Mining and Energy Division

Review of Environmental Assessment

Mandalong Southern Extension Project

SSD5144

Submission

Construction Forestry Mining and Energy Union (Mining and Energy Division)

Northern Mining & NSW Energy District

December 2013

On 31 January 2012 Centennial Mandalong Pty Limited applied to the Minister, Department of Planning seeking approval to extend existing underground mining operations into the Southern Extension Area and utilise existing and proposed new surface infrastructure integral to the mining operation. This Project is sought under Part 4 of the EP&A Act, 1979.

The Director General made the Environmental Assessment publicly available on the 31 October 2013 at the DP & I Information Centre Sydney, Wyong Shire Council, Lake Macquarie City Council and Nature Conservation Council.

The Union is pleased to take the opportunity to comment on the Mandalong Southern Extension Project and related activities Environmental Assessment.

The Mining and Energy Division is a Division of the CFMEU under the Federal Workplace Relations Act 1996, with over 120,000 members, one of the largest in Australia. The Division covers several industries including the coal industry, coal ports, metalliferous mining industries, electrical power generation, oil and gas and the Nation's small coking industry.

The Northern Mining & NSW Energy District of the CFMEU Mining and Energy Division, being the branch that on behalf of the organisation which is making the submission is the principal Union representing coal miners in the Northern District coalfields of New South Wales. The Mandalong facility is located approximately 35 kilometres south west of Newcastle and is wholly within the State's Northern District coalfields.

The Union is familiar with the Mandalong facility site and has engaged the services of an Environmental Consultant with extensive experience in local government and environmental assessments on coal mining related projects.

After reviewing all the material and taking advice, the Union strongly supports this application to extend mining operations to the south at the Mandalong Underground Mine as proposed.

Project Overview

Centennial Mandalong seeks a single new development consent for the Mandalong Southern Extension Project to regulate its approved existing mining operations, extend existing underground mining operations into the Southern Extension Area and utilise existing and proposed new surface infrastructure integral to the mining operation. The primary components of the Project are:

- Continue the currently approved operations at the Mandalong Mine, with the exception of the infrastructure and operations at the surface of the Cooranbong Entry Site (however the mine ventilation shaft, ventilation fan and Borehole Dam at the surface of the Cooranbong Entry Site are part of the Project);

- Extend the Mandalong Mine's underground mining operations into the area covered by EL 6317 (Southern Extension Area) using a combination of continuous miner and longwall mining methods;

- Extract up to 6 Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams within the current mining lease areas and the area covered by EL 6317;

- Deliver ROM coal from the underground workings to the Cooranbong Entry Site at a rate of up to 6 Mtpa and/or to the Delta Entry Site at a rate of up to 6 Mtpa;

- Continue to utilise the existing surface infrastructure of the Mandalong Mine Access Site;

- Install and operate surface infrastructure at the proposed Mandalong South Surface Site to service the extended underground mining operation;

- Increase manning to 420 full-time employees and up to 50 contractors during longwall relocations;

- Undertake on-going exploration drilling activities within the bounds of Centennial Mandalong's mining leases and exploration licences;

- Increase the life of mine to 25 years from the granting of a mining lease(s) over EL 6317; and

- Continue to operate 24 hours per day, seven days per week.

Stakeholder Consultation

Centennial Mandalong has undertaken consultation with State and local government agencies, local Aboriginal groups, the Mandalong Mine Community Consultative Committee (CCC), surrounding residents and the wider community and service providers during pre-feasibility, feasibility and planning stages of the Mandalong Southern Extension Project. A stakeholder consultation log was maintained by Centennial Mandalong as a record of the consultation activities undertaken in relation to the Project.

The main issues raised by the community during the consultation process were:

- Structural impacts to dwellings as a result of subsidence;

- Increased flooding potential for dwellings as a result of subsidence; and

- Noise emissions from the construction and operation of the proposed Mandalong Southern Surface Site and associated access road.

There were no issues regarding impacts to agricultural resources, enterprises or stakeholders raised during the community consultation process.

According to the Project EIS Centennial Mandalong places the utmost importance on maintaining effective communication with the local community, and other stakeholders, in which it operates. Prior to the commencement of the Mandalong Southern Extension Project, a Stakeholder Engagement Strategy was developed to provide a consistent management framework for the identification and consultation with stakeholders that have an interest in the Project. The objectives of the Stakeholder Engagement Strategy are to:

- Establish a process for engagement with stakeholders, with clear outcomes for Centennial Mandalong and the various stakeholders;

- Openly communicate with stakeholders about the Project; and

- Provide a means of community access to the Centennial Mandalong Project Team via a dedicated information phone line.

The Stakeholder Engagement Strategy was reviewed regularly throughout the Project and updated as required. A copy of the Strategy is available on Centennial's website.

Subsidence

A detailed and comprehensive subsidence impact assessment has been undertaken by Ditton Geotechnical Services (DGS) for the proposed Mandalong Southern Extension Project.

Subsidence Predictions

Predicted Single Panel Subsidence

The maximum subsidence above a single longwall panel will depend upon its width, cover depth, extraction height and the subsidence reduction potential of the overburden.

In summary, the results of the single panel spanning assessment undertaken by DGS (2013) for the Southern Extension Area are:

- Longwall panels 160 metres wide – maximum single panel subsidence ranging between 0.08; and
- 0.46 metres, which is 1 to 18 percent of the extraction height;
- Longwall panels 180 metres wide – maximum single panel subsidence ranging between 0.14;
- 0.87 metres, which is 2 to 29 percent of the extraction height; and
- Longwall panels 200 metres wide - maximum single panel subsidence ranging between 0.22 and 0.74 metres, which is 3 to 44 percent of the extraction height.

These single panel subsidence values have been used by DGS (2013) with the predicted chain pillar and goaf edge subsidence to estimate the multi-panel subsidence.

Predicted Subsidence above Chain Pillars

DGS (2013) predicted the mean and credible worst-case subsidence values above the proposed chain pillars under double abutment loading conditions. The predicted first subsidence over the chain pillars is estimated to range from 0.1 metres to 0.94 metres for the range of pillar sizes and geometries proposed (and ignoring the 144 metre barrier between longwalls 38 and 61).

The final subsidence over the chain pillars after mining is completed is estimated to range from 0.12 metres to 1.1 metres, which is an overall increase of 20 percent.

Predicted Goaf Edge Subsidence

DGS (2013) predicts the final mean goaf edge subsidence for the proposed longwalls will range from 0.03 metres to 0.56 metres, and the credible worst-case goaf edge subsidence will range from 0.06 metres to 0.79 metres.

