

Response to Submissions

Berrima Colliery Continued Operations MP 10_0172
Berrima Cement Works DA No. 401-11-2002-i MOD 6
Prepared for Boral Cement Limited | November 2011



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Prepared for Boral Cement Limited | 21 November 2011

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Response to Submissions

Final

Report 09022RP3 | Prepared for Boral Cement Limited | 21 November 2011

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Preamble

P1 Background

Boral Cement Limited (Boral) owns and operates the Berrima Colliery and Berrima Cement Works located near Berrima in the Southern Highlands. Berrima Colliery is an existing underground coal mine located approximately 7 km west of Berrima in the town of Medway. The Berrima Cement Works is located immediately south of New Berrima and 2.5 km east of the Hume Highway. Coal mining has a long history at Berrima Colliery with operations commencing in 1872. Coal from the Colliery is supplied to the Cement Works to fire the cement kiln, as well as other cement plants and power stations in Australia and overseas.

An application dated 29 September 2009 was lodged with the NSW Department of Planning and Infrastructure (DP&I) to continue operations at the Colliery as changes to NSW planning legislation has meant that the Colliery, and also a number of other underground mines in NSW, can no longer operate under existing use rights and require a planning approval. Another application was also lodged with DP&I on 14 June 2011 to modify the current development consent for the Cement Works to increase the amount of coal able to be stockpiled at the Works.

While these two applications are separate, due to local community interest in both the applications and the integrated nature of the operations, it was decided by DP&I to exhibit the two applications concurrently. The Environmental Assessment (EA) report for the Berrima Colliery continued operations application was initially to be exhibited for a period of 30 days from 6 June 2011 to 5 July 2011. This was extended by 17 days to finish exhibition on the 22 July 2011 to coincide with the exhibition of the Cement Works modification EA which was for a period of 24 days between 28 June and 22 July 2011.

During the exhibition periods the public and relevant government agencies were able to lodge submissions on the two applications.

P2 Purpose of this report

This Response to Submissions report has been prepared in accordance with Section 75H(6) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and considers the matters raised in submissions during the public exhibition of the two EAs for consideration by the Minister for Planning and Infrastructure in determining the two applications.

P2.1 Structure of this report

DP&I have requested that Boral respond to submissions received for the two applications in one report although separated into a response to submissions received in relation to the individual applications. Therefore, this report has been separated into two volumes: Volume A responds to submissions received in relation to the Berrima Colliery application; and Volume B responds to submissions received in relation to the Berrima Cement Works modification application. Submissions received that related to both applications have been responded to in both volumes.

Matters raised in the submissions have been grouped and the chapters in this report are divided into areas addressing each matter. The chapters are ordered with the matters that were raised the most often being addressed first. Whilst the majority of submissions were in support of the applications, due to the economic benefits of both proposals, these submissions have been addressed towards the end of both volumes as the primary purpose of this report is to respond to matters that raised concerns in relation to

the applications. Suggested conditions raised within the submissions, particularly by government agencies, are also considered under the relevant chapter. The chapters are as follows:

- Volume A – Response to submissions on Berrima Colliery continued operations application:
 - Chapter 1 introduces the submissions received and matters raised;
 - Chapter 2 responds to submissions relating to traffic matters;
 - Chapter 3 responds to submissions relating to noise matters;
 - Chapter 4 responds to submissions relating to air quality matters;
 - Chapter 5 responds to submissions relating to community and consultation matters;
 - Chapter 6 responds to submissions relating to groundwater matters;
 - Chapter 7 responds to submissions relating to water quality matters;
 - Chapter 8 responds to submissions relating to subsidence matters;
 - Chapter 9 responds to submissions relating to ecology matters;
 - Chapter 10 responds to submissions relating to other matters; and
 - Chapter 11 outlines the details of the submissions in support of the application.
- Volume B – Response to submissions on Berrima Cement Works modification application
 - Chapter 12 introduces the submissions received and matters raised;
 - Chapter 13 responds to submissions relating to traffic matters;
 - Chapter 14 responds to submissions relating to noise matters;
 - Chapter 15 responds to submissions relating to air quality matters;
 - Chapter 16 responds to submissions relating to community and consultation matters;
 - Chapter 17 responds to submissions relating to other matters; and
 - Chapter 18 outlines the details of the submissions in support of the application.

The matters raised in submissions received are summarised in Table A.1 in Appendix A.

P2.2 Readers guide to this report

Within this report, Chapters 2 – 11 of Volume A and Chapters 13 – 18 of Volume B provide the reader with information responding to matters raised in the submissions received on the two applications as of 11 August 2011. Within these chapters the matters received have been grouped under chapter headings.

Response to Submissions Volume A

Berrima Colliery Continued Operations MP 10_0172



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1 Introduction

1.1 The proposal

In September 2009 an application for project approval under Part 3A of the EP&A Act was lodged with the then NSW Minister for Planning for the continuation of operations at the Berrima Colliery. Accompanying this application was a Preliminary Environmental Assessment (PEA) which provided a brief description of the operations and the likely impacts. The PEA was distributed to the relevant government agencies, including Wingecarribee Shire Council, for them to provide Director General's Requirements (DGRs) for the EA. A revised PEA which reduced the proposed mining area to that approved under the Colliery's Subsidence Management Plan (SMP) was provided to the DP&I and other government agencies in May 2010. The DGRs were received on 8 October 2010 and the EA was lodged with DP&I for adequacy on 28 October 2010 and then for exhibition on 3 June 2011.

The EA report was initially to be exhibited for a period of 30 days from 6 June 2011 to 5 July 2011. This was extended by 17 days to finish exhibition on the 22 July 2011 due to requests by the community for additional time to review the EA. The extension also allowed the community to review the Berrima Colliery EA and Cement Works modification EA concurrently as the former was to be exhibited between 28 June and 22 July 2011.

1.2 Overview of submissions

As of 11 August 2011, a total of 69 submissions have been received, including:

- 58 submissions from residents of Wingecarribee Shire, 43 of which were in support of the application (ie 74% in support, 26% in opposition);
- two submissions from public interest groups, one of which was in support of the application;
- one submission from a local member of government which was in support of the application;
- a submission from Wingecarribee Shire Council (WSC) which supported the continued operations of the Colliery but opposed certain aspects of the application; and
- seven submissions from state government agencies.

The state government agencies who provided submissions on the Colliery EA included Division of Resources and Energy (DRE), Lands and Property Management Authority (LPMA), NSW Office of Water (NOW), Office of Environment and Heritage (OEH), Roads and Traffic Authority (RTA), Sydney Catchment Authority (SCA), and The Heritage Branch. The Heritage Branch and the RTA had no comments or objections to the proposal.

A draft Response to Submissions report was sent to NOW, OEH and SCA for their comment on 30 September. Additional comments received have been addressed in this report.

The submissions received have been categorised according to the issue raised. These issues have been summarised and tabulated in Appendix A. The majority of issues raised were categorised into technical disciplines, and are considered in this report according to the number of submissions received, including:

- traffic;

- noise;
- air quality;
- consultation;
- groundwater;
- water quality;
- subsidence;
- ecology; and
- other matters including heritage, existing use rights and declaration of a mine subsidence zone.

A number of submissions from government agencies provided recommended conditions of approval and these are discussed at the end of each chapter.

2 Traffic

2.1 Overview

The Traffic Impact Assessment (TIA) for the Berrima Colliery EA was undertaken by Arup Pty Limited in 2009. The principal author of the TIA was Dr Tim Brooker who has considerable experience (over 20 years) in the preparation of TIAs. The TIA was summarised in Chapter 11 of the main volume of the EA and provided in full in Appendix E of the EA. The assessment considered the potential traffic impacts resulting from the proposed continued operations at Berrima Colliery including the increase in truck numbers from those associated with the average production rate over the last 10 years (220,000 tpa) up to a maximum production rate of 460,000 tpa, in line with previous production levels.

The issues raised in the submissions in relation to traffic impacts generally related to the following:

- scope of assessment;
- impacts to public safety;
- discrepancies in the assessment;
- proposed product transport volumes;
- classification of Medway Road;
- external sales and haulage campaigns;
- upgrades to local road network; and
- alternatives to heavy vehicle use of Medway Road.

