Ditton Geotechnical Services Pty Ltd
82 Roslyn Avenue Charlestown NSW 2290
PO Box 5100 Kahibah NSW 2290

DgS
Ditton Geotechnical Services

4 July, 2014

Mr Mark Robinson
West Wallsend Colliery
The Broadway
Killingworth NSW 2278

Report No. WWD-012/16c

Dear Mark,

Subject: Review of Environmental Assessment on the Proposed LWs 51 and 52 - Response to Lake Macquarie City Council Objection

As requested, Ditton Geotechnical Services Pty Ltd (DgS) has prepared a response to the objection raised by Lake Macquarie City Council (LMCC) regarding the sub-surface fracture height assessment for the proposed longwalls 51 and 52 presented in DgS Report No. WWD-012-16 (dated 15.12.13) [**DgS, 2013**].

It is understood that LMC considers that the assessment in the DgS Report that the potential for the height of connective cracking to occur above LW51 is 'Unlikely' is not acceptable, based on the inference that the probability of a prediction exceedance for the likelihood category of occurrence is defined as 5 - 10%.

Reference to *Table 7* in **DgS, 2013** provides the definition of 'Unlikely' as an event that is "conceivable, but only if adverse conditions are present." The probability of such as event occurring is 5-10% in the context of the prediction model used, and infers 1 in 10 to 1in 20 chance of an exceedance.

It should be understood however, that the chance of surface to seam connection also requires "adverse geological conditions" to be present, which may be assumed to mean the presence of significant geological structure and/or the absence of swelling tuffaceous claystones between the A-Zone and Surface Cracking Zone.

The assessment of the study area at the time of report preparation considered that the geological conditions were probably not "adverse", due to the following observations:

- Development headings in the LW51 panel area did not encounter any geological structure of significance (i.e. a fault with throws > 1 m).

- There are several tuffaceous claystone beds within 30 m of the surface.

ABN 43 113 858 910 ACN 124 206 962
Ph: 02 4920 9798 Mob: 0413 094074
Email: steve.dgs@westnet.com.au

- The coincidence of the low depth of cover area above the panel with the toe of a steep slope that is likely to result in compressive strain to develop at the surface instead of tensile strains.

- This is then likely to result in low angle shear cracking to depths < 5 m instead of high angle tensile cracks extending for depths up to 10 or 12 m. Note also that recent observations above LW42 has identified tensile cracking on steep slopes of < 7.5 m.

Despite the apparent absence of adverse geological conditions for LW51, actual mining experiences at WWC at a cover depth of 80 m were not available.

So, as a further precautionary measure, it was proposed to reduce the longwall face height to the practical minimum limit of 3.6 m where cover depths above the panel were < 90 m.

Since the DgS report was submitted for review, LWs 41 and 42 have successfully undermined several Diega Creek tributaries at average cover depths between 80 m and 90 m with no surface connectivity occurring. It is therefore concluded that the geological and topographical conditions above LW51 are indeed favourable so that surface to seam connectivity may almost certainly be ruled out with the mining height reduction proposed.

In regards to the application of the U95%CL values when estimating the fracture heights for LW51, it should be understood that if a higher confidence limit on the predictions is applied (say 99%CL or 2 standard deviations (sd) instead of 1.65 sd), then the error in the predictions is likely to become **too high** and the model will start to predict "false positives" or surface to seam connectivity, when experience to-date strongly infers that it won't (for the known geological conditions and mining geometry).

The point here is that the empirical model is already calibrated to measured heights of fracturing for a given mining geometry and geology and therefore has an adequate or reasonable allowance for natural variation built into it. Further, the application of the 95% confidence limit concept is intended to demonstrate that it is really only possible to provide "credible maximum values" due to the uncertainties inherent in predicting the response of the rock mass to mining.

Therefore, in consideration of:

(i) the measured heights of fracturing above LWs 39 to 41 were predicted by the models 'mean' values (and not the U95%CL values),

(ii) recent mining successes in low cover depth areas above LWs 41 and 42 and

(iii) the depth of cracking and strains are likely to be < 5 m and compressive respectively along the toe of the slope in the low cover depth area for LW51,

it is concluded that the height of sub-surface fracturing above LW51 (and 52) based on U95%CL values are conservative and the probability of surface to seam connectivity is now 'very unlikely' to occur.