Predicted Multiple Panel Subsidence

Based on the predicted maximum single panel, chain pillar and goaf edge subsidence values derived by DGS (2013), the mean and worst-case first and final maximum subsidence predictions for multi-panels (and the associated impact parameters) have been derived. The predicted credible worst-case subsidence effect results for the proposed mine plan are summarised below:

- First maximum panel subsidence – 0.21 to 1.14 metres, with an average of 0.54 metres;
- Final maximum panel subsidence - 0.27 to 1.34 metres, with an average of 0.73 metres;
- First maximum chain pillar subsidence - 0.05 to 0.94 metres, with an average of 0.42 metres;
- Final maximum chain pillar subsidence - 0.06 to 1.1 metres, with an average of 0.49 metres;
- Maximum panel tilt - 2 to 20 mm/m, with an average of 7 mm/m;
- Maximum panel concave curvatures - 0.2 to 0.91 kilometres-1 (km-1), with an average of 0.44 km-1, or radii of curvature of 5 to 1.1 kilometres, with an average of 2.3 kilometres;
- Maximum panel convex curvatures - 0.16 to 0.72 km-1, with an average of 0.35 km-1, or radii of curvature 6.3 to 1.4 kilometres, with an average of 2.9 kilometres;
- Maximum panel compressive strains – 2 to 9 mm/m, with an average of 4 mm/m;
- Maximum panel tensile strains – 2 to 7 mm/m, with an average of 3.5 mm/m.

Subsidence Impacts

Based on the predicted maximum panel subsidence, tilt and strain values for the proposed mine plan, DGS (2013) assessed the potential for subsidence related effects, including cracking, slope instability, valley uplift and closure, and far-field displacements. A summary of the predicted effects is provided in the below sub-sections.

Surface Cracking

Based on previous experience at the existing Mandalong Mine, the predicted final maximum panel subsidence magnitudes in the Southern Extension Area (0.27 to 1.34 metres) may result in the occasional surface crack developing within the limits of the extracted panels in relatively flat terrain. Cracks may also occur outside the high sides of longwall panels beneath the steep slopes (i.e. greater than 18 degrees) in the south-west of the proposed mine plan.

Based on the predicted maximum tensile strains (1 to 7 mm/m), crack widths are estimated to range from 10 to 70 millimetres wide where shallow rock exists within 5 metres of the surface. If alluvium or deep soil profiles exist, the strain will probably be more uniformly distributed and consist of several smaller width cracks (rather than just one single crack) or not occur at all. Where steep slopes exist, the crack widths due to the predicted subsidence could range from 150 to 320 millimetres due to rigid body rotation movements that can occur if the toe of a slope is undermined.

Surface cracking of the creek beds within the Southern Extension Area is considered “unlikely” where cover depth is greater than 180 metres. Specifically in relation to third and fourth order streams surface cracking of the creek beds is considered “highly unlikely” and will be limited by longwall panel geometries and the “strain absorbing” properties of the surface alluvium.

Sub-Surface Cracking

DGS (2013) modelled continuous (A-Zone) and discontinuous (B-Zone) sub-surface fracturing heights and constrained zone thickness above the proposed 160 metre, 180 metre and 200 metre wide longwall panels. In summary, the predicted credible worst-case continuous cracking in the A-Zone above the proposed longwall panels range from 111 to 189 metres for cover depths of 185 to 480 metres, respectively. The depth to the height of the continuous fracturing from the surface ranges from 58 to 296 metres, and is "very unlikely" to interact with surface cracking within 15 metres of the surface.

The predicted depth of discontinuous fracturing in the B-Zone from the surface ranges from 11 to 260 metres. It is likely that the constrained zone will be limited by the presence of spanning Munmorah Conglomerate, which exists between 83 to 115 metres below the surface. It is therefore considered that the B-Zone is "very unlikely" to reach the surface zone above the proposed longwall panels.

The surface alluvium along the creeks within the Southern Extension Area is estimated to range from 5 metres to approximately 20 metres below the surface. Based on the above predictions for sub-surface cracking, it is considered "not credible" that A-Zone cracking will affect the surface alluvium beneath any of the creeks. It is also considered "unlikely" that surface watercourses will be subject to sub-surface flow re-routing due to interaction with sub-surface bed separation or discontinuous fracturing.

DGS (2013) advises that the presence of geological structures should be viewed with caution in regards to potential interaction with surface watercourses. Undermining significant faults may result in higher continuous fracture connectivity and water inflow in the mine workings.

Slope Instability and Erosion

Surface Gradient Changes

The proposed longwalls will cause subsidence, tilting and bending of the surface supporting rock faces and steep slopes. Worst-case subsidence predictions range from 0.6 metres to 1.2 metres above the proposed longwall panels beneath elevated ridges. The predicted post-mining surface slope gradient changes for the proposed mine plan indicate bedding dips may be increased or decreased by up 1 degree (plus or minus). The predictions of maximum tilt and strain indicate the slopes may be subject to tilts between 5 and 15 mm/m and tensile strains between 2 and 5 mm/m. Strains up to 15 mm/m may occur locally due to discontinuous movements associated with steep slopes.

Overhang Collapse and Rock Falls

The predicted subsidence and associated tilt and strains could result in cracking from bending occurring in the existing cliff faces, with the release of sandstone boulders downslope. Some existing pre-mining sandstone boulders of between 0.5 metres and 5 metres in diameter have rolled for distances of up to 100 metres downhill of the cliff line crests. The boulders appear to have been stopped by trees on the densely timbered slopes or at breaks in slope.

Deep-Seated Land Sliding

The steep slopes within the Southern Extension Area in their current pre-mining condition are assessed by DGS (2013) to have a "low" sliding potential over an extreme range of climatic conditions (i.e. dry to saturated). The subsided slopes for the same climatic conditions and range of expected tilts and strains are also assessed by DGS (2013) to have "low" sliding potential during worst-case conditions, which may include unrepaired, water-filled cracks.

Shallow Translational Sliding

The potential for steep soil slope failure after mining is considered “medium” to “high” for the predicted tilts, strains and cracks. However, this may be reduced to an overall “low” to “medium” sliding potential due to the high density of trees and vegetation and assuming surface cracks are repaired.

The consequence of a shallow translational slope failure is likely to be localised and unlikely to impact on slope aesthetics. Public safety issues are addressed by way of the proposed management strategies.

Erosion of Slopes and Creek Beds

The potential for terrain adjustment due to erosion and deposition of soils after subsidence has also been broadly assessed by DGS (2013). The rate of soil erosion is expected to increase in areas with exposed dispersive/reactive soils and slopes greater than 18 degrees, where these slopes are subjected to the estimated tilt increases of 1 degree. Areas with slopes less than 18 degrees are expected to have low erosion rate increases, with the exception of creek channels, which would be expected to re-adjust to any changes in gradient. In general, head-cuts in creek channels would be expected to develop above chain pillars between the longwall panels and on the side where gradients increase. Sediment would be expected to accumulate where gradients decrease.

Valley Uplift and Closure

Due to the observed low horizontal stress regime in the Mandalong Mine workings, it is considered unlikely that significant valley uplift and closure movements will occur along the drainage gullies and in broad crested valleys above the proposed mine plan. The lack of thick, massive beds of conglomerate and sandstone units along the broad creeks and valleys at the surface will also mean the development of such movements is likely to be limited to less than 200 millimetres in the Southern Extension Area.

