological Significance
Aboriginal heritage items				
38-4-1252	Cockle Creek Grinding Grooves 1	Grinding Grooves	Very high to extremely high	Low to moderate
38-4-1232	Bangalow Creek AS1	Artefact Scatter	Moderate	Low
38-4-1233	Bangalow Creek AS2	Artefact Scatter	Moderate to high	Low
38-4-1243	Brunkerville Trail AS1	Artefact Scatter	High to very high	Low to moderate
38-4-1246	Cockle Creek AS1	Artefact Scatter	Moderate to high	Low
38-4-1250	Cockle Creek AS5	Artefact Scatter	Moderate to high	Low
38-4-1251	Cockle Creek AS6	Artefact Scatter	Moderate to high	Low
38-4-1257	Cockle Creek IF3	Isolated Find	Moderate to high	Low
38-4-1258	Cockle Creek IF4	Isolated Find	Moderate to high	Low
45-7-0289	Diega Creek AS1	Artefact Scatter	Moderate to high	Low
38-4-1262	Diega Creek AS2	Artefact Scatter	Moderate to high	Low
38-4-1263	Diega Creek AS3	Artefact Scatter	Moderate to high	Low
38-4-1270	Diega Creek IF1	Isolated Find	Moderate to high	Low
38-4-1271	Diega Creek IF2	Isolated Find	Moderate to high	Low
38-4-1272	Diega Creek IF3	Isolated Find	Moderate to high	Low
38-4-1273	Diega Creek IF4	Isolated Find	Moderate to high	Low
38-4-1274	Diega Creek IF5	Isolated Find	Moderate to high	Low
38-4-1275	Diega Creek IF6	Isolated Find	Moderate to high	Low
38-4-1280	Palmers Creek Grinding Groove	Grinding Grooves	Extremely high	High

	3			
38-4-0995	GNW1	Artefact Scatter	High to very high	Low to moderate
38-4-1000	Western Domain 6	Artefact Scatter	Moderate	Moderate
38-4-1001	Western Domain 7	Artefact Scatter	Moderate	Moderate
38-4-1002	Western Domain 8	Artefact Scatter	Moderate to high	Low
38-4-0098	AS	Artefact Scatter	Moderate	Low
38-4-1259	Cockle Creek SA1	Stone Arrangement	Extremely high	Moderate to high
38-4-1276	Diega Creek SA1	Stone Arrangement	Extremely high	Moderate to high
38-4-1260	Cockle Creek Rockshelter with Artefacts and PAD	Rockshelter with Artefacts and PAD	Very high to extremely high	High
38-4-1261	Cockle Creek ST2	Scarred Tree	Very high	Moderate
38-4-1277	Diega Creek ST1	Scarred Tree	Very high	Moderate
38-4-1224	AS1	Artefact Scatter	High	Low*
38-4-1225	AS2	Artefact Scatter	High	Low*
38-4-1226	AS3	Artefact Scatter	High	Low*
38-4-1228	IF1	Isolated Find	High	Low*
38-4-1229	IF2	Isolated Find	High	Low*
38-4-1231	IF4	Isolated Find	High	Low*
-	Potential Aboriginal Scarred Tree**	Potential Scarred Tree	High if it is a scarred tree	Moderate if it is a scarred tree
Aboriginal cultural features				
-	Wet Soak (#2)	Resource - wet soak or perch wetland in Diega Creek catchment	Extremely high	-
-	Pigment Site	Resource - pigment located in creek bed along Bangalow Creek	Extremely high	-
-	Stone cairns/ stacks	Landscape marker	Moderate to high	-
-	Rock Shelters 3, 4, 7, 10, 11	Rock shelters	Extremely high	-

* Not assessed by Virtus Heritage, however based on small number of artefacts and degree of disturbance is assessed by Umwelt as low

** It is noted that Virtus Heritage did not register this possible scarred tree on the AHIMS and suggested that it was inspected by an arboriculturalist to identify if the scar was natural, historic or Aboriginal cultural in origin.

APPENDIX I – ABORIGINAL HERITAGE MANAGEMENT STRATEGIES

Site Name AHIMS #	Aboriginal Significance	Archaeological Significance	Assessed Outcome of Potential Impact	Proposed Management Strategy
Bangalow Creek Grinding Grooves 1 (#38-4-1234)	Very high to extremely high	High	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	In order to demonstrate Intergenerational Equity West Wallsend will provide funding for further survey within the Sugarloaf SCA by the registered Aboriginal stakeholders and an archaeologist and involvement of the registered Aboriginal stakeholders in the provision of information related to sites/site management gathered during the survey to the NPWS/OEH for inclusion in the POM for the Sugarloaf SCA. The purpose of the survey is to confirm whether sites of similar nature and similar significance exist in the Sugarloaf SCA that can be managed for their long-term conservation as an offset for any damage that may occur to these sites as the result of subsidence. If Intergenerational Equity can be demonstrated and if the sites are to be undermined, mitigation will be undertaken in compliance with the ACHMP prepared for the proposed continued underground mining area and will include: • record and report to OEH impacts of subsidence on sites to inform future assessments; • if required and if assessed as necessary by the relevant Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010. If Intergenerational Equity cannot be demonstrated by the results of the survey, the management strategy in relation to these sites will be reviewed in consultation with the relevant registered Aboriginal stakeholders, DP&I and OEH. The management strategy revisions may include further survey or other forms of appropriate offset.