For and on behalf of
Ditton Geotechnical Services Pty Ltd

Steven Ditton
Principal Engineer and Director
BE(Civil/Hons) C.P.Eng(Civil), M.I.E.(Aust)

NPER 342140

References:

DgS, 2013. **Subsidence Predictions and General Impact Assessment of the Proposed Southern Domain Longwalls 51 and 52, West Wallsend Colliery.** DgS Report No. WWD-012/16 (15/12/13).

WEST WALLSEND UNDERGROUND

GLENCORE

1 August 2014

Jessie Evans
Mining Projects
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Jessie

Re: West Wallsend Colliery Proposed Longwall 51 & 52 Project (Modification 1) – Additional Commitments in response to NOW and OEH Submissions on the Response to Submissions Report

The West Wallsend Colliery Proposed Longwalls 51 and 52 (the Project) Environmental Assessment (EA) was placed on public exhibition from 4 April 2014 to 21 April 2014. Following the exhibition period, the NSW Office of Water (NOW) provided a submission on the Project, dated 10 April 2014 and the NSW Office of Environment and Heritage (OEH) provided a submission dated 21 March 2014.

West Wallsend Colliery (WWC) submitted a Response to Submissions Report on the Project in June 2014. In response, NOW and OEH provided further comment on the Response to Submissions Report on 1 July 2014 and 30 June 2014 respectively. Further discussions regarding the issues raised in these submissions have been held with both agencies. This letter outlines additional commitments made by Oceanic Coal Australia Limited (OCAL) as an outcome of these discussions.

NOW Submission

The key issues raised in the NOW submission related to groundwater assessment and management, and water take and associated licensing requirements.

NOW identifies in its submission that it accepts that a numerical model is not required to support the determination of the Project, however, requests a commitment or condition of approval that requires further groundwater modelling to standards agreed with NOW. Accordingly, OCAL makes the following commitment:

- *OCAL will prepare a groundwater model for the Project in consultation with NOW and to the satisfaction of DP&E to inform discussions with NOW regarding groundwater licensing. This model will be prepared within 6 months of the approval of the Project.*

The NOW submission also raised several issues related to licensing. It is understood that NOW will write to OCAL separately regarding the licensing of the currently approved operations, but also recommends that OCAL obtain a licence for the alluvial water sources whilst the further modelling is being undertaken. Accordingly, OCAL makes the following commitment:

PO Box 4186, Edgeworth, NSW 2285
The Broadway, Killingworth, NSW 2278
T + 61 2 4941 2100 F + 61 2 4955 2314 www.glencore.com

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Manager and Agent of the Macquarie Coal Joint Venture

- *Whilst further groundwater modelling is being completed for the Project to inform licensing requirements, OCAL will obtain a Water Access Licence for alluvial groundwater sources relevant to the Project as an interim measure.*

As outlined in the Response to Submissions report, OCAL will continue attempts to obtain all relevant water licenses to cover the take of groundwater for its existing operations, in consultation with NOW. OCAL will work with NOW to seek to resolve the licence application made to NOW in 2009 as soon as possible.

OEH Submission

The key issues raised in the OEH submission related to subsidence impacts including surface cracking and remediation, and groundwater impacts and connective cracking. OCAL has undertaken further consultation with OEH regarding these issues and as an outcome of this consultation makes the following commitments:

Surface Cracking

- *OCAL will complete a field trial of the revised subsidence remediation procedures at WWC in consultation with OEH and to the satisfaction of DP&E prior to the commencement of longwall extraction (secondary extraction) in LW 51 and LW 52.*

Groundwater Impacts and Connective Fracturing

- *OCAL will develop and implement groundwater and connective fracturing monitoring programs for the Project in consultation with OEH and to the satisfaction of DP&E. The groundwater monitoring program will include monitoring locations within the Project Area, subject to the approval of OEH for the required works to install the monitoring equipment in the SSCA. The monitoring programs will be developed and submitted to DP&E for approval within 6 months of the approval of the Project.*

OEH has provided feedback to OCAL on some specific aspects of the monitoring program, with work on determining the approach to the monitoring program underway.

We would be happy to provide any further clarification of the above additional commitments if required. In this regard, please don't hesitate to contact Mark Robinson on 0439 131 585, if you have any questions.