Far-Field Horizontal Displacements and Strains

DGS (2013) assessed that far-field strains are likely to be less than 1 mm/m at 0.5 times the cover depth and less than 0.3 mm/m beyond an angle of draw of 45 degrees or a distance equal to one times the cover depth outside longwall extraction limits. Measureable horizontal displacements can extend further out than then vertical subsidence, however these are likely to be less than 20 millimetres beyond a distance of one times the cover depth. The displacements and strains are unlikely to cause damage beyond an angle of draw of 26.5 degrees to sensitive features.

Groundwater

A comprehensive assessment of the potential impacts of construction and operation of the Mandalong Southern Extension Project on groundwater resources was undertaken by GHD.

Impact Assessment

Proposed Surface Facilities

Based on exploration boreholes within the area surrounding the proposed Mandalong South Surface Site, the depth to the coal seam at this location is approximately 340 to 370 metres. The overburden consists primarily of interbedded sandstone and siltstone, and is generally of low permeability unless joints or fracturing creates a secondary permeability. The surface geology consists of weathered clay to approximately 15 metres below ground level.

Ventilation Shafts and Services Boreholes

The ventilation shafts and service boreholes proposed at the Mandalong South Surface Site may intercept deep low yielding porous and fractured rock groundwater sources that may be present within the overburden. Localised drawdown may occur during boring of the shafts and boreholes until they are lined or cased. Based on the observed recovery of drawdown within the deeper groundwater monitoring bores within the Southern Extension Area, it is considered that any depressurisation of these groundwater sources will recover within a few months.

Since the proposed surface facilities area will overlay main headings (first workings), it is anticipated that mining induced fracturing of strata between the surface facilities area and the seam will be negligible.

No registered water supply bores are located within 3 kilometres of the Mandalong South Surface Site. Therefore, although a temporary water pressure head decline of greater than 2 meters may be possible within fractured rock groundwater sources immediately adjacent to the shafts and boreholes during construction, no pressure head decline is anticipated at existing water supply works GHD does not expect groundwater in the shallow rock strata to be intercepted given that the surface site is proposed to be constructed at a relatively high elevation along the prominent ridgeline.

It was concluded that the potential groundwater impacts from the construction of the ventilation shafts and service boreholes will be less than the Level 1 minimal impact considerations from the AIP and are therefore considered to be acceptable. Nevertheless, it will be necessary to obtain a groundwater interference licence under the *Water Act 1912* for the construction works.

Access Road

The proposed access road between Mandalong Road and the Mandalong South Surface Site will overlay Morans Creek alluvium at the Mandalong Road end. There are no substantial cuttings proposed along the alignment within the existing cleared area and, considering that the depth to groundwater is typically greater than 2 metres in this area (based on monitoring data for bore MSGW04A), it is therefore unlikely that there will be interception of alluvial groundwater during construction.

While some cuttings are proposed along the alignment of the access road at the southern end within the existing forested area, they are not expected to intercept fractured rock groundwater sources due to the relatively high elevation of the proposed earthworks in this area. In addition, the alignment of the access road will not intercept potential GDEs.

The assessment conclude that the potential groundwater impacts from the construction of the access road will have minimal impact considerations from the AIP and are therefore considered to be acceptable.

Licensing Requirements

Based on current legislation and the groundwater impact assessment, the Project will require the following groundwater licences under the *Water Act 1912*:

- Groundwater interception licence for the construction of the ventilation shafts and service boreholes at the Mandalong South Surface Site.

- Groundwater licence with an extraction allocation of 5.9 megalitres per day to allow for interference and extraction of groundwater from the underground workings via the dewatering bore at the Cooranbong Entry Site. Centennial will consult with the NOW in terms of seeking a licence variation to increase the volumetric limit of the current dewatering licence (20BL169424) from the approved 1,825 megalitres per year to 2,154 megalitres per year (i.e. 5.9 megalitres per day) in order to manage the underground water storage and dewatering requirements over the life of the Project.

A water sharing plan for the north coast fractured and porous rock groundwater source is currently under development and due to commence in 2014. The porous and fractured groundwater sources within the Project Application Area will be covered by the Sydney Basin – Lower Hunter/Central Coast Groundwater Source. Most of the existing licences under the *Water Act 1912* will be transferred to water access licences under the *Water Management Act 2000.* Licensing requirements for the Project will need to be reviewed once this water sharing plan is finalised. Since the draft of this plan is not yet on exhibition, no further details regarding plan rules and allocations are available at this point in time.

No water access licence is required to account for groundwater take from the alluvial groundwater sources.

Surface Water

The potential surface water impacts associated with the Mandalong Southern Extension Project, specifically subsidence and construction of the access road (including the crossing over Morans Creek) to the proposed Mandalong South Surface Site in the Southern Extension Area, have been assessed by Umwelt (2013).

Impact Assessment

The key features of the Project that have the potential to impact on surface water resources within the Southern Extension Area are subsidence and the construction of the access road (including the crossing over Morans Creek) to the proposed Mandalong South Surface Site. Importantly, the potential subsidence impacts that will impact on surface water resources is primarily limited to vertical subsidence displacement, given that no connective cracking is predicted. The assessment methodology used by Umwelt (2013) comprised review of available information, including surface water monitoring data and subsidence predictions from DGS (2013), development of a digital terrain model (DTM) using airborne laser survey data, and one-dimensional (1D) and two-dimensional (2D) hydrodynamic modelling.

Catchment Areas

Based on the maximum vertical subsidence predictions for the Project, Umwelt identified no significant adverse impacts on the existing catchment boundaries and watercourse alignments within the Southern Extension Area.

Watercourse Stability

The existing characteristics of the watercourses within the Southern Extension Area have the potential to be impacted as a result of changes to the profiles of the watercourses caused by subsidence. This includes changes to the longitudinal grades of the watercourses, and associated changes to flow velocities and tractive stresses. Changes to the stability of a watercourse can result in increased scouring, changed channel geometry or rerouting of the watercourse. The existing environment has already undergone scouring as a result of constructed features, including culverts and bridges, however increases to scouring may degrade the existing water quality within and downstream of the Southern Extension Area.

The existing landform and predicted subsided landform long-sections and hydraulic conditions were compared by Umwelt (2013) for Morans Creek, Wyee Creek (three branches), Mannering Creek, and Buttonderry Creek in the Southern Extension Area.

- Wyee Creek (Watercourse 1) – potential for sections of scouring above longwalls 56 and 57.

- There is minimal difference in velocities predicted between the existing landform and predicted subsided landform, with the exception of two locations in the vicinity of longwalls 57 and 55 where a decrease in velocity is predicted.

- Wyee Creek (Watercourse 2) – no significant changes to the existing scouring expected.

- There is little difference in the modelled bank full velocities and tractive stresses for Watercourse 2 when comparing the existing landform and predicted subsided landform.
- Wyee Creek (Watercourse 3) - potential for increased scouring in the vicinity of longwalls 40, 41and 43.

- There is little difference in the modelled bank full velocities and tractive stresses for Watercourse 3 when comparing the existing landform and predicted subsided landform.