Bangalow Creek Grinding Grooves 2 (#38-4-1235)	Extremely high	Moderate to high	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Bangalow Creek Grinding Grooves 1
Bangalow Creek Grinding Grooves 3 (#38-4-1236)	Very high to extremely high	Moderate to high	Potential for cracking of the sandstone and the grooves it contains is assessed as very low. Loss of waterflow through site due to diversion through cracks upstream (but unlikely within the site) is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Bangalow Creek Grinding Grooves 1

Bangalow Creek Grinding Grooves 4 (#38-4-1237)	Extremely high	Moderate to high	Potential for cracking of the sandstone and the grooves it contains is assessed as very low. Loss of waterflow through site due to diversion through cracks upstream (but unlikely within the site) is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Bangalow Creek Grinding Grooves 1
Bangalow Creek Grinding Grooves 5 (#38-4-1238)	Extremely high	High	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Bangalow Creek Grinding Grooves 1

Bangalow Creek Grinding Grooves 6 (#38-4-1239)	Extremely high	Moderate to high	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. Loss of waterflow through site due to diversion through cracks upstream (but not in the site) is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.	As above for Bangalow Creek Grinding Grooves 1
Bangalow Creek Grinding Grooves 7 (#38-4-1240)	Extremely high	Moderate to high	Potential for indirect impact to the grooves is assessed as very low. Loss of waterflow through site due to diversion through cracks upstream is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.	This site is located outside the proposed continued underground mining impact area. If mining of the Bangalow Creek Grinding Groove sites upstream is approved following further survey in the Sugarloaf SCA the following mitigation will be employed in compliance with the protocols and procedures of the ACHMP: • monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments and • (if required) employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline that may impact/bury these sites. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.

#38-4-0461	Extremely high	Moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Potential loss of waterflow through site due to diversion through cracks upstream/within the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.	In order to demonstrate Intergenerational Equity West Wallsend will provide funding for further survey within the Sugarloaf SCA by the registered Aboriginal stakeholders and an archaeologist and involvement of the registered Aboriginal stakeholders in the provision of information related to sites/site management gathered during the survey to the NPWS/OEH for inclusion in the POM for the Sugarloaf SCA. The purpose of the survey is to confirm whether sites of similar nature and similar significance exist in the Sugarloaf SCA that can be managed for their long-term conservation as an offset for any damage that may occur to these sites as the result of subsidence. If Intergenerational Equity can be demonstrated and if the sites are to be undermined, mitigation will be undertaken in compliance with the ACHMP prepared for the proposed continued underground mining area and will include: • record and report to OEH impacts of subsidence on sites to inform future assessments; • if required and if assessed as necessary by the relevant Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010. If Intergenerational Equity cannot be demonstrated by the results of the survey, the management strategy in relation to these sites will be reviewed in consultation with the relevant registered Aboriginal stakeholders, DoP and OEH. The management strategy revisions may include further survey or other forms of appropriate offset.

#38-4-0462 Grinding Grooves and Associated Rockshelter	*Extremely high*	*High*	*Potential for indirect impact to the grooves is assessed as very low.* *Loss of waterflow through site due to diversion through cracks upstream is possible.* *Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible.* *Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.*	*This site located outside the proposed continued underground mining area. If mining of the Bangalow Creek Grinding Groove sites upstream is approved following further survey in the Sugarloaf SCA the following mitigation will be employed in compliance with the protocols and procedures of the ACHMP:* • *monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments and* • *(if required) employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline that may impact/bury these sites.* *and* *West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.*
Cockle Creek Grinding Grooves 1 (#38-4-1252)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/within the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.	In recognition of modifications to the mine plan to avoid impact to the Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the widening of the chain pillar under Palmers Creek Grinding Grooves 3 – underground mining may be undertaken in the vicinity of this grinding groove site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following subsidence to record and report to OEH any impacts of subsidence on the sites. This information will be used to inform future assessments. and • if required and if assessed as necessary by the relevant registered Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 in Umwelt 2010.