2.2 Response to matters raised

2.2.1 Scope of assessment

The submission from WSC states that the TIA was deficient in its scope, as it only assesses certain aspects of the proposal, but does not provide sufficient detail in its submission as to the nature of these deficiencies. As mentioned above, the TIA was prepared by Dr Tim Brooker who has considerable experience in the preparation of TIAs. The TIA's scope of assessment was based on the DGRs, for which WSC had input into what they were to contain, and the RTA guidelines. Deficiencies in the TIA have not been raised by the RTA in their submission nor were any deficiencies identified by WSC in its adequacy review letter dated 19 November 2010.

The only deficiency that WSC details in its submission is that the Berrima Colliery EA does not include a consideration of the use of B-Doubles. However, there is mention in Section 11.2.3 of the EA and Chapter 3 of the TIA about a separate feasibility study and application to be lodged with WSC for approval for the use of B-Double vehicles for coal transport to/from the site. Since approval at the time hadn't been given, the TIA based its traffic impacts on the current truck type used for deliveries. Table 5 in the TIA does mention that future delivery vehicles may include B-Double trucks in addition to the current tri-axle tipper trucks, but again mentions that this is subject to a separate approval.

The use of B-Doubles on Medway Road is dependent on WSC's approval for gazettal of the road for such use, as it is Council owned. An application for use of Medway Road by B-Doubles was lodged with WSC by Boral, following the preparation of the TIA, in August 2010 and subsequently approved by WSC at its meeting on 8 September 2010. Following this meeting the approval was required to be sent to the RTA for gazettal but, due to reasons unknown to Boral, was not. B-Doubles were used in a haul campaign by Boral in early 2011 after which it was discovered that the RTA had not received the application for gazettal. Following this discovery, the use of B-Doubles was ceased as soon as practical. The application was then reconsidered at a Council meeting on 25 May 2011 at which gazettal was again approved, subject to a number of conditions for Boral to upgrade Medway Road.

2.2.2 Safety concerns

Some public submissions raised concerns about safety on Medway Road in relation to use of the road by trucks and impacts on the safety of cyclists and school buses. Management measures to ensure cyclist's safety were discussed in Section 5.9 of the Colliery EA. There is a local cycle club which holds race meetings on Medway Road and they have races on a limited number of days a year. In Section 5.9 of the Colliery EA, Boral commits to ongoing consultation with the cycle club to ensure that staff and truck drivers are aware of the clubs race dates and that the necessary safety precautions can be undertaken. Boral also proposes to undertake certain road upgrades to Medway Road which will increase road safety for everyday road users, cyclists and school buses. This is discussed further in Section 2.2.7 and is provided in the revised Statement of Commitments in Appendix B. Trucks have long shared Medway Road with the cycle club without incident and this can be expected to continue under the proposal.

Truck drivers travelling to and from the Colliery currently communicate with school bus drivers through the use of UHF radio and this measure will be included in Boral's Driver Code of Conduct. There is also a commitment in the EA that school bus warning signs be erected at each end of Medway Road with the wording "7:30-9AM and 3-4:30PM SCHOOL DAYS NEXT 5KM". Boral will need to obtain approval from WSC to erect these signs.

The Medway Residents Group stated in their submission that residents were not consulted or had no input into the risk management process for the EA, in particular in relation to heavy vehicle movements on Medway Road. This risk management process was first presented in the PEA which was made publicly available on DP&I's website and was also supplied to WSC to assist them in providing the DGRs for the EA. The purpose of the risk management process was to prioritise the technical studies conducted for the EA (see Chapter 7 of the EA). Traffic was given a high rating both for maximum traffic volumes and potential amenity impacts on residents. Irrespective of the risk management process and the risk ratings given, the TIA was comprehensive in its assessment of impacts as discussed above in Section 2.2.1. Community consultation is further discussed in Chapter 5.

Compliance with the above safety measures and appropriate behaviour by drivers on Medway Road will be ensured through Boral's Driver Code of Conduct by which all Colliery staff will be made aware of and all Boral truck drivers or contractors will be engaged under.

2.2.3 Discrepancies in traffic assessment

A number of submissions raised matters regarding traffic volumes on Medway Road, in particular apparent discrepancies within the EA and supporting documents.

Clarification was sought in submissions from a number of parties regarding a supposed discrepancy in tonnage figures between the Colliery EA and the Cement Works application. The Berrima Colliery EA refers to a maximum of 340,000 tpa being made available for external sales. As explained in the Cement Works application, a portion of this (ie 100,000 tpa) will be stockpiled at the Cement Works, if the

modification application is approved, with the remainder (240,000 tpa) either trucked directly to customers or stockpiled at Loch Catherine. The EA states that a maximum of 340,000 tpa would be despatched through Port Kembla as this represents the balance between the maximum likely future colliery production (460,000 tpa) and the minimum likely future consumption of coal at the Berrima Cement Works (120,000 tpa). This maximum of 340,000 tpa through Port Kembla also assumes that there would be no internal sales to Boral operations other than the Berrima Cement Works or external sales that would not be despatched through Port Kembla which is a highly unlikely scenario; however, this scenario was used to provide a conservative assessment of traffic impacts.

There is a discrepancy in relation to delivery times in the Colliery EA and the Cement Works application. The cement works applications states that coal would be transported from both the Cement Works and Loch Catherine between the hours of 4am and 4pm during a haulage campaign. This is incorrect and should only refer to transport from the Cement Works. See Section 3.3 of this report for further discussion on proposed delivery times.

The submission from WSC raises the matter of discrepancies between coal truck delivery figures contained in the main volume of the EA and in the TIA. The average figure of 23 existing coal truck deliveries per day, which is quoted in the TIA, is the average number of truck deliveries along Medway Road, based on six months of actual data collected during 2009. The quoted figure of 32 truck deliveries in the EA report also includes eight deliveries per day from the mine to the Loch Catherine Stockpile area. Boral acknowledges that this apparent discrepancy is unintentionally confusing. The absence of the 8 deliveries per day to Loch Catherine are essentially internal truck movements and do not affect the general traffic flow on Medway Road nor the predicted traffic impacts assessed in the TIA as these are based on predicted future volumes and current figures are only provided for context.

2.2.4 Proposed product transport volumes

A number of public submissions, including the group submission from the Medway Residents Group, appear to have misinterpreted the figures provided in the EA concerning maximum coal truck deliveries per day and production days per annum; and the subsequent coal production/transport figure of 605,880 tpa that this produces. The maximum possible future colliery coal production is assessed in the EA as 460,000 tpa. Under the proposal production days are proposed to increase from 210 to 340 days which would be necessary if the actual production rate of the Colliery ever reached 460,000 tpa.

The increase to 340 days transport is sought to give flexibility as to which days the coal transport can operate on. However, the maximum traffic increase in the TIA has been calculated for current production days (460,000 tpa delivered in 66, fully loaded 33t trucks is approximately 210 transport days). If Boral was to transport for 340 days per year the number of trucks would be more spread out with only 41 fully loaded trucks per day. It should also be noted that truck delivery times are not increasing from current and a maximum of 5.5 haulage days per week would be maintained. In practice the coal transport operation would not be able to achieve 66 truck deliveries, 340 days a year without further approval to increase the production rate of the Colliery above 460,000tpa. However, the TIA has assessed the worst case scenario for the numbers of truck deliveries and can be considered very conservative in its approach.

2.2.5 Classification of Medway Road

In their submission the Medway Residents Group questioned the classification of Medway Road in the EA as a “principal haulage route” when the road is classified as a local road by WSC and the RTA. Medway Road has been defined as a “principal haulage route” only for the purposes of the road traffic noise impact assessment. This is discussed further in Section 3.2.1 of this report.

2.2.6 External sales and haulage campaigns

The main confusion associated with residents' perception of the purpose of both the Berrima Colliery's continued operations project application and the Berrima Cement Works modification application is in relation to the external sale of coal produced at the Colliery. Internal sales are defined as sales between Boral operations, for example between the Berrima Colliery and the Berrima Cement Works. External sales are defined as all sales to non-Boral owned companies and would include sales to other domestic and international customers. In the past the Berrima Colliery has sold product both internally and externally. Under the Berrima Colliery application a maximum of 340,000 tpa would be made available for both internal sales (excluding sales to the Cement Works) and for external sales. Boral is currently investigating sales to their cement plant at Maldon which would be allocated within the 340,000 tpa figure.

Boral undertook a haulage campaign in early 2011 where coal was trucked from the stockpiles at Loch Catherine to Port Kembla to load a bulk carrier for an external sale. As the carrier is only in the Port for a short period of time, coal transport to Port Kembla is required to be intensive with usually a consignment transported over a period of five to seven days before a ship's arrival to enable continuous loading. The residents of Medway strongly objected to the intensive truck movements that occurred during the haul campaign in early 2011 and some complaints (approximately 10) were received by Boral.