- Mannering Creek (Watercourse 4) – potential for increased scouring between longwalls 48 and 49.

- There is little difference in the modelled bank full velocities and tractive stresses for Mannering Creek.

- Buttonderry Creek (Watercourse 5) – only very minor changes are predicted to the watercourse long-sections as a result of the predicted subsidence.

- There is almost no difference in the modelled bank-full velocities and tractive stresses for Buttonderry Creek when comparing the existing landform to the predicted subsided landform.

- Morans Creek (Watercourse 6) - potential for increased scouring to occur in the vicinity of longwall 25.

- There is little difference in the modelled bank full velocities and tractive stresses for Morans Creek, with these parameters typically consistent between the existing landform and predicted subsided landform.

In summary, it is concluded that the potential impacts on the stability of watercourses within the Southern Extension Area are relatively minor (Umwelt 2013) and, as such, the potential for the Project to degrade the existing water quality within and downstream of the Southern Extension Area is also considered relatively minor.

Remnant Ponding

Ponding refers to pre- and post-mining depressions on the surface. Pre-mining ponding usually occurs in-channel along watercourses and may be altered in size and location as a result of subsidence.

Changes to ponding can impact drainage patterns, flora and fauna and GDEs. Flat, low lying land may be susceptible to out-of-channel ponding or depressions forming after subsidence.

Predicted subsidence has the potential to affect remnant ponding in Morans Creek, Wyee Creek, Buttonderry Creek, Mannering Creek and Jilliby Jilliby Creek catchments. Analysis of remnant ponding for the current conditions in the Southern Extension Area (i.e. pre-mining) indicates that it is currently confined predominantly to existing flow paths and covers an area of approximately 182 hectares.

Umwelt's (2013) assessment of the predicted subsided landform indicates negligible changes to remnant ponding, with a total increase in area of approximately 3.6 hectares (i.e. an increase of less than 2 percent).

Flood Regimes

Changes to the flood regimes (flood response) within and surrounding the Southern Extension Area are a potential consequence of the predicted subsidence and proposed surface infrastructure.

The analysis of flood regimes within the Southern Extension Area indicated that increases to the maximum modelled flood depth for the 100 year ARI design storm event as a consequence of predicted subsidence of between 0.1 and 0.4 metres within the main channels of the watercourses are possible (Umwelt 2013). These increases are generally limited to the immediate vicinity of the proposed longwall panels, as well as upstream of the proposed access road to the Mandalong South Surface Site where flood flows are constricted by the conceptual crossing over Morans Creek. The modelled impacts on flood depths were typically limited to approximately 100 metres downstream of the conceptual road crossing over Morans Creek (Umwelt 2013). The final design of the creek crossing will include drainage structures sufficient to minimise the local impacts on flooding.

The analysis indicated that the predicted subsidence had no significant impact on the duration of flooding at the boundary of the Southern Extension Area, with minor flood events remaining in-channel and no discernible increase to the time out of bank for larger flood events (Umwelt 2013). This indicates that the potential for flooding impacts on the agricultural value of the surrounding properties are negligible.

Conclusion

The potential impacts of the Project on surface water resources has been minimised by the iterative process Centennial Mandalong has undertaken to develop and refine the mine design to minimise subsidence and associated impacts on the natural and built environment (Umwelt 2013). As a result:

- No significant adverse impacts on the existing catchment boundaries and watercourse alignments within the Southern Extension Area are predicted.

Impacts on the stability of watercourses within the Southern Extension Area are predicted to be relatively minor and, as such, the potential for the Project to degrade the existing water quality within and downstream of the Southern Extension Area is also considered relatively minor. The predicted subsided landform indicates negligible changes to remnant ponding, with a total increase in area of approximately 3.6 hectares (i.e. an increase of less than 2 percent).

The maximum modelled flood depth for the 100 year ARI design storm event as a consequence of predicted subsidence is predicted to increase between 0.1 and 0.4 metres within the main channels of the watercourses.

The flooding regimes are unlikely to have a significant impact on the habitability or access to dwellings, with all of the identified dwellings within the Southern Extension Area outside of the modelled flood extent for the 100 year ARI design storm event, and no identified dwellings that are currently outside of the modelled flood extent for the 100 year ARI design storm event becoming inundated as a result of the predicted subsidence.

There is limited potential for changes to water quantities, including annual flow volumes, baseflows and environmental flows. On this basis, downstream users are unlikely to experience significant changes to water availability as a consequence of the Project.

It is concluded that the Project will not result in adverse cumulative impacts.

Flora and Fauna

RPS was engaged by Centennial Mandalong to undertake the assessment of the flora and fauna issues associated with the Mandalong Southern Extension Project. The Study Area adopted by RPS for this assessment comprised the Southern Extension Area and an additional area external to the Southern Extension Area covering the 26.5 degree of draw from the edge of proposed mine plan, totalling approximately 4,613 hectares. The remainder of the Project Application Area (to the north of the Study Area) was not assessed given that it comprises existing approved workings and infrastructure and there are no additional activities or disturbance proposed.

The activities associated with the Project that have been identified by RPS (2013a) to represent a potential impact to flora and fauna are construction of the Mandalong South Surface Site, subsidence and the increased discharge of water (from the underground workings of Mandalong Mine) into Muddy Lake at the Cooranbong Entry Site via LDP001.

RPS concludes that the Project will not significantly impact upon occurring or potentially occurring threatened flora, fauna and/or ecological communities within the Study Area.

The only ecological constraint to the mine layout is associated with those species reliant on surface water and groundwater within the surface watercourses. The proposed mine plan has been designed with varying longwall widths of between 160 metres and 200 metres to achieve manageable subsidence impacts to watercourses and avoid substantial changes to flows and ponding.

The consideration of the mine design in minimising impacts to watercourses subsequently mitigates potential impacts to those species reliant on the surface water and groundwater within the surface watercourses. Additionally, the orientation of longwalls sub-parallel to Wyee

Creek and Mannering Creek will assist in minimising subsidence impacts that could impact on water-dependent species.

To minimise and manage impacts associated with the construction of the Mandalong South Surface Site and access road, the following commitments are made:

- Centennial Mandalong will aim to minimise the area of clearing within the disturbance footprint.

- Vehicles and machinery will travel through a wheel-wash when leaving the construction site to help prevent soil-borne disease (Phytophthora), pathogenic fungus (Myrtle Rust) transmission and weed seed dispersal.

- Erosion and sediment control measures and surface water management controls will be installed, in accordance with *Managing Urban Stormwater Soils and Construction* (the Blue Book) *Volume 1* (Landcom 2004) and *Volume 2C Unsealed Roads* (DECC 2008), and monitored and maintained to prevent erosion and sedimentation and runoff impact on adjacent areas.

- Vegetation to be removed will be clearly marked using temporary fencing (flagging tape or similar) to delineate boundaries and minimise the potential for equipment to accidently enter areas to be retained.

- Vegetation adjacent to the disturbance footprint will be fenced (fauna friendly fencing) prior to construction activities to reduce damage from uncontrolled or accidental access.