Cockle Creek Grinding Grooves 2 *(#38-4-1254)*	*Very high to extremely high*	*Low to moderate*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Diega Creek Grinding Grooves 1 (#38-4-1264)	Extremely high	Moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	In compliance with the protocols and procedures of the ACHMP (see Section 9.4 and Appendix H of Umwelt 2010) to be prepared for the proposed continued underground mining area; prior to subsidence: • Diega Creek Grinding Grooves 2 to 6 sites will be monitored to assess the impacts of subsidence; • if more than 50% of the Diega Creek Grinding Grooves 2 to 6 sites have cracked (ie 3 or more), West Wallsend will revise their management strategy for the Diega Creek Grinding Grooves 1 site. Revisions may include conservation of the site or further survey to locate suitable sites to act as an offset in terms of Intergenerational Equity. If Intergenerational Equity can be demonstrated and if the site is to be undermined, mitigation will be undertaken in compliance with the ACHMP prepared for the proposed continued underground mining area and will include: • record and report to OEH impacts of subsidence on site to inform future assessments; • if required and if assessed as necessary by the relevant Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • where practical, implementation of appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.

Diega Creek Grinding Grooves 2 (#38-4-1265)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	In recognition of modifications to the mine plan to avoid impact to the Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the widening of the chain pillar under Palmers Creek Grinding Grooves 3 – underground mining may be undertaken in the vicinity of this grinding groove site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following subsidence to record and report to OEH any impacts of subsidence on the sites. This information will be used to inform future assessments. and • if required and if assessed as necessary by the relevant registered Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and • West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 in Umwelt 2010.
Diega Creek Grinding Grooves 3 (#38-4-1266)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Diega Creek Grinding Grooves 2

Diega Creek Grinding Grooves 4 (#38-4-1267)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Diega Creek Grinding Grooves 2
Diega Creek Grinding Grooves 5 (#38-4-1268)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	As above for Diega Creek Grinding Grooves 2
Diega Creek Grinding Grooves 6 (#38-4-1269)	Very high to extremely high	Low to moderate	Potential for cracking of the sandstone and the grooves it contains is assessed as high. Loss of waterflow through site due to diversion through cracks upstream/in the site is possible.	As above for Diega Creek Grinding Grooves 2

			Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. Potential burial of the site from increased sediment load in creekline.	
Palmers Creek 1 (#38-4-1007)	Extremely high	High	No impact - outside of longwall layout. Area to the north also removed from mine plan.	No mitigation required as mine plan revised as an offset to avoid impacting Aboriginal cultural and archaeological values. The sites will be protected throughout the life of the mine through protocols and procedures to be implemented under an ACHMP to be prepared in consultation with the relevant registered Aboriginal stakeholders and the NPWS/OEH. The modification to the mine plan is proposed to offset potential damage to seven grinding groove sites in the proposed continued underground mining impact area including Cockle Creek Grinding Grooves 1 and Diega Creek Grinding Grooves 2 to 6 sites and the Palmers Creek Grinding Grooves 3 site.
Palmers Creek Grinding Groove 2 (#38-4-1279)	Extremely high	High	No impact - outside of longwall layout. Area to the north also removed from mine plan.	As above for Palmers Creek 1
Palmers Creek Grinding Groove 3 (#38-4-1280)	Extremely high	High	Impact from cracking assessed as low as mine plan revised to enlarge chain pillar from 30 metres to 45 metres. Loss of waterflow through site due to diversion through cracks upstream is still possible. Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is unlikely as the tracks upstream will not be subsided and will not require remediation.	Mine plan has been revised to set aside two other sets of grinding grooves in the Palmers Creek catchment (Palmers Creek Grinding Grooves 1 and 2) as an offset for potential damage to this site. The chain pillar beneath this site has also been widened to lessen the probability of cracking. Mitigation to include monitoring by the relevant registered Aboriginal stakeholders and a qualified archaeologist following the cessation of all subsidence impacts to record and report to OEH any impacts of subsidence on the site. This information will be used to inform future assessments. and • if required and if assessed as necessary by the relevant registered

			Potential burial of the site from increased sediment load in creekline is unlikely.	Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Bangalow Creek AS1 (#38-4-1232)	Moderate	Low	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. and Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Bangalow Creek AS2 (#38-4-1233)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. and Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	As above for Bangalow Creek AS1
Boggy Hole Creek	*Moderate*	Low	*No impact*	*No management applicable – Outside Continued Underground Mining*

AS1 *(#38-4-1241)*				*Impact Area*
Boggy Hole Creek IF1 *(#38-4-1242)*	*Moderate*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Brunkerville Trail AS1 (#38-4-1243)	High to very high	Low to moderate	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. and Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. AND West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010. *ADTOAC to provide West Wallsend and OEH with information in relation to culturally significant feature near the Brunkerville Trail site. This feature will be managed through the ACHMP and specifically through the monitoring program in a culturally appropriate manner.
Cockle Creek AS1 (#38-4-1246)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site.

			further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Cockle Creek AS2 (#38-4-1247)	*Moderate to high*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Cockle Creek AS3 (#38-4-1248)	*Moderate to high*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Cockle Creek AS4 (#38-4-1249)	*Moderate*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Cockle Creek AS5 (#38-4-1250)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence

			motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Cockle Creek AS6 (#38-4-1251)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	As above for Cockle Creek AS6
Cockle Creek IF1 (#38-4-1255)	*Moderate*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Cockle Creek IF2 *(#38-4-1256)*	*Moderate*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*
Cockle Creek IF3	Moderate to high	Low	Impact from cracking of soil profile following	In recognition of modifications to the mine plan to avoid impact to the