Boral has recognised that this campaign in early 2011 should have been managed better from the community's perspective and an alternative to trucking from Loch Catherine was sought. The Berrima Cement Works has an existing stockpile area where 15,000 t is currently stockpiled for use in the cement kiln. It was proposed in the Cement Works modification application that this existing stockpile be increased by 5,000 t to 20,000 t. Whilst future campaigns are likely to have a consignment of approximately 10,000 t, in the event of a 'worst case' scenario consignment of 25,000 t, up to 20,000 t would be available to be transported from the Cement Works and up to 5,000 t transported from Loch Catherine. During these campaigns, transport of cement clinker from the Cement Works to Port Kembla and deliveries from the Colliery to the Cement Works will not occur to minimise the increase in truck movements that would otherwise occur during the campaigns.

In order to allow the increased coal stockpiling at the Cement Works for the purposes of sales, a modification is required to its existing development consent. This was implemented by Boral and an application to modify the consent lodged with the DP&I in June 2011. The intent was to have this relatively minor modification approved quickly so that any future haulage campaigns from the Colliery would have minimal impact on the residents of Medway Village. This modification application was placed on exhibition by DP&I and a response to the submissions received during exhibition is provided in Vol B. Further discussion of the traffic impacts resulting from the Cement Works modification application is provided in Vol B, Chapter 13.

2.2.7 Upgrades to road network

A number of submissions, including the WSC submission, raised the need to upgrade Medway Road. The sealed road width of Medway Road is 7 m typically, and no less than 6.5 m wide, and mostly provides a sealed or unsealed shoulder of more than 0.5 m. Boral proposes to undertake the following two phases of upgrades and contributions for maintenance of Medway Road:

- Within 12 months of receiving Project Approval, fund the widening of the 50km/h section of Medway Road through Medway Village to 10 m wide. This would involve retaining the existing 7 m of pavement and providing 1.5 m shoulders with 50 mm asphalt. Additionally, this work will also include repairing already damaged sections of Medway Road with asphalt spray seal.

- Within 6 months of sales volumes reaching 330,000 tpa, or following a year in which sales volume exceeded 250,000 t but no earlier than 2015, commence an upgrade of the remaining 80 km/h section of Medway Road to 10 m. This second phase would involve upgrading the remaining 80kmh 'section' of Medway Road to 10 m width (excluding the approximately 300 m section of Medway Road adjoining the Hume Highway which already meets this width). Works would again involve the retaining of the existing 7 m wide pavement and providing 1.5 m shoulders on each side with asphalt spray seal. They would also include AUSTROAD 'BAR' and 'BAL' treatments to nine driveways, as well as treatment to 20 m of Liebmans Road. This second phase of upgrade is contingent on the Colliery still being in operation.
- Pay a maintenance levy of 15 cents per tonne of coal transported from the Colliery along the full length of Medway Road for the ongoing maintenance of the road. This levy would apply for the life of the Project Approval.

Boral proposes to manage both phases of these upgrades itself or, if it elects, to pay WSC contributions not exceeding \$1 million (exc. GST) for the first phase, and not exceeding \$1.7 million (exc. GST) for the second phase. These upgrades have been included in Boral's revised Statement of Commitments which is provided in Appendix B to this report.

Other road upgrades on Medway Road that Boral committed to in the EA based on discussions with the RTA include:

- that edgelines and centrelines be marked on Medway Road from the Hume Highway to Medway;
- that sight distance for vehicles exiting Liebmans Road at Medway Road be improved by reducing vegetation on the north-eastern corner;
- that street name signs and advance street name signs for Liebmans Road be installed on Medway Road; and
- a reduction of the speed limit of Medway Road outside of Medway Village to the intersection with the Old Hume Highway from 100kph to 80kph – this was implemented on 6 June 2011.

2.2.8 Construction of railway line

A number of submissions requested that coal transport be undertaken by rail rather than road. Reasons for this are that a railway line was previously constructed for the Colliery in 1924 before the village of Medway was developed. The railway ran east from the pit top generally parallel to Medway Road for 1.9 km before crossing Liebmans Road where it then angled south-east crossing Medway Road approximately 1.3 km west of the Hume Highway. The railway then ran parallel to Medway Road on its southern side before crossing under the Hume Highway and continued east to the Cement Works. The railway line stopped operating in the 1960's and the tracks have since been removed.

Construction of a railway in the existing corridor to transport coal between the Berrima Colliery and the Berrima Cement Works was considered in the initial stages of the project. Consideration was given to a range of matters, particularly the cost of constructing the railway and the impacts on the community.

The distance between the Colliery and the Cement Works (for construction of the railway line) is approximately 7.5 km. The railway line would need three road level crossings, across Medway Road, Liebmans Road and the Old Hume Highway as well as crossing several property access roads. A rail loading facility would also be required approximately 1.1 km from the Colliery (which would have to be located immediately adjacent to the middle of Medway Village) to allow the train to fit and to avoid

clearing native vegetation. Other infrastructure required would include conveyors and transfers between the Colliery and the loading facility, a rail link around the Cement Works, and a rail dumping station and conveyor into the existing coal storage facility at the Cement Works. Accordingly, it is estimated that it would cost between \$50-60 million to transport coal by rail. This price does not include repairs/modifications/upgrades to existing or new property driveways, land acquisition costs, relocation of any existing services, or power upgrades if required to operate the new rail loading facility or the new rail dump station.

Berrima Colliery is a small mine with an annual operational budget less than the estimated cost of constructing the railway line. The estimated cost far exceeds any commercial return ratio for the mine at both current and maximum production rates. The mine would need to substantially increase both its production rate and mine life beyond what is currently proposed in order to make investment in a railway feasible.

Whilst it is acknowledged that the proposal will lead to an increase in truck movements compared to recent movements, it will not lead to an increase compared to historical movements. Furthermore, the operation of a railway along the borders of several properties would not be without impacts on residential amenity. The potential impacts of the continued operations do not warrant the construction of a railway line which, as discussed above, would require a much larger operation to be economically feasible.

2.2.9 Alternate haul road

The Medway Residents Group and WSC, in their submissions, have requested that an alternate haul road be constructed which would separate trucks from Medway Road. The impacts of truck movements on Medway Road have been assessed in the EA and traffic volumes are not proposed to increase past historic volumes. However, Boral has considered the option for construction of an alternate heavy vehicle route along the disused Berrima rail spur described above. Three potential routes were considered:

1. the full length of the rail spur between the pit top and the Medway Road crossing;
2. along the rail spur between the pit top and the Liebmans Road intersection; and
3. along the rail spur then south to connect with Medway Road east of Medway Village.

All of these options have issues that would need to be overcome including intersections with Liebmans Road and Medway Road, land acquisition for route 3 and potential geotechnical issues such as creek crossings. Further, the construction of a road along the rail spur would displace potential impacts associated with truck movements to the north side of Medway Village and would run along the boundary of a number of properties in Medway and a number of larger rural properties to the east of Medway that do not currently experience road impacts.

Potential costs associated with these options are between approximately \$5 million to \$7 million. This price does not include repairs/modifications/upgrades to existing or new property driveways, relocation/replacement of property fences, land acquisition costs, relocation of any existing services, or relocation of existing power lines. It is considered that the construction of an alternate heavy vehicle route would not be an amenable option to all residents of Medway, particularly those on the northern side of Medway Village and those located on the boundary of the rail spur and on Liebmans Road. Therefore, an alternate haul road is not considered a suitable alternative as it would have little reduction in likelihood of impacts with benefit to certain Medway residents only at the expense of others and at a large cost to Boral.

2.3 Suggested conditions of approval

WSC in their submission suggested certain conditions of consent for the approval of Berrima Colliery's continued operations. These were:

- the construction of a Medway village bypass road;
- the physical separation of traffic moving between the Berrima Colliery and Loch Catherine stockpile area from Medway village traffic;
- Boral enters into a VPA with WSC for immediate upgrades to Medway Road, a funding mechanism based on a per tonne production of coal be developed for the purpose of maintaining Medway Road between the colliery and the South Western Freeway, and the ongoing contribution to all roads used by the Berrima Colliery where Council wholly or partly maintains roads along the transport route;
- Boral engages ARRB to undertake an existing pavement analysis and report of Medway Road between Hume Highway and the colliery gates (or the point of juncture of a future Medway village Bypass road) and that the analysis and report be repeated each 3 years thereafter; and
- all loads leaving the mine and stockpiling areas are to be covered.