- Material stockpiles will be established within already disturbed areas and not within areas of retained vegetation.

- Strict weed management, monitoring and control practices will be implemented to minimise the spread of exotic species.

- Revegetation of disturbed areas will be undertaken using locally occurring native plant species.

- Where possible, clearing activities will be timed to avoid removal of hollow-bearing trees during breeding season of threatened species.

An ecologist will be present to supervise vegetation clearing and ensure vegetation clearing, particularly the removal of hollow-bearing trees, is undertaken in the following manner:

- Hollow-bearing trees will be clearly marked (spray paint or flagging tape) by a qualified ecologist prior to any vegetation clearing commencing;

- Non-habitat vegetation will be removed at least one day prior to felling of hollow-bearing trees to encourage resident fauna to self-relocate before felling of remaining habitat trees;

- Immediately prior to the felling of hollow-bearing trees, trees will be given two sharp taps with the machinery arm/bucket to encourage fauna to escape. After waiting one to two minutes after tapping the tree, the hollow-bearing tree will be felled as gently as possible;

- An ecologist will inspect each felled hollow-bearing tree (once safe) to recover any injured fauna and seek appropriate treatment and relocate uninjured fauna into vegetation to be retained immediately adjacent to the site; and

- Felled timber will be left in place for one night after all other vegetation is removed to allow any remaining fauna to vacate hollows.

The Project proposes to clear approximately 15.6 hectares of MU 15: Coastal Foothills Spotted Gum - Ironbark Forest, which is not commensurate with any threatened ecological community listed under the TSC Act 1995 or EPBC Act 1999 (RPS 2013a). MU 15 is very common and widespread in the locality, occupying approximately 2,502 hectares within the Study Area and approximately 21,094 hectares between Ourimbah and Beresfield (NPWS 2003, cited in RPS 2013a). The proposed clearing, therefore, amounts to approximately 0.6 percent of the total available vegetation community within the immediate area and approximately 0.07 percent of the total available vegetation community within the region. None of the land proposed to be cleared contains threatened flora species or endangered ecological communities.

For these reasons, Centennial Mandalong is not proposing to provide a direct offset strategy. Rather, as a substantial landholder in the Mandalong Valley, Centennial Mandalong will develop a Land Management Plan for land owned by Centennial in the Valley. This plan will include the continuation of the following land management activities:

- Management of weeds and feral animals;

- Establishment and maintenance of suitable fencing for the exclusion of stock from riparian areas;

- Bushfire management;

- A rehabilitation program for riparian areas where an assessment has determined that rehabilitation activities will improve water quality in the creek systems;

- Provision of a nominal funding value towards research over the life of the Project into the habitat values of species likely to be impacted by the Project; and

- Provision of a nominal dollar amount for future maintenance of the land. This is to provide incentive to any future purchaser of the land to continue the land management activities.

Centennial Mandalong will report on the progress of works associated with the Land Management Plan annually in the Annual Review.

Aboriginal Heritage

RPS was engaged by Centennial Mandalong to undertake the assessment of Aboriginal heritage issues associated with the Mandalong Southern Extension Project.

Within the Southern Extension Area a total of 113 registered sites of Aboriginal cultural heritage significance have been identified. These sites are scattered across the area and therefore it is not possible to avoid undermining them entirely. The proposed mine plan has been adjusted or refined, where practical, to avoid or minimise the potential for impact on Aboriginal cultural heritage sites. This included, where possible, adjusting the widths of the

proposed longwalls and locating the Aboriginal sites over gate road pillars to minimise subsidence effects.

The mitigation and management commitments outlined below have been based on RPS's previous experience from other development sites and have been developed in consultation with the registered Aboriginal parties. Additional measures to manage potential impacts to Aboriginal heritage will be determined through the monitoring process outlined in Centennial's *Northern Holdings Aboriginal Cultural Heritage Management Plan* (ACHMP) (RPS 2012), which was also developed in consultation with the registered Aboriginal parties and is available for viewing on Centennial's website (www.centennialcoal.com.au). The effectiveness of mitigation measures and management strategies will be determined on an on-going basis throughout the Project and in consultation with the registered Aboriginal parties.

Exploration Activities

Prior to the commencement of exploration drilling, Centennial Mandalong will ensure that the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) is followed prior to the commencement of any on site works. Proposed drilling locations and associated access tracks will be inspected according to the protocols in the ACHMP (RPS 2012), which adheres to the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) and has been developed in consultation with the Registered Aboriginal Parties.

Sub-surface Archaeological Testing

Sub-surface archaeological testing will be carried out in Areas A, B and C prior to the construction of the Mandalong South Surface Site and access road in accordance with the guiding principles of the *Code of Practice* (DECCW 2010). If Aboriginal cultural heritage material is identified within these areas, the Aboriginal Cultural Heritage Management Plan (RPS 2012) will be implemented for the management of this material. In brief this may require application for a Care and Control Agreement from OEH and/or salvage of the artefact material.

Aboriginal Cultural Heritage Management Plan

All Aboriginal cultural heritage sites, including the 13 sites "likely" to be impacted by subsidence and the additional 15 sites that may "possibly" be impacted by subsidence, will be monitored and managed by Centennial Mandalong in accordance with Centennial's *Northern Holdings Aboriginal Cultural Heritage Management Plan* (ACHMP) (RPS 2012). The ACHMP, which was developed in consultation with the registered Aboriginal parties and relevant government agencies and approved by the DP&I in November 2012, will be reviewed and updated where required to take in to consideration the commitments made in this EIS and all relevant consent conditions. This will also be undertaken in consultation with the registered Aboriginal parties and relevant government agencies.

Installation of Fencing

A combination of silt and protective fencing will be installed prior to and/or during the construction of the Mandalong South Surface Site to ensure that run-off does not impact Aboriginal sites down slope of this area and that Aboriginal sites upslope are not inadvertently impacted by construction activities.

If further Aboriginal site(s) are identified in the Southern Extension Area, any surface works in the area will cease and a suitably qualified archaeologist and representatives from the registered Aboriginal parties will be contacted in order to ensure appropriate assessment and management.

Field Surveys

In relation to the small areas of land unable to be accessed by RPS for field surveys due to lack of landowner access agreements, Centennial Mandalong will attempt to obtain access for further field surveys by a suitably qualified archaeologist and representatives from the registered Aboriginal parties prior to mining activities commencing under those areas. Any new Aboriginal cultural heritage sites located will be recorded as required under legislation and monitored and managed in accordance with the protocols detailed in the ACHMP (RPS 2012).

Access Agreement

Centennial's land holdings within the Southern Extension Area contain a number of Aboriginal cultural heritage sites and through the *Heritage Impact Assessment* (RPS 2013b) and the ACHMP (RPS 2012) an opportunity has been identified to provide the Aboriginal community with access to a number of Aboriginal sites which would not have been otherwise possible.