Yours sincerely

Mark Robinson
Approvals Manager – West Wallsend Colliery
Oceanic Coal

PO Box 4186, Edgeworth, NSW 2285
The Broadway, Killingworth, NSW 2278
T + 61 2 4941 2100 F + 61 2 4955 2314 www.glencore.com

Oceanic Coal Australia Pty Ltd ABN 39 003 856 782
Manager and Agent of the Macquarie Coal Joint Venture

WEST WALLSEND UNDERGROUND

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12 June 2014

The General Manager
Lake Macquarie City Council
Box 1906
Hunter Region Mail Centre NSW 2310

Attn: Georgie Williams, Senior Development Planner
Steve Brown, Manager Planning

Re: West Wallsend Colliery Proposed Longwall 51 and 52 Modification – Additional Information for Lake Macquarie City Council

Dear Steve and Georgie,

On 22 May 2014, OCAL met with representatives from Lake Macquarie City Council (LMCC) to discuss concerns in relation to the proposed Longwall (LW) 51 and LW 52 (the Project) at West Wallsend Colliery (WWC), as outlined in the submission dated 19 March 2014.

During the meeting, concerns in relation to connective cracking as a result of underground mining were raised and it was indicated that LMCC's Ecosystem Enhance Team (and therefore LMCC) did not support the Project in its current form on these grounds. LMCC's Ecosystem Enhancement Team requested that consideration be given to the use of an alternate mine plan. As discussed in the meeting, OCAL has investigated alternative mine plans and no economically viable alternatives are available for the Project. It is also noted that the Division of Resources and Energy (DRE), as the key government agency responsibility for mining and subsidence in NSW and with the expertise to technically review such issues, has reviewed the Project and has no objections or concerns regarding the Project or its subsidence impacts.

If LMCC maintain their objection to the Project, the proposed modification will be referred to a Planning and Assessment Commission (PAC). This process may add considerable time to the approval process. There are no other issues or submissions that would trigger a PAC review of the Project. It is OCAL's preference to resolve these issues with LMCC prior to the finalisation of the Department of Planning and Environment's (DP&E) assessment of the Project. OCAL have responded to LMCC's concerns through the Response to Submissions report and we understand that DP&E will be seeking advice from LMCC on their final position regarding this Project. This letter provides additional information in relation to concerns raised in the meeting held on 22 May 2014, building on the information provided in the Response to Submissions report.

PO Box 4186, Edgeworth, NSW 2285
The Broadway, Killingworth, NSW 2278
T + 61 2 4941 2100 F + 61 2 4955 2314 www.glencore.com

Oceanic Coal Australia Pty Ltd ABN 39 003 856 782
Manager and Agent of the Macquarie Coal Joint Venture

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Connective Cracking and Previous Subsidence Event at West Wallsend Colliery

Connective cracking as a result of subsidence is cracking due to coal extraction at depth that passes upwards through strata units and allows a direct hydraulic/air connection from the surface to the mine workings below. Connective cracking may result in a number of serious environmental and safety implications due to the ability of air and water to reach underground workings from the surface.

It is noted that the safety of underground miners is of the utmost importance to OCAL. The mine plan for the Project has been developed to maximise resource recovery as required under the mining lease conditions whilst minimising potential for connective cracking as OCAL will not place underground miners at unacceptable levels risk. We also note that it is a requirement of the Project Approval for WWC that no connective cracking occurs and that all of the existing approved mining operations and the Project have been designed to achieve this aim.

Representatives of LMCC have made reference to Newstan Colliery and a previous incident related to connective cracking. The connective cracking at Newstan is thought to have been a specific interaction with significant geological features, namely a fault, sub-parallel to the longwall face with >2.5m displacement. No evidence of a feature of this type and dimension is present within the LW 51 or LW 52 mining area. Mining operations have been undertaken adjacent (on three sides) to the proposed LW 51 and LW 52 area which have contributed to a high level of confidence in the geological knowledge in the area. The mine plan has been developed to avoid areas of low depth of cover, where there may be higher potential for connective cracking to occur.

LMCC has indicated that OCAL's recent subsidence incidents at LW41 demonstrate that monitoring and mitigation measures are unable to adequately manage environmental risk. OCAL does not agree with this statement. A detailed review of the LW41 subsidence incidents has been completed by OCAL and also by a high-level interagency working group, the Sugarloaf Safety and Remediation Committee (SSRC) consisting of DP&E, OEH, DRE and the EPA.