The construction of the Medway Village bypass road or 'alternate haul road' was discussed above in Section 2.2.9 and is considered to be an unfeasible alternative to the use of Medway Road in light of the 8 years of approval life and the scale of the Colliery.

The construction of a haul road between the pit top and Loch Catherine which will take the trucks off the public road is currently being considered by Boral. This, a funding mechanism, and the provision of a pavement condition report, will be included in further discussions with WSC.

The covering of truck loads is a requirement in the Driver's Code of Conduct. Boral is accepting of this being made a condition of consent.

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3 Noise

3.1 Overview

A Noise Impact Assessment (NIA) undertaken by EMM, was summarised in Chapter 12 of the main volume of the EA and provided in full in Appendix G of the EA. The main author was Najah Ishac who is a Principal Acoustic Engineer with almost two decades experience in the field and considerable experience in impact assessment for mining operations. The assessment considered the potential noise impacts resulting from the proposed continued operations at Berrima Colliery including operational noise and road traffic noise from trucks transporting product along Medway Road.

The matters raised in relation to noise impacts in the submissions generally relate to the following:

- assessment methodology;
- existing noise emissions;
- noise mitigation measures; and
- community consultation.

3.2 Response to matters raised

3.2.1 Assessment methodology

i Compliance with DGRS

The DGRs for the Colliery EA required a noise assessment of on-site construction and operational noise and off-site road noise and vibration impacts from the haulage of coal along Medway Road. The EA included detailed noise impact assessment that addressed noise from on-site operations (from the Colliery and Loch Catherine) and road transport noise (including Medway Road) (see NIA in Appendix G of the EA). The assessment was prepared in accordance with OEH's guidelines. The proposal does not include a construction stage as it is a continuation of existing operations and hence no construction noise assessment was required.

The vibration related to the site is limited to relatively minor emissions from transport operations (ie trucks on roads passing homes). Such events are not different to current activities and are not considered significant. The levels of vibration experienced by dwellings from passing trucks on roads is typically less than the threshold of human perception (0.2 mm/s) at 15 m. Hence, impacts from vibration are considered unlikely.

ii Flaws in noise impact assessment

Some submissions raised potential flaws in the NIA which are shown in italics and addressed below.

The three Medway monitoring locations in the noise assessment do not adequately assess impact on most affected residents. The nearest monitoring location in Medway Village is some 130 m away from the nearest potentially affected residential receiver.

The purpose of recording noise levels at the three Medway monitoring locations was not used to assess impacts on potentially affected residences. Rather, its purpose was to establish background noise levels in

order to determine criteria at the most potentially impacted residential receivers for the Colliery's operational noise emissions. The monitoring locations chosen are considered representative of the background noise levels at surrounding receivers and captured data that is typical of rural residential areas. This is standard methodology in noise impact assessments.

The monitoring locations are not necessarily the most affected because the aim is to capture data at quieter locations to establish conservative criteria. This is demonstrated in the relatively low background noise levels reported in Table 2.1 of the NIA. The selected monitoring locations also provide a conservative representation of residences that are closer to roads where background noise levels may be more elevated. Under OEH's *Industrial Noise Policy* (INP) the criteria for assessment of intrusive noise impacts and noise amenity for sensitive receivers near industry is 5 decibels (dB) above the existing background noise levels. The reported background noise levels at the monitoring locations were as low as 30 dB(A) which is OEH's minimum level for background noise levels. Therefore, the noise criterion of 35 dB(A)_{Leq,15minute} (background noise plus 5 dB) for the Colliery's on-site operational noise at night results in the lowest possible criterion. The daytime criteria are also down to the lowest of possible criterion of 35 dB(A) and not more than 37 dB(A).

The assessment locations selected, on the other hand, do represent the potentially worst affected residences. The assessment uses criteria derived from the quieter monitoring locations to assess impacts at locations which are likely to have higher background noise, as they are located on more exposed roads. Hence the assessment is conservative as it gives stricter criteria for these residences than the actual background levels at these locations would likely require.

The noise assessment does not accurately depict closest and potentially most exposed residences in Fig 3.1 for assessment locations R1 - R15.

The assessment locations in Figure 3.1 shows the most potentially impacted residences as located near the corner of Medway Road and Railway Parade. Not all the residences in Medway Village are shown as the residences that were assessed were considered representative of other residences in the village. Nevertheless, the noise contours provided in Figures 5.1 and 5.2 of the noise assessment (Appendix G of the Colliery EA) show predicted noise levels for all surrounding areas. Therefore, if a specific property was not included in the single point results or the location varied slightly than what was shown, the contours can be used to determine levels at any location.

Noise assessment selectively excludes haulage between the colliery and Loch Catherine.

These vehicles were excluded from the road traffic noise calculations since they did not pass the selected worst case assessment location located 15 m from Medway Road east of the Loch Catherine entry road intersection. If these relatively low vehicle volumes (ie eight per day) were to be assessed along with all other site related movements, the assessment location would be north of the Loch Catherine access and Medway Road intersection. Dwellings in this area are typically over 30 m from the truck route and therefore not as close as the selected 15 m location on Medway Road. The noise levels at these properties would therefore be lower than those presented in the assessment.

The calculated vehicle movements and expected coal production in the noise assessment does not add up (66 trucks per day x 27 t x 340 days production = 605,880 tpa of coal not 460,000 tpa as specified).

The calculated vehicle movements have been explained in Section 2.2.5 of this report. Further, the adopted vehicle volumes are estimates and any minor variations will not alter the noise assessment. For example, doubling or halving traffic volumes equates to 3dB changes in average traffic noise levels used for assessment purposes.

iii Road traffic noise

In OEH's submission it is observed that road traffic noise associated with the Colliery (ie. employee's arriving to the site for morning shift in their vehicles and also truck movements from 6am) would occur earlier than 7am (the standard time for delineating day and night). OEH comment further in their submission that noise graphs have not been provided in the noise assessment which demonstrate early morning noise level rise, therefore it is not possible to determine whether a shoulder period is justified.

However, whilst it is noted that night road traffic noise emissions are only likely to occur between the 5am to 7am period and not the full night period, the traffic noise assessment does not seek any allowance for a shoulder period assessment between these hours. The road traffic noise assessment simply adopts the stricter night time target noise goals for the morning period 5am to 7am and shows that night criteria is expected to be satisfied. The assessment is therefore conservative in this respect, since 5am – 7am could in actual fact be considered a shoulder period and not truly 'night time' as it has been adopted in the road traffic noise assessment.

The adoption of 'principal haulage route' in the road traffic noise assessment is reliant on Council or the road authority's classification and acceptance as per OEH's Environmental Criteria for Road Traffic Noise (ECRTN). Undoubtedly the existing situation and use of the road confirms that Medway Road is a 'principal haulage route' for the Colliery as per the intent of the ECRTN as the Colliery is not served by any other arterial roads and is, by necessity, required to use this road as a haulage route.

As WSC have objected to the adoption of 'principal haulage route' in the road traffic noise assessment, Table 3.1 below presents a revised traffic noise impact summary that adopts the stricter local road classification for Medway Road. This results in lower noise criteria (non-mandatory as before) and it also introduces the allowance goal of existing +2 dB as per the ECRTN. The allowance criteria is used when existing noise levels are already at or above the recommended goals as in the case for the 6am to 7am period. As shown in Table 3.1, the stricter local road criteria are satisfied in all cases for future peak hour traffic noise.

Table 3.1 Calculated road traffic noise levels for a façade 15m from Medway Rd, dB(A)

Existing Peak hour $L_{eq,1hour}$ Noise Levels			Future Peak hour $L_{eq,1hour}$ Noise Levels		
Day	Night		Day	Night	
	5am-6am	6am-7am		5am-6am	6am-7am
54	48	52	55	50	54
Criteria	55	50	55	50	54 (existing +2)

WSC, in their submission, have queried the calculated noise measurement used to assess road traffic noise of 15 m from the façade to the centre line of Medway Road used in the road traffic noise assessment. Under the ECRTN impacts from road traffic noise are assessed at a distance of 1 m from the closest façade of a dwelling. A 15 m distance was chosen based on aerial photography which showed that a 1m distance from the closest house to Medway Road, which was located in Medway village, was 15 m from the centre of Medway Road. At this minimum distance road traffic noise under a worst case scenario complies with the relevant criteria. Additionally for most of the residences on Medway Road the noise levels seen would be lesser as they are set back further than 15 m.