As a strategy to offset the potential impacts on Aboriginal cultural heritage, Centennial will formalise an agreement to authorise access to suitable areas within its land holdings in the Southern Extension Area to the local Aboriginal community. This will provide the opportunity for cultural preservation, development, education and management of Aboriginal cultural heritage sites. The strategy will be supported via the Aboriginal community consultation and engagement framework provided in the ACHMP (RPS 2012).

Non-Indigenous Heritage

Non-Indigenous heritage issues associated with the Mandalong Southern Extension Project were assessed by RPS as a component of the *Heritage Impact Assessment* (2013).

RPS (2013b) concludes that the non-Indigenous cultural heritage sites recorded in the Southern Extension Area have no local or State significance and, therefore, do not requiring listing in any heritage database/register. Sites SF20 and OSF27 are outside the proposed mine plan and will not be undermined. OSF30 no longer exists and the landing skids are unlikely to be impacted by the predicted subsidence levels.

The disturbance footprint for the Mandalong South Surface Site, including the access road and power easement, comprises approximately 20 hectares. While RPS (2013b) did not identify any non-Indigenous heritage sites within this disturbance footprint, the Landing Skid 2 has the potential to be impacted during the construction, as a result of surface disturbance works associated with the construction of the site.

RPS (2013b) advises that if it is not possible to avoid harming the skid it should be archivally recorded by a qualified historical archaeologist prior to impact.

Air Quality

An air quality impact assessment has been undertaken by SLR for the proposed Mandalong Southern Extension Project.

A detailed assessment of the background concentrations in the area surrounding the Project Application Area was performed. SLR (2013a) determined a regional background concentration and added a contribution from local power stations. A further contribution from Project activities to the background dataset was added in order to provide information on the cumulative impact of Project activities on the air quality within the local area.

Dust Deposition

The modelling results indicate that incremental and cumulative annual average dust deposition rates at all nominated residences/properties surrounding the existing Mandalong Mine Access Site and proposed Mandalong South Surface Site are predicted to be well below the incremental increase in dust deposition criterion of 2 g/m2/month and below the cumulative dust deposition criterion of 4 g/m2/month for all three scenarios. Given that the nominated residences/properties were chosen as being indicative of all surrounding residences/properties, SLR concludes that cumulative dust deposition levels at residences/properties surrounding those modelled would also be below the relevant criterion of 4 g/m2/month.

Total Suspended Particulates – Annual Average

The annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m3 at all identified sensitive receptor locations for Scenarios 1, 2a and 2b. As the nominated residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, SLR concludes it is unlikely that annual average TSP concentrations at other residences and properties surrounding these modelled residences would exceed the EPA criterion of 90 µg/m3.

Particulates as PM10 – Maximum 24-Hour Average

The maximum 24-hour average PM10 increment from the Project is predicted to be 29 µg/m3 at receptor R7. The predicted maximum cumulative concentrations, which represent the maximum of the sum of concurrent increments of regional background, power stations and the Project, are predicted to be below the criterion of 50 µg/m3 at all identified sensitive receptor locations for Scenarios 1, 2a and 2b. Further investigation by SLR (2013a) revealed that the cumulative maximum 24-hour average concentrations are dominated by the background concentrations, which contribute up to 85 percent for Scenario 1 and up to 96 percent for Scenarios 2a and 2b.

Particulates as PM10 – Annual Average

Annual average PM10 concentrations are predicted to be below the criterion of 30 µg/m3 at all identified sensitive receptor locations for Scenarios 1, 2a and 2b. As the nominated residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, SLR (2013a) concludes it is unlikely that annual average PM10 concentrations at other residences and properties surrounding these modelled residences would exceed the EPA criterion of 30 µg/m3.

Particulates as PM2.5 – Maximum 24-Hour Average

The predicted maximum 24-hour average PM2.5 cumulative concentrations for Scenario 1, which represent the maximum of the sum of concurrent increments of regional background, power stations and the Project, are predicted to exceed the advisory reporting standard of 25 µg/m3 at three nominated receptors (R6, R7 and R8) surrounding the existing Mandalong Mine Access Site by up to 25 µg/m3. SLR predicts that the source of related PM2.5 emissions from the Project is the existing ventilation fans at the Mandalong Mine Access Site. The majority of the ventilation air for the mine is drawn in through the men and materials drift located at the Mandalong Mine Access Site adjacent to the Sydney-Newcastle F3 Freeway, which is likely to already contain elevated levels of PM2.5 from traffic along the Freeway.

The particulate sampling undertaken from the ventilation fans at the Mandalong Mine Access Site was unable to differentiate between the particulate emissions drawn into the mine from the Freeway and those generated by the underground operations alone.

To ensure the workforce operating underground are not exposed to elevated PM2.5 levels, Centennial Mandalong:

- Utilises a low sulphur diesel, which is a premium grade diesel that results in lower emissions of particulate matter and sulphur dioxide;

- Ensures diesel engines conform to the United States EPA Tier 3 standards for exhaust emissions; and

- Ensures all machines are fitted with particulate filter assembly units.

These measures are current best practice standards for the underground coal mining industry in Australia for reducing PM2.5 emissions.

The predictive model for Scenario 1 shows that the background concentrations contribute up to 88 percent (at R22) of the total cumulative concentrations. The exceedance of the PM2.5 advisory reporting standard at receptor R7 is shown to be marginally dominated by the Project, with the Project contributing 51 percent to the total predicted concentration.

The predicted maximum 24-hour average PM2.5 cumulative concentrations for Scenarios 2a and 2b are also predicted to exceed the advisory reporting standard of 25 µg/m3 at the same three receptors (R6, R7 and R8) near the existing Mandalong Mine Access Site. The source of related PM2.5 emissions from the Project is again the existing ventilation fans (SLR 2013a). For Scenarios 2a and 2b, the predictive model shows that the background concentrations contribute up to 83 percent (at R11) of the total cumulative concentrations.

Particulates as PM2.5 – Annual Average

Annual average PM2.5 concentrations are predicted to be below the advisory reporting standard of 8 µg/m3 at all identified sensitive receptor locations for Scenarios 1, 2a and 2b. As the nominated residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, it is unlikely that annual average PM2.5 concentrations at other residences and properties surrounding these modelled residences would exceed the 8 µg/m3 standard.

Odour

The adopted 99th percentile 1-hour average odour criterion of 4 OU is predicted to be exceeded at eight sensitive receptors during Scenarios 1, 2a and 2b. These eight receptors are identified as R1 to R3 and R6 to R10, which are all located in the vicinity of the existing Mandalong Mine Access Site.

The exceedances are due to the operation of the existing ventilation fans at the Mandalong Mine Access Site, which represents an existing impact rather than a change in impact as a result of the Project.

While the odour concentrations are predicted to exceed the adopted criterion, SLR (2013a) advises that attention should be given to the characteristics of the odour. From the odour monitoring undertaken in August 2012, it is noted that the characteristics of odour experienced from the existing ventilation fans were mostly yeast, exhaust and metallic in character. In addition, a "Community Odour Diary" has been issued to the community through the Mandalong CCC in order to monitor and record any odour issues in the community surrounding the Mandalong Mine Access Site.