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

As outlined in the EA, the LW41 subsidence event occurred as a result of anomalous subsurface fracturing due to unknown geological conditions, with these features resulting in unpredicted movement as mining progressed through the area. The steepness of the topography above LW41 was also a causative factor and the terrain

above LW51 and 52 is much more undulating. As also discussed in the EA, underground and surface geological mapping work has not detected any significant geological structure of concern in the Project Area and therefore the geological conditions that led to the unpredicted subsidence events above LW41 are not predicted to occur in the Project Area. The subsidence assessment for the Project has identified that if present, differential subsidence due to the Project is unlikely to generate VBM's greater than 1 metre deep based on the features observed on similar terrain to the north. It is also noted that the Vertical Block Movement above LW41 is not related to a connective cracking issue. LW41 has also mined to 80m depth of cover with no connective cracking. This is the same depth of cover proposed for LW51 and 52.

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

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

OCAL believes that these risks can be effectively managed through the range of measures that OCAL has committed to and in accordance with the requirements of NSW government agencies.

Application of the Precautionary Principle

LMCC have suggested that the precautionary principle should be applied in the determination of the Project. As outlined in the EA, the Environmental Planning and Assessment Regulation 2000 defines the precautionary principle as:

> 'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:
>
> (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
> (ii) an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, the EA undertook an extensive evaluation of all the key components of the Project, including subsidence. Detailed assessment of key issues and necessary management measures has been conducted and is documented in the EA.

The assessment process has involved a detailed study of the existing environment and the use of engineering and scientific modelling and investigation, to assess and determine potential impacts as a result of the Project.

The decision making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- Government authorities, landholders potentially affected by the proposed development, the local community, the Aboriginal community and other stakeholders were consulted during EA preparation. This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures;

- OCAL has designed and implemented a comprehensive Environmental Management System (EMS), and related environmental management programs, that seek to minimise the potential environmental and social impacts of its operation. The Project will incorporate the practices implemented and demonstrated to be effective at WWC and has built on learnings from past monitoring programs and liaison with stakeholders. The existing EMS will be revised to incorporate the additional controls outlined in this EA;

- the EA was undertaken on the basis of the best available scientific information for the Project Area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty; and

- an auditing and review process is an integral component of the EMS at WWC providing for verification of project performance by independent auditors and relevant government agencies. The Project will implement an auditing and verification process consistent with that currently undertaken at the current WWC operations and as required by the existing WWC Project Approval.

As discussed in the EA and above, during past mining at WWC in LW 41, some unpredicted subsidence events occurred. The learnings from these unpredicted events have been incorporated into the Subsidence Assessment conducted by DGS for this Project. This includes the potential for VBM's associated with discontinuities in the strata and rigid block rotation being incorporated into the subsidence model resulting in the most up-to-date local scientific knowledge for subsidence being used to complete this assessment, further details are provided below.

Subsidence Predictions

A detailed Subsidence Assessment has been completed for the Project by Ditton Geotechnical Services Pty Ltd (DGS). The subsidence assessment is considered to have been prepared in a conservative manner in accordance with the precautionary principle.

The Subsidence Assessment (DGS, 2013) identifies that the predicted height of fracturing within LW 51 where the depth of cover is 90 metres, is 63 metres to 75 metres. The predicted height of fracturing within LW 51 at the 80 metres cover depth is 55 metres to 66 metres (Table 9 of Appendix 3 of the EA).

These predications are considered the credible worst case and have been developed with a high level of conservatism. Therefore, it is unlikely that the height of fracturing experienced within LW 51 and LW 52 will realise the upper limit of the predictions.

Recent mining in the adjacent LW 44 and LW 45 have shown that actual subsidence has been considerably less than the predictions. Recent monitoring has indicated the development of subsidence cracks up to three metres in depth, which is substantially less than the 10 metres cracking depth used in modelling to determine the risk of connective cracking for LW51 and 52. It is anticipated that due to the similar geology and landscape, similar subsidence would be anticipated within LW 51 and LW 52. This adds weight to the precautionary approach taken by West Wallsend Colliery.

Mine Plan Modifications

In order to minimise the potential for connected cracking to occur within LW 51 and LW 52, OCAL will reduce extraction heights where depth of cover is shallower and there is a higher risk of connected cracking. The maximum mining height within LW 51 and LW 52 will typically range from approximately 4.2 metres to 4.5 metres. Based on the concept mine plan, extractions heights are likely to be reduced to heights between 3.6 metres and 3.8 metres in sections of LW 51 in areas with a depth of cover of less than 90 metres to minimise potential for connective cracking.