WSC stated in their submission that the proposed hours and days of operation will exacerbates noise impacts from vehicle movements. There is no change in proposed hours of operation under the proposal

compared to existing hours of operation. The total annual days of operation would increase from the current 210 days to 340 days if the maximum production reached 460,000 tpa but this is not an increase on historic operating days. See Section 3.3 below for further discussion on operating hours.

3.2.2 Existing noise emissions

Some submissions from Medway residents raised complaints about existing noise sources from the operation, for example, road noise from coal trucks, operation of reversing beepers, coal being dumped into trucks, banging of tail gates and delivery hoppers. All operational noise sources were modelled in the noise impact assessment (see Table 5.1 of the Noise Assessment). Noise levels from operations are assessed under OEH's INP at the nearest residential boundary, or if the boundary is more than 30 m from the house at a point 30 m from the boundary, by averaging noise levels over a period of 15 minutes ($L_{eq,15\text{minute}}$). While some noise sources may produce an L_{max} dB(A) (ie the maximum sound pressure level recorded during a period) above general site noise for a short period, the $L_{eq,15\text{minute}}$ criteria for the operations can still be achieved and is expected to be as shown in the noise assessment. Further, the noise assessment proposes a sleep disturbance criteria of 45 dB(A) L_{max} for all residences. This is equivalent to the lowest possible criterion of this kind for residences, based on a minimum background noise level of 30 dB(A).

There were no known noise complaints from residents prior to the preparation of the NIA. However, Boral have advised that complaints have been received recently in relation to the reversing alarms on the front end loader and for the office phone which is put on speaker when the office is unattended (eg at periods of low staff levels such as at night or on Sundays and Public Holidays). These sources are deliberately of a certain noise frequency for OH&S purposes, though Boral has upgraded the reversing beepers and is investigating options to reduce the noise from the phone due to these complaints.

Road traffic noise levels are measured under OEH's ECRTN by averaging noise levels over a 1 hour period ($L_{eq,1\text{hour}}$). In the Medway Residents Group submission noise readings from operations and passing trucks at certain times of the day were presented (Table 1 of the Medway Residents Group submission). As mentioned above, under OEH's guidelines road traffic noise levels are to be assessed at 1 m from the closest façade to the road or from the property boundary for operational noise. It is unclear from Table 1 what distance the readings were taken from the façade or if they were within the referenced property boundaries. Further, these readings are likely L_{max} dB(A) and not representative measurements of the $L_{eq,15\text{minute}}$ or $L_{eq,1\text{hour}}$ periods that OEH's guidelines specify for noise levels from operations and road traffic noise respectively.

3.2.3 Noise mitigation measures

OEH in their submission state "the NIA has concluded that noise emissions from the premises are above the project specific noise level." This is a strict interpretation of one aspect of the NIA that needs to be put into context. The NIA demonstrates that the noise criteria will be met at all assessment locations under calm weather conditions. However, there will be some instances in prevailing weather conditions during the day and evening periods where predicted operational noise levels are marginally over the criteria established under the INP. However these are not considered significant, as defined under the INP, as they are not more than 10 dB above background noise levels which are conservative, as discussed in Section 3.2.1. Further, the proposal is for continuation of existing operations and no upgrades to the existing infrastructure are proposed.

However, Boral does recognise that there are opportunities for the site to reduce its noise emissions. A Noise Management Plan will be prepared and this will address OEH's requirements for "the development of formal operating practices to reduce noise generation" and "that Boral document all feasible and reasonable noise mitigation measures including a time-frame for implementation to satisfy the above

requirements". In addition the site will continue to keep a complaint register where noise and other complaints from residents will be recorded and if necessary actions implemented to address the source of the complaint. Quarterly attended noise monitoring will also be undertaken at the nearest residential receivers (Receivers 1 – 4 in Figure 12.2 of the EA) for a period of two years, after which the results from the noise monitoring will be reviewed and a suitable long term monitoring program developed in consultation with OEH.

The above commitments in relation to noise mitigation and management have been included in Boral's Revised Statement of Commitments for the Berrima Colliery provided in Appendix B.

3.2.4 Community consultation

Submissions from residents in Medway and from WSC raised concerns about a lack of community consultation in relation to noise impacts for the current and proposed operations. As mentioned above, prior to the NIA being prepared there were no known instances of complaints from the community in relation to noise. Boral has received some complaints following this and has attempted to address concerns relating to noise as discussed in Section 3.2.2. Concerns relating to noise were also not raised during consultation efforts during the preparation of the EA (see Section 6.4 of the EA and Chapter 5 of this report).

As a result of community feedback about logistics management at the Colliery in January 2011, and subsequent community contact between February and June 2011, Boral has reviewed its community consultation arrangements at Berrima. Due to this feedback, the already established Berrima Cement Works Community Liaison Committee has been expanded to include Medway residents and associated matters at the Colliery. This new arrangement has worked well and Boral is keen to use the existing committee as the Community Consultative Committee (CCC) for the proposal. The CCC would be provided with the results of ongoing noise monitoring and the proposed Noise Monitoring Plan. Community representatives of the CCC will also be able to communicate to Boral any concerns residents may have in relation to noise generated by the Colliery. A complaints register is currently kept by Boral so any resident can contact the Colliery if there are any issues with the Colliery's operations including noise issues. Boral will erect a sign at the entry to the Colliery which will display the number that residents call if they have complaints. The complaint register and actions arising from any complaints received will be reported on annually in the Colliery's Annual Environmental Management Report (AEMR) which will be made available on Boral's website (www.boral.com.au/berrimacolliery) to ensure there is transparency in any issues, such as noise, being addressed and acted upon by Boral.

3.3 Suggested conditions of approval

WSC have requested the following conditions in their submission related to noise:

- that any site equipment, when replaced, should meet contemporary operational noise standards;
- that Boral be required to operate within legislative limits to reduce the impacts of noise on local residents;
- that copies of regular noise monitoring reports be made available to the public through Councils offices and website; and
- that noise generating activities such as loading and haulage are restricted to the hours of 7.00am to 6.00pm Monday to Friday and 7.00am to 1.00pm Saturdays with no loading and haulage to occur on Sundays or Public Holidays.

Following a review of the draft Response to Submissions, OEH recommended that the condition regarding the noise compliance of site equipment, suggested by WSC be strengthened to read as follows:

“That any site equipment, when replaced, should meet contemporary operational noise standards and should aim to have a noise output at least 5 decibels below the background noise level (ten decibels below the Project Specific Noise Levels) with the objective of noise emissions from the whole premises reducing over time to contemporary standards.”

The proposal does not propose to replace any site infrastructure though Boral is supportive of a site equipment noise compliance condition being applied to the operations. However, it is considered that the requirement for a noise output 5 dB below the background noise levels (10 dB below the Project Specific Noise Levels) is not a standard nor practical condition to ensure noise compliance of site equipment is achieved. Therefore, it is proposed to amend the suggested condition to the following:

“That any site equipment, when replaced, should meet contemporary operational noise standards with the objective of noise emissions from the whole premises reducing over time to contemporary standards.”

Boral recognises a need to establish confidence in the community that the continued operations of the Colliery will not have an adverse impact on resident’s amenity particularly at the maximum production rate of 460,000 tpa. Following a review of the draft Response to Submissions, in which Boral proposed that the below noise limits be conditioned if consent is issued, OEH also recommended that these be conditions of consent. Boral will commit to undertaking quarterly attended monitoring, for a period of two years, at the nearest residential receivers (ie 1 – 4) to confirm the Colliery’s compliance with these limits.

Table 3.2 Proposed noise limits

Receiver**	Day dB(A)*	Evening dB(A)*	Night, dB(A)*	
	L _{eq,15minute}	L _{eq,15minute}	L _{eq,15minute}	L _{max}
1	42	39	35	45
2	42	39	35	45
3	42	39	35	45
4	41	39	35	45
5	40	38	35	45
6	39	36	35	45
7	38	35	35	45
8	37	35	35	45
9	40	38	35	45
10	36	35	35	45
11	36	35	35	45
12	36	35	35	45
13	35	35	35	45
14	35	35	35	45
15	35	35	35	45

* These noise levels are to apply under meteorological conditions described in the INP.

** See Figure 12.2 of the EA for receiver locations.

OEH further requested that a Noise Monitoring and Verification Program be prepared, in accordance with prescribed criteria, and implemented within six months of approval. Boral is agreeable to preparing and implementing a Noise Monitoring and Verification Program; however, would seek to only use real-time noise monitoring, as recommended by OEH, if non-compliance against the noise limits was established in an AEMR or as directed to by the Director-General.