The odour diaries provided to Centennial Mandalong indicate that the odours experienced in the area are chicken manure, "Weetbix" and bush fire in character. Since commencement of

operations of the ventilation fans at the Mandalong Mine Access Site, there have been no complaints associated with odour. Based on the odour monitoring and Community Odour Diary, SLR concludes that the odour from ventilation fans is likely to be non-offensive to the community.

No exceedances of the odour criteria are predicted at the sensitive receptors surrounding the proposed Mandalong South Surface Site.

Nitrogen Dioxide (NO2)
The maximum 1-hour average and annual average nitrogen dioxide concentrations are predicted to be below the project criteria of 246 µg/m3 and 62 µg/m3, respectively, at all the sensitive receptors during Scenarios 2a and 2b. There is no nitrogen dioxide emissions associated with Scenario 1.

Carbon Monoxide (CO)
The maximum 1-hour average and 8-hour average carbon monoxide concentrations are predicted to be below the project criteria of 30 mg/m3 and 10 mg/m3, respectively, at all the sensitive receptors during Scenarios 2a and 2b. There is no carbon monoxide emissions associated with Scenario 1.

Sulphur Dioxide (SO2)
The maximum 1-hour average, 24-hour average and annual average sulphur dioxide concentrations are predicted to be below the project criteria of 570 µg/m3, 228 µg/m3 and 60 µg/m3, respectively, at all of the sensitive receptors during Scenario 2b. There are no sulphur dioxide emissions associated with Scenario 1 or Scenario 2a.

Noise
A noise impact assessment has been undertaken by SLR for the proposed Mandalong Southern Extension Project.

Centennial Mandalong will continue to employ the mitigation measures and management strategies currently adopted at the Mandalong Mine, as relevant to the Project, to minimise noise emissions. These are standard work procedures to minimise noise emissions, maintaining plant and equipment to ensure optimal operating conditions, and assessing the sound power levels when purchasing new plant and equipment. The fan evasee will also be designed and installed to be directed away from the closest sensitive receptors to minimise potential noise impacts.

The following additional noise mitigation and management commitments are made:

Noise Monitoring
Mandalong Mine's currently approved and implemented EMS, including the *Noise Monitoring Program,* will be reviewed and updated for the Mandalong Southern Extension Project. The review will take into consideration the findings and conclusions of the noise impact assessment, the commitments made in this EIS and all relevant consent conditions. As part of this review, Centennial Mandalong proposes to expand the existing noise monitoring program, which currently comprises annual operator-attended monitoring in the vicinity of the Mandalong Mine Access Site, to include quarterly operator-attended noise monitoring at and around the Mandalong South Surface Site to confirm the noise levels predicted by SLR. The optimal location for this additional monitoring will be determined in consultation with a suitably qualified consultant.

Centennial Mandalong will continue to report noise monitoring results on a monthly basis on Centennial's website and on an annual basis in the Annual Review.

Temporary Construction Noise Barrier

To provide acoustic shielding for the shaft sinking activity at the Mandalong South Surface Site, a temporary barrier measuring seven metres high and 20 metres long will be installed at a distance of 20 metres from the drill rig at the intake shaft site.

Construction Management Plan

As recommended by SLR (2013b), a Construction Management Plan will be developed for the construction phase of the Mandalong South Surface Site. The following noise mitigation and noise management procedures, among others, will be incorporated into the Construction Management Plan:

- Where and when possible, construction equipment with reduce sound power levels will be sourced and used.
- Where necessary, and in consultation with potentially affected residents, temporary noise barriers will be established and maintained.
- Where and when possible, noisy equipment will be oriented away from noise sensitive receivers.
- Site personnel will be advised of noise compliance limits and the practical measures that can be undertaken to limit noise generation during their activities. This will include avoiding unnecessary use of radios and stereos and turning off plant and equipment when not in use.
- Internal traffic flow will be directed to minimise the need for reversing and, as such, the use of reversing alarms.
- Tipping actions and stockpiles will be positioned as far away from residential locations as possible.
- Rigid dump trucks used to haul waste material from the Mandalong South Surface Site during construction will be limited to recommended standard construction hours.
- Consultation with potentially-affected residences regarding the timing of acoustically significant events will be undertaken and, where possible, construction during the most sensitive times of the day will be limited.
- Rock hammering will be restricted to between the hours of 8.00 am and 4.00 pm Monday to Friday and between 9.00 am and 1.00 pm Saturday (no rock hammering on Sundays or public holidays).
- Any complaints in relation to construction noise will be promptly responded to and, where possible, measures implemented to avoid a recurrence of the issue.
- Noise monitoring within the construction site and at neighbouring property boundaries.

All potentially affected residents will be informed of the following prior to the commencement of acoustically significant construction activities at the Mandalong South Surface Site:

- The nature and duration of the works to be carried out;
- The expected noise levels; and
- Relevant contact details for site personnel.

Exploration Activities

The proposed exploration drilling activities will be undertaken within the bounds of Centennial Mandalong's mining leases and exploration licences, and in accordance with the requirements of the ICNG (DECC 2009). Consultation with potentially noise affected landholders will be undertaken in accordance with a Stakeholder Engagement Strategy in which all neighbouring landholders and any residents within 450 metres of a drill rig are notified of the timing, location and anticipated duration of the exploration drilling activities. Where drilling is to be undertaken in close proximity of residents, the following noise mitigation measures will be implemented:

- Temporary noise barriers will be established and maintained;
- Drilling will be undertaken adopting rotary methods with water circulation (rather than compressed air); and
- Avoiding the unnecessary use of radios and stereos.

Traffic and Transport

Intersect Traffic (Intersect) was engaged by Centennial Mandalong to undertake the assessment of traffic and transport related issues associated with the Mandalong Southern Extension Project.

In conclusion, Intersect (2013) advises that the proposed Mandalong Southern Extension Project will not adversely impact the local road network.

Construction Management Plan

As recommended by Intersect (2013), a Construction Management Plan will be developed for the construction phase of the Mandalong South Surface Site. The traffic management strategies adopted will aim to minimise the impacts of the construction works on the local road network and ensure suitable safe conditions throughout the construction period. Measures will include:

- The installation of temporary signage and line marking;
- Regulated construction and delivery times and periods;
- The provision of suitably qualified traffic marshals (where and when required);
- Implementation of appropriate dust and noise mitigation measures; and
- Appropriate temporary works, such as road shoulder sealing or construction accesses (where and when required).

Proposed Mandalong South Surface Site Entrance

As recommended by Intersect (2013), the access intersection from Mandalong Road to the proposed Mandalong South Surface Site will be constructed as an at-grade (two roadways joining at the same level) BAR/CHL intersection (basic right turn treatment / channelised left

turn) providing a left turn turning lane into the site. The intersection will be constructed in accordance with *Guide to Road Design Part 4A – Design of Unsignalised and Signalised Intersections* (Austroads 2009).

The final location and construction of the intersection will be subject to detailed engineering design and approval from LMCC. This will include ensuring appropriate sight distances along Mandalong Road and appropriate turning templates for heavy vehicles.