The decision to reduce extraction heights has taken into account the predictions from the Subsidence Assessment, which are considered to be conservative. The level of risk of subsidence significantly impacting on landform, hydrology or ecology is considered as low.

Underground mining operations can have delays from time to time resulting in discontinuous movement. Additional efforts are made to ensure continuous operations when undermining areas with a low depth of cover. This includes maintaining continuous cutting operations where possible, prioritisation of response to stoppages and management of underground workforce numbers.

The mine plan, as currently proposed, has been designed in a manner to reduce the impacts of subsidence on the landform, hydrology and ecology. WWC disagrees with LMCC's comment that alternative mining methods are available for the Project. WWC has completed detailed feasibility studies for the proposed project and these studies have identified that other mining options such as bord and pillar, mini-wall or dividing the two proposed longwall blocks into three or four narrower width longwall blocks are not economically viable. WWC believes that the proposed plan is the most appropriate approach for the project such that it is economically viable and can recover the coal resource in a sustainable manner.

The Division of Resources and Energy (DRE) has no objection to the Project and based on the information provided in the EA, DRE considers that the proposed modification does not substantially change the overall subsidence risks at the site and should be manageable through the Extraction Plan process/SMP process.

Subsidence Management and Monitoring

OCAL has implemented a range of subsidence monitoring and management activities as part of the SMP/Extraction Plans that have been developed and approved for its current mining operations at WWC. These measures have been refined over WWC's long history of operation as a result of consultation with relevant stakeholders and also the outcomes of monitoring programs.

As part of the continued mining operations at WWC, OCAL undertakes a detailed subsidence assessment process to determine the predicted subsidence impacts associated with the completion of each area of longwall mining. This includes modelling and prediction of mine subsidence by technical specialists who utilise subsidence monitoring results from previous mining undertaken at WWC to assist in refining the models that predict the subsidence which is expected to occur. These models are regularly updated based on monitoring data and the subsidence modelling for this Project considered the subsidence monitoring results from LW41, including consideration of the greater than predicted subsidence events.

OCAL currently also operates under a detailed Trigger Action Response Plan (TARP) for low depth of cover areas. The TARP provides a further level of management to mitigate, monitor and respond to subsidence related issues within areas considered to be of low depth of cover. The TARP includes responses in relation to:

- extraction height;
- longwall stoppages;
- underground monitoring; and
- surface inspections.

As noted earlier, to avoid higher-than-predicted subsidence incidents at WWC in the future, the SSRC have requested OCAL to provide specific additional information with all future Extraction Plans and Subsidence Management Plans, including the plans that would be required as part of the implementation of LW51 and LW52.

OCAL does not agree with LMCCs comment that 'monitoring and mitigation measures are unable to adequately manage environmental risk'. OCAL believes that these risks can be effectively managed through the range of measures that OCAL has committed to and in accordance with the requirements of NSW government agencies.

Conclusion

While OCAL recognise the concerns of LMCC relating to connective cracking, based on the information presented in this letter, it is considered that these concerns pose a low risk that can and is being successfully managed, and do not warrant objection to the Project. It is again noted that DRE, as the key government agency responsibility for mining and subsidence in NSW and with the expertise to technically review such issues, has reviewed the Project and has no objections or concerns regarding the Project or its subsidence impacts.

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OCAL notes that consent authorities issue approval conditions that are specific to particular projects based on their nature, specific issues, location, predicted impacts and other site and project specific considerations. In this case, the existing Project Approval for WWC has existing conditions that require OCAL to implement the Project such that no connective cracking occurs. It is anticipated that the concerns raised by LMCC are and can be addressed through the conditions of the approval, if granted.

OCAL request that LMCC reconsider its current position of outright objection to the Project, and suggest adoption of a position of recommendation of consideration of issues by DP&E.OCAL would be happy to meet with LMCC to further discuss their concerns and the information provided in this correspondence. We trust that the above information will assist LMCC in resolving their final position on this Project and to prepare their final submission on the Project to DP&E.

If you have any further questions, please don't hesitate to contact me on 02 4941 2115.

Yours Sincerely,

Mark Robinson
Coal Assets Australia
Glencore