As discussed above, results of all monitoring programs at the Colliery including noise monitoring are reported on by Boral in their AEMR which is provided to the relevant government agencies, including WSC. Boral will make the AEMR available to the public on their website. This commitment has been included in the Revised Statement of Commitments (see Appendix B).

Both WSC and OEH recommended noise generating activities such as loading and haulage are restricted to the hours of 7 am to 6 pm Monday to Friday and 7 am to 1 pm Saturdays with no loading and haulage to occur on Sundays or Public Holidays. Boral is supportive of the application of these restrictions to haulage along Medway Road. However, owing to ongoing operational requirements, the loading and hauling of coal to the Loch Catherine Stockpile will still be required between 6am and 9 pm Monday to Friday and between 6am and 2pm on Saturdays. Boral does not currently, nor has it proposed, to transport coal from the Colliery on Sundays or Public Holidays.

Furthermore, following a review of the draft Response to Submissions, OEH recommended that a Traffic Noise Management Statement (TNMS) be developed and implemented within 6 months of approval for the management of operational noise impacts associated with road haulage of materials. The TNMS should include, but not necessarily be limited to:

- driver training to ensure that noisy practices such as the use of compression brakes are not unnecessarily used near sensitive receivers;
- a holistic examination of truck traffic generated by the cement works to reduce traffic noise impacts on the community;
- best noise practice in the selection and maintenance of vehicle fleets;
- movement scheduling where practicable to reduce impacts during sensitive times of day, or evening (trucking shall be contained to day and evening operations only)(evening operation may be pending) communication and management strategies for non licensee/proponent owned and operated vehicles to ensure the provisions of the TNMS are implemented;
- a system of audited management practices that identifies non conformances, initiates and monitors corrective and preventative action (including disciplinary action for breaches of noise minimisation procedures) and assess the implementation and improvement of the TNMS;
- specific procedures to minimise impacts at identified sensitive areas; and
- clauses in conditions of employment, or in contracts, of drivers that require adherence to the noise minimisation procedures and facilitate effective implementation of the disciplinary actions for breaches of the procedures.

Boral is supportive of the intent of the TNMS and many of the suggested conditions, however, submits that the inclusion of conditions regarding disciplinary action for drivers and insertion of conditions in employment contracts is not for a planning approval to stipulate. Boral reserves the right to include appropriate conditions in employment contracts at its discretion.

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4 Air quality

4.1 Overview

An Air Quality Assessment for the Berrima Colliery EA undertaken by ENVIRON Australia Pty Ltd (ENVIRON), was summarised in Chapter 13 of the main volume of the EA and provided in full in Appendix H of the EA. The principal author of the assessment was Yvonne Scorgie who has over 16 years experience in preparation of air quality assessments. The assessment considered the potential air quality impacts resulting from the proposed continued operations at Berrima Colliery.

The issues raised in relation to air quality impacts in the submissions generally relate to the following:

- air quality monitoring and management;
- best management practice;
- impacts on residents of Medway and surrounds;
- uncovered loads and coal spillage; and
- public health impacts.

A detailed response by ENVIRON to air quality comments made by OEH is provided in Appendix D to this report. Their comments are summarised below, where relevant.

4.2 Response to matters raised

4.2.1 Air quality monitoring and management

Both OEH and WSC raised the need for improvement in dust monitoring and management on site in their submissions. The dust control measures currently in place at the Colliery were outlined in the EA, this includes:

- the coal is wet (8% moisture content);
- covered or partially covered conveyors;
- enclosed crusher;
- enclosed truck loading bin;
- use of a truck loading chute;
- carpark area and driveway is sealed;
- coal stockpile area regularly sprayed using a water cart;
- watering of unpaved haul road sections and trafficked unsealed areas of the site using a water cart; and
- occasional sweeping.

The EA states that increased watering on unsealed haul roads may achieve 80% control efficiency, and if not achievable through watering this could be achieved through applying water extender chemicals or chemical road stabilisers. However, OEH has raised concerns regarding the lack of information demonstrating how this efficiency would be achieved and measured. Further detail concerning this control efficiency can be found in Appendix D.

Additional measures have been proposed, including: sealing 300 m of the access road to the Loch Catherine stockpile from the intersection with Medway Road; and the use of a street sweeper, which is to be shared with the Cement Works, on internal roads and around the pit top. These measures are considered adequate considering the scale of operations at the Colliery and the existing rural environment in the vicinity.

In their submission, OEH recommended that Boral install and operate a dust deposition, and fine particulate (PM₁₀ and TSP) monitoring network around the pit top. While the dust deposition rates, current and predicted, do not justify the requirement for ongoing PM₁₀ and TSP monitoring, Boral has committed to undertaking a short-term monitoring campaign (six months) to establish background data, and confirm the predictions in the EA. As the operation of a high volume sampler is an expensive undertaking, and the equipment itself presents a potential noise nuisance, a short-term monitoring campaign represents the most viable option to balance potential dust impacts and impacts associated with the monitoring activity. If the short-term monitoring is inconsistent with the predictions in the EA and fine particulate levels are above the OEH impact assessment criterion, consideration will be given to the implementation of a permanent fine particulate monitoring program at the Colliery in consultation with OEH.

The matter of dust generation by vehicles entering and exiting the Loch Catherine stockpile was also raised in a number of submissions. In a westerly or south-westerly wind the dust generated blows directly across the residences in Medway Village. As mentioned above, Boral is committed to sealing a significant portion of the Loch Catherine access road and purchasing a street sweeper in order to mitigate the potential dust nuisance from dust generated by vehicles.

WSC raised concerns regarding the lack of long-term air monitoring at the Colliery in their submission. Air quality monitoring at the Colliery has not been required historically under the Colliery's licences. In order to provide some substantive data on air quality for the EA, three dust deposition gauges were installed in October 2009. Data from these gauges, up until June 2010, was reported in the EA and the results of this data show that dust generation from the Colliery's continued operations would be below the OEH criterion. However, in order to establish a more definitive database of air quality data it is proposed to continue dust deposition monitoring and also to undertake a short-term monitoring campaign for fine particulates.

The Medway Resident's Group state in their submission that ENVIRON "appear to be admitting that the current operations are deficient and significant upgrading is required". This statement is drawing a conclusion that is not implied in the wording of ENVIRON's report. The report concludes that the predictions for future operations (ie maximum production levels of 460,000 tpa) indicate that, provided that current and proposed air quality management measures are implemented at the Colliery, particulate matter and dust deposition emissions attributable to the continued operations Colliery are anticipated to be within OEH's air quality goals. Based on dust deposition data collected, the current operations were also assessed as being under OEH's air quality goals and, therefore, could not be considered 'deficient'. Further, the current and proposed dust control measures are routinely successfully implemented at other mines and are considered to be feasible measures to manage air quality impacts.

4.2.2 Best management practice

Both OEH and WSC recommended the application of best management practice to air quality management at the Colliery. OEH suggested utilising the Katestone report (2011) in order to aid in the implementation of these best management practice. The report is comprehensive and covers a wide range of matters related to PM emissions, and identifies best practice operational methods and controls for minimising PM emissions from coal mining, which in relation to the Colliery, include:

- application of suppressant on haul roads and application of water to control emissions from grading; and
- use of water application or suppressants on coal stockpiles.

The measures identified above are, in part, already in place at the Colliery. Dust management currently involves watering of haul roads and stockpile area and occasional sweeping. The use of suppressants to reduce the need for water is a viable alternative to the current management methods. However, given the decision to seal the majority of the Loch Catherine access road, the use of chemical suppressants to manage air quality impacts for the small remaining unsealed area is not considered necessary.

The scale and nature of mining activities at the Colliery do not warrant management measures beyond those recommended above. Further details regarding site-specific best management practice are provided in Appendix D.

4.2.3 Impacts on residents of Medway and surrounds

The Medway Residents Group and a number of other public submissions raised concerns regarding the matter of dust generation and deposition on roofs, water tanks, cars and washing, and throughout homes. The Colliery currently complies with the OEH impact assessment goals for dust deposition, and it is predicted that the highest project-related dust deposition rates will comply also. The Colliery, Medway Village and surrounds are located in a rural environment and there are number of different sources that are likely to contribute to deposited dust levels. Further, as discussed above, the Colliery will implement a number of measures to improve dust generation from its operations.