Road Dilapidation Report

Centennial Mandalong, in consultation with LMCC, will undertake a road dilapidation review on completion of construction activities to identify areas of road pavement deterioration requiring maintenance treatment that could be directly attributed to the construction activities. Any areas identified as requiring repairs will be rehabilitated to Council's satisfaction by Centennial Mandalong.

Visual Amenity

A visual impact assessment has been undertaken by Green Bean Design (GBD) for the proposed Mandalong Southern Extension Project in order to determine the likely visual significance of the Project on people living and working in, or travelling through, the surrounding landscape. The assessment focussed on the proposed Mandalong South Surface Site, as the most visible component of the Project, in terms of the extent and nature of the potential visual significance of the proposed surface infrastructure on surrounding areas. The remainder of the Project Application Area was not assessed given that there are no items of additional surface infrastructure proposed beyond what has been previously approved.

GBD (2103) concludes that the Project, specifically the proposed Mandalong South Surface Site and access road, will have a negligible to low visual impact on people living in or travelling through the area.

This is attributed to the following:

- The majority of view locations surrounding the proposed surface site, including sensitive rural residential view locations, will experience a negligible to low visual impact.

- The proposed surface site will not be visible from more distant urban centres including Wyee and Morisset or the Sydney-Newcastle F3 Freeway.

- The proposed surface site will be located within a landscape context of sloping and ridgeline landforms with moderate to dense tree cover, which will combine to result in a negligible to low magnitude of visual significance.

- Landform and tree cover will result in a high visual absorption capability for the existing landscape to accommodate the proposed surface site.

- Existing mature tree planting surrounding residential dwellings and the proposed surface site will provide screening and visual filtering to the proposed infrastructure.

- There are no significant views toward the proposed surface site from formal public lookouts, and distant public vantage points are unlikely to be visually impacted.

- Distant views (in excess of 3 kilometres) toward the proposed surface site are likely to be influenced by atmospheric conditions which will tend to further reduce visibility.

While the overall visual significance of the Project is likely to be negligible to low, Centennial Mandalong will implement the following mitigation measures to further minimise the potential for visual impact.

Infrastructure
Where possible, infrastructure items will be dark in tone and constructed of non-reflective materials to assist in minimising the potential for visual contrast between the surface sites and surrounding landscape.

Landscape works
Landscape works, such as shrub and tree planting, will be undertaken to increase the level of existing screening toward the surface site and access road. Such landscaping will be undertaken.

Project Benefits
Benefits of the Project include:

- Sustaining the current and expanded workforces at Mandalong Mine.
- The mine plan has been designed to maximise resource recovery while at the same time minimising subsidence and associated impacts on the natural and built environment and mitigating impact on social amenity.
- The majority of the Southern Extension Area will remain unchanged as a result of the Project. This includes existing land use, rural characteristic, the manner in which residents and visitors access and move around the area, and the aesthetic quality of the area.
- The impact to social amenity across the Southern Extension Area will be minimal, with no change to the day to day life of residents. There will be no additional demand for services or facilities.
- Improved water management across the Project and at the Cooranbong Entry Site, which will improve water quality by increasing the settling of water prior to discharge, reducing total metal concentrations and indirectly mitigating dissolved metal concentrations.
- Scope for the continued trialling of the ventilation air methane regenerative after burner (VAM-RAB) technology as a viable strategy for the capture and abatement of ventilation air methane (VAM) from underground mining operations in the future.
- The opportunity to provide the Aboriginal community with access to Centennial-owned land within the Southern Extension Area that comprises a number of Aboriginal sites.
- The opportunity to develop and implement a mutually agreeable planning agreement with Lake Macquarie City Council, which is aimed at providing and/or improving public amenities and public services.

Mandalong Mine's current Development Consent DA 97/800 expires on 14 October 2019 and Centennial Mandalong expects to have extracted the final approved longwall panel at Mandalong Mine in 2018. Expiration of the development consent and cessation of mining would necessitate the closure of Mandalong Mine, with all economic and related benefits ceasing beyond this time.

The Project will facilitate the recovery of additional economic and valuable coal reserves that are high in heat energy and low in ash content, making it ideal for electricity generation. The Project will enable the on-going underground mining operations and continuity of coal production beyond the currently projected life of mine. It will maximise the use of existing underground and surface infrastructure.

There are benefits in terms of the continued operation of Mandalong Mine and the associated revenues. The current and expanded workforces that will be sustained by the Project will benefit, and the incomes that they derive will result in further induced benefit across the regional community as a result of the "pay packet effect" of the consumption activity of these employees in local and regional economies (Aigis Group 2013). The total number of employees at Mandalong Mine will increase by 115 full-time equivalent employees, from the current 305 full-time equivalent employees to 420 full-time equivalent employees. Up to an additional 50 contractors (12 full-time equivalent positions) will be employed during longwall moves. Furthermore, the construction program for the proposed Mandalong South Surface Site will result in the employment of 35 contractors (on average) over the total 2.5 year construction program.

In addition to the direct economic benefits, there will be broader benefits to the State in the form of royalty revenues and taxes associated with the continuation of coal production at Mandalong Mine. The net economic benefit of the Project for the State and regional communities is positive, at a net present value (NPV) of $665 million.

The extended economic analysis under by Aigis Group (2013) by applying output and employment multipliers for mining and mining-related services indicates that the estimated net benefit of the Project ($665 million) would result in extended economic effects of approximately 2.1 to 4.4 times the initial stimulus, dependent on the economic measure being considered. Employment of the magnitude of approximately 2.7 to 4 times the economic stimulus would also result (Aigis Group 2013). These indirect positions represent employment supported in the broader economy as a result of the demand for additional goods and services related to the Project.

In Summation

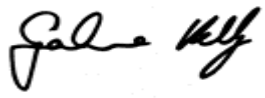
The Mandalong Southern Extension Project has been assessed in this EIS in accordance with the EP&A Act, the DGRs, correspondence from other government agencies and the outcomes of community consultation. It is concluded that the overall balance of environmental, social and economic impact of the Project is positive.

The potential environmental impacts of the Project have been minimised by the iterative process Centennial Mandalong has undertaken to develop and refine the mine design to minimise subsidence and associated impacts. The Project, as designed, represents the best of the alternatives considered when taking the economic, environmental and social impacts and benefits in to consideration.

The Project will enable the on-going operations and continuity of coal production beyond the currently projected life of Mandalong Mine. The net impact of the Project to the local, regional

and NSW communities, and to the National economy, will be positive. The impacts to existing land use, social amenity and aesthetic quality within the Project Application Area will be minimal, and there will be no additional demand for services or facilities. On this basis, it is concluded that the potential impacts associated with the Project are of a significantly lesser magnitude than the benefits that will be generated by the Project.

The Union considers that, this Project is consistent with currently approved Development Consent objectives of the EP&A Act, and therefore strongly supports the proponent's application and asks for the consent to be granted in the form sought by the Proponent.



Grahame Kelly
DISTRICT SECRETARY