(#38-4-1257)			subsidence is assessed as low to moderate and limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this isolated find site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Cockle Creek IF4 (#38-4-1258)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as low to moderate and limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	As above for Cockle Creek IF3
Diega Creek AS1 (#45-7-0289)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders

			Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Diega Creek AS2 (#38-4-1262)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the area in which the artefacts are exposed may damage surface and subsurface artefacts.	As above for Diega Creek AS1
Diega Creek AS3 (#38-4-1263)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the area in which the artefacts are exposed may damage surface and subsurface artefacts.	As above for Diega Creek AS1
Diega Creek IF1 (#38-4-1270)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefact down cracks and exposure of further artefacts by cracks.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this isolated find site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders

			Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Diega Creek IF2 (#38-4-1271)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	As above for Diega Creek IF1
Diega Creek IF3 (#38-4-1272)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	As above for Diega Creek IF1
Diega Creek IF4 (#38-4-1273)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks.	As above for Diega Creek IF1

			Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	
Diega Creek IF5 (#38-4-1274)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	As above for Diega Creek IF1
Diega Creek IF6 (#38-4-1275)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed very low and limited to loss of artefact down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.	As above for Diega Creek IF1
GNW1 (#38-4-0995)	High to very high	Low to moderate	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	As above for Diega Creek IF1
Western Domain 1 (#38-4-0996)	Moderate	Low	Site has been collected under existing DECCW AHIP #1098480. Impact to site area assessed as low and limited to: Cracking of soil profile following subsidence may reveal further artefacts on track. Remediation works to fix cracking may damage	This site has already been surface collected under Section 87 AHIP #1098480. In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this isolated find site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence

			surface and subsurface artefacts.	remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Western Domain 2 (#38-4-0997)	Moderate	Low	Site has been collected under existing DECCW AHIP #1098480. Impact to site area is assessed as high and limited to: Cracking of soil profile following subsidence may reveal further artefacts on track. Remediation works to fix cracking may damage surface and subsurface artefacts.	This site has already been surface collected under Section 87 AHIP #1098480. In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Western Domain 3 (#38-4-0998)	Moderate to high	Low	Site has been collected under existing DECCW AHIP #1098480. Impact to site area is assessed as moderate and limited to:	As above for Western Domain 2

			Cracking of soil profile following subsidence may reveal further artefacts on track. Remediation works to fix cracking may damage surface and subsurface artefacts.	
Western Domain 4 *(#38-4-0999)*	*Moderate*	*Low*	*Outside continued underground mining area.* *Site has been collected under existing DECCW AHIP #1098480.*	*No management applicable – Outside Continued Underground Mining Impact Area*
Western Domain 5 (#38-4-0993)	Very high to extremely high	Low to moderate	Mine plan modified to avoid site.	No mitigation required as mine plan revised as an offset to avoid impacting Aboriginal cultural and archaeological values. The site will be protected throughout the life of the mine through protocols and procedures to be implemented under an ACHMP to be prepared in consultation with the relevant registered Aboriginal stakeholders and the NPWS/OEH. The modification to the mine plan is proposed to offset potential damage to other artefact scatters and isolated find sites.
Western Domain 6 (#38-4-1000)	Moderate	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set

				out in Section 9.3 of Umwelt 2010.
Western Domain 7 (#38-4-1001)	Moderate	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts; Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	As above for Western Domain 6
Western Domain 8 (#38-4-1002)	Moderate to high	Low	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts; AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.	As above for Western Domain 6
Western Domain 9 (#38-4-1003)	Moderate	Low	Site has been collected under existing DECCW AHIP #1098480. Impact to site area is assessed as high and limited to: Cracking of soil profile following subsidence may reveal further artefacts on track.	This site has already been surface collected under Section 87 AHIP #1098480. In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this isolated find site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence

			Remediation works to fix cracking may damage surface and subsurface artefacts.	remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
AS (#38-4-0098)	Moderate	Low	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Cracking of soil profile following subsidence may impact site area and expose/bury artefacts. Remediation works to fix cracking may damage surface and subsurface artefacts.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
AS *(#38-4-0097)*	*Moderate*	*Low*	*No impact*	*No management applicable – Outside Continued Underground Mining Impact Area*