Medway Village and surrounds does not have a reticulated water supply and residences in the area use tank water. A number of submissions expressed concern over the potential impacts of coal dust in tank water. Research conducted in Queensland investigated the potential health risks as a result of elements contained in coal dust being deposited on rooftops entering rainwater tank systems (Lucas et. al. 2009). Leaching tests were conducted on numerous coal types to identify the potential for trace element release into rainwater in the tank. In addition, rainwater samples were collected from both the rainwater tanks and taps of three homes within the dust deposition zone of the nearby mine. The leaching tests indicated that negligible amounts of trace elements in coal dust were released in the rainwater, and all trace elements were below the Australian Drinking Water Guidelines (ADWG). The ADWG provide the threshold levels considered safe for human consumption. The analysis of the rainwater from homes also showed that no trace element exceeded the ADWG.

As per advice from NSW Health (2007) it is good practice for any rain water system in any location to install a simple first flush system to prevent particulate matter, or any other undesirable materials, that have collected on the roof being washed into the rain water tank.

4.2.4 Uncovered loads and coal spillage

In their submission, the Medway Residents Group expressed concerns regarding overloaded and/or uncovered loads, and the subsequent coal spillages and coal dust accumulation that results. WSC also noted anecdotal evidence of uncovered loads in their submission. Boral acknowledges that, whilst loads are required to be covered when leaving the Colliery, there was a practice of not covering loads between the pit top facilities and the stockpiling area at Loch Catherine due to the fact that the coal is wet when loaded from the enclosed truck bin and the short distance to Loch Catherine from the pit top. However, Boral has acted to cease this practise and these trips now require loads to be covered.

Boral has developed and implemented a Driver's Code of Conduct which governs the haulage of coal on a day to day basis from the Colliery. The Code contains a number of measures designed to ensure compliance with the Colliery's lease, respect for residents of Medway, road users and the environment, and to maximise public safety at all times. It clearly states that loads must be covered and compliant. The Code also outlines the procedure to be followed should a product spillage occur, which includes the notification of mine staff, and the cleaning up of the spillage in an acceptable and environmentally sound manner.

Boral would be supportive of a condition in its consent that all loads be covered when travelling on public roads.

4.2.5 Public health impacts

A majority of the submissions objecting to the proposal raised concerns regarding the health impacts of coal dust. Queensland Health (2010) investigated the health impacts from ambient coal dust levels on the community of Gladstone, Queensland's largest commodity port. The study found that exposure to coal dust in itself was not posing a specific risk to human health over and above any risks that could be attributable to particulate matter generally, and concluded that, based on black carbon measurements at Auckland Point in Gladstone, coal dust levels were more than 1,000 times lower compared with the exposure levels for respirable coal dust known to be associated with adverse health effects resulting from occupational exposure. Queensland Health further noted that National Environmental Protection Council's National Environment Protection Measure (NEPM) ambient air quality standards issued for particulate matter, in both Queensland and NSW, were sufficiently protective of risks posed by coal dust.

NSW Health (2007) notes that it is thought that fine particles below 2.5 μm in diameter may be of a greater health concern than larger particles as they can reach the air sacs deep in the lungs. However, coarse particles (PM 2.5-10) may also be associated with adverse health effects. Combustion sources release air pollutants which generally comprise fine particulates that contain acidic and carcinogenic substances which can be detrimental to a person's health. Particulate releases from mining activities, which don't involve combustion, contain a smaller fraction of fine particulates and also a relatively less amount of acidic and carcinogenic substances. It is important to understand that the health-based criteria set by OEH are based on studies undertaken in urban areas with large populations where there is higher exposure of air pollutants from combustion sources, that is emissions from traffic fumes and industrial sources.

As outlined in Section 4.2.3, the Colliery currently complies with OEH impact assessment goals for dust deposition, and continued operations are predicted to comply also. The dust deposition criteria outlined in the OEH Approved Methods are applied as an amenity criterion as a health criterion has not yet been established. At present, deposited dust from coal mining and storage has not been linked with any specific health impacts.

4.3 Suggested conditions of approval

WSC have requested the following conditions in their submission related to air quality:

- that Boral be required to operate within legislative limits to reduce the impacts of dust on local residents;
- that copies of regular air monitoring reports be made available to the public through Councils offices and website.

The proposed air quality monitoring program described in this chapter is in accordance with the relevant criteria to minimise impacts on the community. As discussed previously, results of all monitoring programs at the Colliery including air quality monitoring are reported on by Boral in their AEMR which is provided to the relevant government agencies, including WSC. Boral will make the AEMR available to the public on their website.

Following a review of the draft Response to Submissions, OEH recommended the following conditions in relation to air quality at the site and surrounds.

- Preparation and implementation of an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General.
- Implementation of best practice air quality management on site, including all reasonable and feasible measures to minimise the off-site odour, and dust emissions generated by the project including those generated by any spontaneous combustion on site.
- Minimisation of any visible air pollution generated by the project.
- Regular assessment of the real time air quality monitoring and meteorological forecasting data, and modification and/or suspension of operations on site to ensure compliance with the relevant Conditions of this Approval to the satisfaction of the Director-General.
- A weather station must be established and maintained at the premises so as to be capable of continuously monitoring the parameters specified by OEH.
- All vehicles leaving that have been on unsealed surfaces at the premises must be subject to equipment or facilities to provide a cleaning process for the removal of materials from wheels and underneath the bodies of vehicles. The facilities must be designed and installed or existing facilities augmented with the aim of:
 - preventing materials being carried from the premises to external surfaces; and
 - collecting, treating and management of polluted water from any vehicle maintenance and truck wash areas in such a way that it does not cause pollution of SW and GW.

Boral is agreeable to the above conditions; however, would seek to only use real-time air quality monitoring if non-compliance against the air quality impact assessment criteria was established in an AEMR or as directed to by the Director-General.

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5 Community and consultation

Community consultation and socio-economic impacts were discussed in Chapters 6 and 8 of the EA respectively.

The matters raised in the submissions in relation to community and consultation generally relate to:

- the perceived lack of consultation with the community during preparation of the EA;
- impacts to the community; and
- risk management process.

5.1 Response to matters raised

5.1.1 Community consultation

At the commencement of the Berrima Colliery application, it was identified that the consultation with the local community was important. The community was generally split into three groups – those within the mining area, those within the Medway area (located close to the pit top and along the transport route of Medway Road) and those in the general locality.

The first formal means of consultation with the community was to hold information sessions in early May 2010 to advise them of the proposal and need for a planning approval for continued operations. The community within the mining area were contacted directly and invited along to the information sessions. Unfortunately, Boral did not have a database of residents in and around the Medway area at the beginning of the process. So, in late April 2010, two representatives from Boral went around the Medway area knocking on doors advising residents of the information sessions. Notices were left with those residents at home. For those residents not at home, notices were left at the property. For the general community, notices were distributed around the local area at public places such as the New Berrima shop and Berrima Post Office.

The information sessions held on Friday afternoon 4 May 2010 and Saturday morning 5 May 2010 were attended by approximately 15 people.

Subsequent information sessions were held on Friday afternoon 18 February 2011 and Saturday morning 19 February 2011. The purposes of these sessions were to update the community on the progress of the EA and brief them on the results of the preliminary assessments. Similar to the first sessions, these sessions were advertised by delivery of notices to residences in the local area and distribution of notices around the local area at public places. In addition, notices were sent to addresses of some local community members identified on a preliminary database that was established in January and February 2011. The sessions were also advertised on the local radio.

The information sessions in February were better attended with approximately 43 people attending both sessions. An information sheet was also circulated to the residents of Medway and New Berrima on the Colliery and Cement Works EAs during July 2011.

Boral understands the community's concerns around communication with the community for the Berrima Colliery application. For example, it is also now recognised that past communications have been hampered by the absence of a regular mail service to Medway with some residents that maintain PO Boxes at the Berrima Post Office not receiving letters till some time after they were delivered. Since the

information sessions in February 2011, Boral has put measures in place to significantly improve the way it communicates with the communities of both Medway and Berrima. Matters relating to Berrima Colliery are now included within the Community Liaison Committee (CLC) meetings that have been regularly held for the Berrima Cement Plant since 2003 but used to focus on the Cement Works and residents in New Berrima only. These meetings are publicly advertised in the local newspaper, through Boral's website, letters/emails to residents on the database and notices in the New Berrima General Store and Berrima Post Office. Community members are also invited by way of the community database that was established earlier in the year.