Cockle Creek SA1 (#38-4-1259)	Extremely high	Moderate to high	Very low potential for cracking of soil profile following subsidence to impact stone arrangement and cause movement of stones. Remediation works to fix cracking may adversely impact stone arrangement.	In recognition that subsidence is highly unlikely to impact this site undermining will be endorsed. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. • prior to subsidence photograph stone arrangement from all angles; • prior to subsidence prepare a scale plan of stone arrangement; • following subsidence in the unlikely event that there is any movement of the stones in the arrangement use scale plan to assist the registered Aboriginal stakeholders to replace the stones in their proper arrangement; and • any topsoil crack remediation will be accomplished manually using imported fill so that no impact is occasioned to the stone arrangements. and • West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Diega Creek SA1 (#38-4-1276)	Extremely high	Moderate to high	Low potential for cracking of soil profile following subsidence to impact stone arrangement and cause movement of stones. Remediation works to fix cracking may adversely impact stone arrangement.	As above for Diega Creek SA1
Cockle Creek Rockshelter with Artefacts and PAD (#38-4-1260)	Very high to extremely high	High	Impact assessed as low to moderate. Subsidence may cause cracking of walls and roof of rockshelter. Potential for roof collapse. Cracking of floor deposits, loss of archaeological integrity of PAD.	Partial salvage of this site was deemed warranted due to the extent of cracking already visible in the roof of the rockshelter and recognising that the roof will fail even without subsidence impact. In compliance with the protocols and procedures of the ACHMP (see Section 9.4 and Appendix H of Umwelt 2010) to be prepared for the proposed continued underground mining area and using the Research Design and Methodology in Appendix I of Umwelt 2010, prior to subsidence: • undertake a detailed archaeological salvage of approximately 30% of the floor deposit; and • install props (if feasible) to prevent roof fall; and

				• backfill excavated area. In compliance with the protocols and procedures of the ACHMP following subsidence: • record and report to OEH impacts of subsidence on site to inform future assessments; • if necessary feasible and safe repair any cracks in the walls, floor or roof of the rockshelter in a culturally appropriate manner; • if feasible and safe, remove the roof props; and • if feasible and safe return the artefactual material recovered during the excavation. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Cockle Creek ST2 (#38-4-1261)	Very high	Moderate	Impact from cracking of soil/sandstone bedrock is assessed as very low. Greatest potential for impact is from subsidence remediation works.	In recognition that subsidence is highly unlikely to impact this scarred tree undermining will be endorsed. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. • prior to subsidence the scarred trees are carefully recorded for future reference (as scarred trees have a finite life span ongoing preservation in the landscape is not feasible but a photographic record and scale drawing can assist with making information about them available for future generations); and • following subsidence any repairs to topsoil cracking within the area of the scarred trees to be undertaken manually using imported fill in a manner that avoids impact to the scarred trees. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
Diega Creek ST1 (#38-4-1277)	Very high	Moderate	Impact from cracking of soil/sandstone bedrock is assessed as high. Cracking of sandstone bedrock may cause groundwater loss and death of tree.	As above for Diega Creek ST2

			Greatest potential for impact is from subsidence remediation works.	
Diega Creek ST4 *(#38-4-1278)*	*Very high*	*Moderate*	*Impact from cracking of soil/sandstone bedrock is assessed as very low.* *Greatest potential for impact is from subsidence remediation works.*	*As above for Diega Creek ST2* *Please note that due to mine modifications in the Diega Creek area this site is now outside the project impact area.*
AS1 (#38-4-1224)	High	Not assessed by Virtus Heritage (n.d.), however based on small number of artefacts and degree of disturbance is assessed by Umwelt as low	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. and Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to this artefact scatter site; undermining will be endorsed for the site. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to OEH any impacts of subsidence/subsidence remediation on the site. This information will be used to inform future assessments. and • if remediation works are required collect any surface artefacts or artefacts exposed by cracking; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. and West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.
AS2 (#38-4-1225)	High	As above for AS1 (#38-4-1225)	Impact from cracking of soil profile following subsidence is assessed as moderate to high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	As above for AS1 (#38-4-1225)
AS3	High	As above for AS1	Impact from cracking of soil profile following	As above for AS1 (#38-4-1225)

(#38-4-1226)		(#38-4-1225)	subsidence is assessed as low to moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	
AS4 *(#38-4-1227)*	*High*	*As above for AS1 (#38-4-1225)*	*Outside continued underground mining area.*	*No management applicable – Outside Continued Underground Mining Impact Area due to mine plan modification in the Diega Creek area*
IF1 (#38-4-1228)	High	As above for AS1 (#38-4-1225)	Impact from cracking of soil profile following subsidence is assessed as low to moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	As above for AS1 (#38-4-1225)
IF2 (#38-4-1229)	High	As above for AS1 (#38-4-1225)	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	As above for AS1 (#38-4-1225)
IF3 *(#38-4-1230)*	*High*	*As above for AS1 (#38-4-1225)*	*Outside continued underground mining area.*	*No management applicable – Outside Continued Underground Mining Impact Area due to mine plan modification in the Diega Creek area*
IF4 (#38-4-1231)	High	As above for AS1 (#38-4-1225)	Impact from cracking of soil profile following subsidence is assessed as low but limited to loss of artefacts down cracks and exposure of further	As above for AS1 (#38-4-1225)

			artefacts by cracks. Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.	
Potential Aboriginal Scarred Tree** (not on AHIMS)	High if it is a scarred tree	Moderate if it is a scarred tree	It is noted that Virtus did not register this possible scarred tree on the AHIMS and suggested that it was inspected by an arboriculturalist to identify if the scar was natural, historic or Aboriginal cultural in origin. Impact from cracking of soil/sandstone bedrock is assessed as low. Greatest potential for impact is from subsidence remediation works.	If inspection by an arboricultarist identifies that the tree is Aboriginal cultural in origin the following management strategy will be implemented. In recognition that subsidence is highly unlikely to impact this scarred tree undermining will be endorsed. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. • prior to subsidence the scarred trees are carefully recorded for future reference (as scarred trees have a finite life span ongoing preservation in the landscape is not feasible but a photographic record and scale drawing can assist with making information about them available for future generations); and • following subsidence any repairs to topsoil cracking within the area of the scarred trees to be undertaken manually using imported fill in a manner that avoids impact to the scarred trees. AND West Wallsend to fund and implement the Conservation Offset Strategy set out in Section 9.3 of Umwelt 2010.

Key:

Sites listed in italics are outside the disturbance footprint
Sites listed in italics and highlighted grey are now outside the disturbance footprint due to mine plan changes in the Diega Creek catchment.
Sites listed in bold will be protected by mine plan modifications for cultural heritage management
** Possible Scarred Tree may not be a site. To be determined by an arboriculturalist. Currently being organised by West Wallsend Colliery.

APPENDIX J – ADDITONAL HERITAGE INFORMATION

WEST WALLSEND HISTORIC HERITAGE ASSESSMENT
Umwelt (Australia) Pty Limited

As per the Department of Planning & Infrastructure (DP&I) request, a review of the heritage databases has been undertaken in relation to the West Wallsend Colliery Continued Operations Project (the Project).

This review confirms that no further heritage items have been identified within or in the immediate vicinity of the continued underground mining area, apart from the Mt Sugarloaf and the Sugarloaf Range listing identified by DP&I. We note that there is some inconsistency in the listings of Mt Sugarloaf and the Sugarloaf Range in relation to the identified locations of the listed areas in relation to the Project and therefore Tim Adams, Senior Archaeologist, Historic Heritage, has conducted the further assessment outlined below

We also note that Mt Sugarloaf No 1 Colliery Site (listed on the State Heritage Inventory (SHI) and in the Lake Macquarie Local Environmental Plan (LEP) 2004) is located off Sugarloaf Range Road *'2.3 kilometres northwest of West Wallsend Post Office'* (SHI listing sheet) at Lot 7, DP 813135. The Mt Sugarloaf No 1 Colliery Site is located approximately three kilometres to the northeast of the continued underground mining area and as a result is not considered to be in the immediate vicinity of the Project. This site will not be subject to any direct or indirect impacts as a result of the Project.

Mt Sugarloaf and the Sugarloaf Range Listing

The location of the listed area comprising Mt Sugarloaf and the Sugarloaf Range is not consistently defined in the available listings information. The address of Mt Sugarloaf and the Sugarloaf Range is cited in the *Lake Macquarie Local Environmental Plan (LEP) 2004*, Schedule 4 - Heritage items (other than of indigenous origins and including potential archaeological sites) as Mt Sugarloaf Road, with a property description comprising of the following lots:

- Lot 1, DP 231108;
- Lot 2, DP 231108;
- Lot 21, DP 223395;
- Lot 1, DP 207238;
- Lot 1, DP 338999; and
- Lot 121, DP 755262.

All of the listed lots are outside of the continued underground mining area.

The SHI listing sheet for the Mt Sugarloaf and the Sugarloaf Range cites its location as covering a larger area than the LEP. The SHI listing extends into the Awaba State Forest (now part of the Sugarloaf State Conservation Area):

> *The summit of Mt Sugarloaf and the two spurs, enclosing most of the catchment of Lake Macquarie and defined by the length of the Sugarloaf Range Road, from its intersection with Wakefield Road in Awaba State Forest, north to the Sugarloaf Reserve, then east to its intersection with George Booth Drive (SHI listing sheet).*

The City of Lake Macquarie Heritage Study prepared by Suters Architects Snell (1993) identifies Mount Sugarloaf and the Sugarloaf Range as Item No. WW-46 within the West Wallsend District, to the northeast of the continued underground mining area (Suters 1993).

From the SHI listing description it appears that the continued underground mining area is located within the listed Mt Sugarloaf and the Sugarloaf Range. An assessment has been undertaken of Mt Sugarloaf and the Sugarloaf Range as the Project involves underground mining in the area.

Mt Sugarloaf Historical Context

Mt Sugarloaf is important to the history of Lake Macquarie as the dominant visual and physical boundary of the district. It provides a clear visual boundary for the population of Lake Macquarie and has 'greatly influenced the industrial history' of the area 'by separating it from the more fertile soil and more plentiful fresh water of the Hunter Valley' (SHI Listing Sheet). The physical barrier and rough nature of the Sugarloaf Range 'discouraged traffic through the district or the early agricultural development' of the area. As a result the Lake Macquarie area developed later than the more fertile Hunter Valley, which had better access to the ports of Newcastle or Morpeth (Suters 1993:51).

The Sugarloaf Range is within the traditional country of the Awabakal people. Captain Cook is thought to have sighted and named Mt Sugarloaf when he sailed past in 1770 (SHI listing sheet). Although the coal resources of the area of Lake Macquarie were first discovered in 1800 when Captain William Reid mistook the entrance to the Lake for the entrance to the Hunter River, timber getters and farmers were utilising the resources of the area for a period of time before the first mine opened in the area.

The discovery of the soft beautiful wood of the red cedar, often referred to as red gold, about two years after the first settlement led to such large numbers of cedar being removed that Governor Hunter had to issue regulations in 1795 to control cedar getting along the Hawkesbury River (DECC 2008:2).

Timber getting, particularly for Red Cedar, in the area of what is now the Sugarloaf State Conservation Area likely commenced in the 1820s. The valleys to the west of Lake Macquarie provided an abundance of cedar and it became the region's first export, with timber cutters floating the timber down the creeks and across the lake.

Unlike Sydney and Newcastle, the Lake Macquarie area only had sparse settlement associated with timber getting or minor agriculture until the mid 1800s. Major development and settlement of the area occurred in the mid to late 1800s as a result of the exploitation of its coal resources and in particular the Borehole seam, which was discovered in the mid 1800s. Townships at the foot of the Sugarloaf Range flourished in proximity to successful collieries (Suters 1993:51).

The start of the railway system in NSW in 1855 and the establishment of coal mining created an increased a demand for timber. Steam saw mills opened in the Lake Macquarie district in 1872 at Cardiff Point near Belmont and by 1874 there were four steam sawmills in the region (Suters 1993:22). Sawmillls were also established in the Sugarloaf area. In 1889 Tomas Barnier established a sawmill in the Mount Vincent area and cut timber from the Sugarloaf Range and the Watagan Mountains. Early forest mills were often mobile and didn't remain where they operated. The mills were built in the bush as it was easier and cheaper to move milled timber than logs in the days before transport was fast and efficient. Timber was taken off the mountain by bullock teams and delivered to the site of a new colliery, rail line, rail bridge or building as required. Following the opening of the Awaba Railway Station in August 1887 timber was also delivered direct to the station for transportation further afield.

Bullock teams would have created tracks through the Sugarloaf Range that remain today. Thomas Barnier made tracks and roads along every ridge on the mountain so that logs could be brought to the sawmill. His work included contracts for tallow wood, stringybark or blackbutt sleepers for the railway department and for export to China. Barnier ran the mill for approximately 20 years before disposing of the property to William Lewis and Sons of Quarrobolong, who intended to use the land for cattle agistment. In approximately 1935 the Forestry Department resumed the land and proclaimed the whole of the mountain as a forest reserve for the growth of timber (LMDHS nd).

The Royal Commission into the timber industry, conducted in 1907-8, was of critical importance in the history of forestry in New South Wales. The commission identified the significance of cypress pine to the building industry and stressed the importance of ensuring its survival. As a result of the inquiry the Forestry Act of 1909 was passed. The Act made provision for the dedication of state forests. A dedicated forest could not be revoked (except by an Act of Parliament), whereas a reserve could be revoked by a Notice in the Government Gazette. Previously, if land was considered suitable for agriculture it was made available for closer settlement. Revocations of timber reserves were not unusual. In 1916 a second Forestry Act was passed and the Forestry Commission created. In the 1920s the Forestry Commission divided the forests into administration units and established resident

foremen in the forests in newly constructed cottages so that logging could be supervised and suitable management of the forest put in place.

In approximately 1971, 500 hectares of land around the peak was declared as Mount Sugarloaf Reserve, zoned open space for public recreation (SHI listing sheet). The Awaba and Heaton State Forests now form part of the Sugarloaf State Conservation Area

Significance of Mt Sugarloaf and the Sugarloaf Range

The Heritage Branch criteria for assessing significance are discussed below in relation to Mt Sugarloaf and the Sugarloaf Range.

Table 1 - Statement of Significance

Heritage Branch Standard Criteria	**Statement of Significance**
Criterion (a) Historical	The history of European settlement and the economic and social history of the Lake Macquarie area has been greatly influenced by the dominant visual and physical boundary comprising Mt Sugarloaf and the Sugarloaf Range.
Criterion (b) Associative	Mt Sugarloaf and the Sugarloaf Range is not known to have any associations of particular significance.
Criterion (c) Aesthetic	Mt Sugarloaf and the Sugarloaf Range comprise the most dominant natural feature of the Lake Macquarie area and provides a visual boundary which can be seen by the population of the Lake Macquarie area. There are bushland and panoramic views from Mt Sugarloaf and from along the Range, including of Newcastle, the ocean and Lake Macquarie.
Criterion (d) Social	Mt Sugarloaf and the Sugarloaf Range are seen to be a major factor in the social unity and sense of identity and place amongst the townships that emerged as a result of the exploitation of the mining resources of the West Wallsend area. Mt Sugarloaf and the Sugarloaf Range provide popular bush walks and picnic spots. The summit of Mount Sugarloaf is utilised today for the Lower Hunter's media and communication towers.
Criterion (e) Scientific	There are unlikely to be any intact archaeological remains within the Mt Sugarloaf and the Sugarloaf Range. A high degree of intactness in the archaeological resource is necessary before a substantive contribution can be made to the research potential and hence, the ability of the archaeological resource to answer research questions for the site. Generally any remains that may be present would be unlikely to have any research potential and would at best provide only a minor contribution to the significance of the area. Evidence of surveyors' blazes and any rural fences that may be present may provide information about how the landscape was used and changed during its use and exploitation. However, in general as individual items they have little research potential beyond the immediate physical presence of their type. Sites such as timber getting camps and associated tracks would support the known history of timber getting in the area and are unlikely to provide any additional information to that already known for the area.
Criterion (f) Rarity	Mt Sugarloaf and the Sugarloaf Range do not meet this criterion.

Heritage Branch Standard Criteria	Statement of Significance
Criterion (g) Representativeness	Mt Sugarloaf and the Sugarloaf Range are typical of a forested mountainous landscape with a history of exploitation of timber and mineral resources.

The 1993 Heritage Study identified Mt Sugarloaf and the Sugarloaf Range as having:

- Low state significance;
- high regional significance; and
- very high local significance.

The Study's Statement of Significance stated that Mt Sugarloaf and the Sugarloaf Range:

> *...have high local and regional significance, as the most dominant geographical and visual feature in the district, and a major influence on the economic and social history of the area.*
>
> *Mount Sugarloaf and Sugarloaf Range have been major factors in the social unity and the sense of identity and place amongst the mining villages which sprang up to exploit the coal resources of the West Wallsend area. This sense of identity is still evident today within the local community living 'Neath Mount Sugarloaf' (Suters 1993).*

Impact Assessment

The continued underground mining area lies beneath an expansive tract of native vegetation associated with the Sugarloaf Range linking the Watagan Mountains to Mount Sugarloaf. Mt Sugarloaf is located approximately 4 kilometres north of the continued underground mining area. There will be no impact on Mt Sugarloaf as a result of the Project.

WWC have been operating in the Sugarloaf area for over 20 years. In that time, WWC's operations have not impacted on the heritage values of the Sugarloaf Range. Other than the predicted subsidence movements and any required remediation there are not expected to be any direct or indirect physical impacts to the Sugarloaf Range as a result of the Project.

The underground coal mining operation at West Wallsend Colliery targets the Borehole and West Borehole seams using longwall extraction methods. The longwall panels will be extracted using the existing longwall retreating system of mining. This method has been successfully used for the extraction of the previous longwall panels from LW1 to LW39 since 1985 and is currently being used for the extraction of LW40. Subsidence impact as a result of the extraction of the longwalls on both natural and man-made features is one of the key issues for the Project and has been extensively assessed.

Ditton Geotechnical Services Pty Ltd (DGS) prepared the *Subsidence Predictions and General Impact Assessment of the Proposed Western and Southern Domain Longwalls, West Wallsend Colliery* in March 2010. Specific subsidence parameters were detailed in Section 5.2.3 of the EA.

The mine plan has been substantially modified to avoid and minimise impacts on specific significant cultural landscape features and cultural heritage sites, in consultation with the registered Aboriginal stakeholders. Furthermore there has been substantial modification of the mine plan to avoid landscape impacts in steep slope areas by reducing the longwall void width within the northern extents of Longwalls 42 and 43 to 115 metres to reduce the subsidence profile, and impacts from low depth of cover mining (i.e. less than 80 metres) in the Deiga Creek area. Subsidence impacts for the proposed mine plan, are not predicted to have a significant impact on natural features within the continued underground mining area. Potential remediation works will be required as a result of mining induced subsidence. Based on current practice, it is not expected that the remediation works will have any impact on the heritage value of the Sugarloaf Range.

There are not expected to be any impacts to the heritage significance of Mt Sugarloaf and the Sugarloaf Range. They will remain the 'dominant geographical and visual feature in the district' enabling an ongoing 'sense of identity and place' for the townships at the foot of the range.

References

Department of Environment & Climate Change (DECC) NSW 2008. The Vertebrate Fauna of Sugarloaf State Conservation Area.
Lake Macquarie District Historical Society (LMDHS). History of Wattagan Range.
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http://www.heritage.nsw.gov.au/07_subnav_04_2.cfm?itemid=1910246
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APPENDIX K – RECOMMENDED PROJECT APPROVAL

See separate file under folder *Determination*, entitled *Project Approval.*