5.1.2 Impacts on the community

Impacts on the community have been addressed in other sections of this report.

5.1.3 Risk management process

The Medway Resident Group stated in their submission that residents were not consulted or had input into the risk management process for the EA, in particular in relation to heavy vehicle movements on Medway Road. This risk management process was first presented in the PEA which was made publicly available on DP&I's website and was also supplied to WSC to assist them in providing the DGRs for the EA.

6 Groundwater

6.1 Overview

The Groundwater study undertaken by Australasian Groundwater and Environmental Consultants Pty Limited, was summarised in Chapter 10 of the main volume of the EA and provided in full in Appendix D of the EA. The principal author was James Tomlin, a hydrogeologist with over 15 years experience in the field. The scope of the assessment considered the potential groundwater impacts resulting from the proposed continued operations at Berrima Colliery.

The matters raised in relation to groundwater in the submissions generally relate to the following:

- groundwater assessment;
- water sharing plans;
- groundwater monitoring and management.

6.2 Response to matters raised

6.2.1 Groundwater assessment

NOW have requested in their submission that the following be undertaken at Berrima Colliery:

- installation of additional monitoring bores within the alluvium and coal seam aquifers for the assessment of groundwater within and adjacent to the mining area;
- assessment of alluvial extent for Wingecarribee River and Mandemar Creek;
- detailed hydrological assessment of mining area; and
- surface/groundwater connectivity assessment for Wingecarribee River and Mandemar Creek.

The above would be determined through an expanded groundwater monitoring program proposed for the Colliery. This is described in Section 6.3.

OEH requested that greater consideration be given to predicted increases in mine water make due to the expanded mine roof and the issue of contaminant loads/pollutants downstream. As the mine footprint expands groundwater will seep into the mine from the coal face and from dykes that have intruded the seam. The rate of groundwater seepage is dependent on the position of the mine face and the dykes in this area. There is significant variability in the peak inflows, due to the variability in the geology, but as the water at the face is captured and stored in the mine prior to discharge, the peak inflows are smoothed out during discharge. The increase in foot print of mining is relatively limited, and a significant increase in the volumes of seepage pumped from the mine is not expected. Issues of potential contaminants/pollutants downstream are addressed in Chapter 7 of this report.

One public submission raised a number of matters in relation to groundwater. These are addressed below.

Why details of the Culpepper Bore were not provided in the Groundwater study.

The Culpepper Monitoring bore is an old coal exploration bore that remains open, and has been seen by the mine as an economic opportunity to monitor groundwater levels. There is no available information on the construction of the bore.

A pumping test of the Belpin Production Bore does not appear to meet the objectives of the NSW Groundwater Quality Protection Policy (1998).

There are no water samples to support the assumption that groundwater from the Wongawilli Seam Coal seam has a higher salinity than groundwater in Hawkesbury Sandstone. Water samples collected from the mine at the face of the Wongawilli Seam Coal recorded relatively low salinity, with a TDS between 157 mg/L and 345 mg/L (refer to Appendix A in groundwater report). The Belbin bore, which is screened in the sandstone recorded a TDS of 150 mg/L during the pump test referred to in the Groundwater study. Although the samples were collected at different time periods, and possibly tested with different methods, the data does not indicate a significant contrast between the water quality in the Wongawilli Seam and the Hawkesbury Sandstone, as purported in the submission. As water mixes in the mine the oxidation of sulfides appears to increase the TDS concentration, but this process occurs upon contact of the water with air in the mine, not in the surrounding aquifer, and therefore the conclusions reached regarding the chemical reactions occurring in the groundwater are considered valid.

The proposed monitoring network will consider construction of monitoring bores in the Hawkesbury Sandstone, to better understand the contrast in water quality between aquifers.

The purpose of the NSW Groundwater Quality Protection Policy (1998) is to protect the quality of groundwater within aquifers. It is true that some mixing of groundwater from different geological units occurs when groundwater seepage enters the underground mine. However this seepage does not re-enter the surrounding aquifers, but it discharged back to the Wingecarribee River, which is the natural discharge zone for groundwater in the vicinity of the colliery. Therefore the objectives of the NSW Groundwater Quality Protection Policy (1998) are considered to be met.

Evaporation data from Goulburn isn't relevant to Berrima Colliery.

The purpose of the evaporation data is to present the difference between rainfall and evaporative loss of water. As the evaporative loss of water reduces, relative to rainfall the potential for recharge of underlying aquifers is increased. It is agreed that use of evaporation data from Goulburn is not optimal. However given that there is no other known station where evaporation is recorded in proximity to the colliery, and that it can safely be assumed evaporation at the site is lower than at Goulburn, the data still serves to identify the periods of the year when recharge of the groundwater system is most likely to occur.

The upper part of the (Wongawilli) Seam hosts interbedded carbonaceous shale, mudstone and shaly coal, therefore, it is most unlikely that the seam contains a "10 m thick coal seam aquifer" as stated in the Groundwater study and only the lower, coal-rich porous mining section is a likely significant aquifer.

It is agreed the shales and mudstones have only a limited capacity to transmit water, and that the coal seam is the main aquifer in this 10 m sequence.

Water from the basal Hawkesbury Sandstone is sufficiently low that it would be in the category of "fresh water" and it should therefore be excluded from contact with/mixing with more saline waters, such as in the Wongawilli seam.

There is insufficient data in the area local to the colliery to determine the contrast between the salinity of the groundwater in the Wongawilli coal seam and the Hawkesbury Sandstone. However, the limited

information does suggest the contrast in salinity may not be major. Separation of waters from the Hawkesbury Sandstone and the Wongawilli coal seam is not a practical in the underground mining environment.

What do the transmissivity and storativity determined in the Groundwater study refer to?

The bore that was pump tested was screened across different aquifer zones, and therefore the transmissivity and storativity derived from the test reflect an average for the different geological units, rather than the actual values for each formation. The groundwater report notes that the hydraulic conductivity changes depending on the saturated thickness of the aquifer.

The Belbin and Culpepper bores appear to be production bores. It was observed that the hydrostatic levels rose and fell according to "pumping". Does that mean that water was extracted?

Belbin Bore and the Culpepper Bores are stock/domestic bores and have pumps installed. The long term hydrographs for these bores show a fluctuation in water levels due to pumping which is evident in the hydrographs presented in Figure 3 of the groundwater report. Short term pumping tests were undertaken on these bores by Larry Cook and Associates (2008) and are considered valid.

The discussion of chloride concentration, to indicate a recharge rate of 10% does not appear to be valid.

The source of most chloride in groundwater is rainfall. Evapotranspiration of rainfall within the upper soil profile concentrates the chloride, with the remaining water draining to underlying aquifers as recharge. The purpose of presenting the chloride mass balance was to show that the evaporative concentration of rainfall is relatively low in the area of the colliery, and that therefore the recharge rate for the aquifers is relatively high. It is agreed it would be optimal to utilise water quality from samples that have no potential for intermixing between aquifers, but the conclusion reached in the EA will remain the same (ie that the recharge rate is relatively high).

Does the groundwater inflow range of 2ML/day to 3.5ML/day include water introduced to the mine and used by mining machinery?

Any water used by the machinery in the underground workings is sourced from the groundwater seepage to the mine. Therefore the figures presented represent the ingress to the mine from the aquifers.

Reliable information on specific geological materials and aquifer conditions at a site is necessary to establish the optimum design for various elements of a final production bore.

It is agreed the design of both monitoring bore and production bores should aim to segregate water from different aquifers to prevent intermixing, and ensure representative samples are collected. This ideal is not routinely achieved in production bores which are aiming to maximize bore yields, and therefore frequently obtain water from different geological formations and fracture zones. The study utilized the existing network of bores available around the mine which have screens across different geological units.

6.2.2 Water Sharing Plans

NOW stated in their submission that the water sharing plan rules applicable to surface and groundwater sources within the Colliery's mining area should be considered. The *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011* and the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011* commenced on 1 July 2011. This was nine months after the groundwater study was finalised in September 2010 and whilst the EA was on exhibition.

The Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources (NOW 2011) does not apply to the Berrima Colliery as surface water is not harvested by the operations. However, the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (NOW 2011) does apply due to groundwater being extracted during mining operations. Under this plan the mining operation is largely located with Nepean Management Zone 2. There is the potential that a very small portion of the operation is located within Nepean Management Zone 1, but available maps in the water management plan are not sufficiently detailed to determine this with confidence.

The Nepean Management Zone 1 was embargoed under the *Water Act 1912* in 2007. There is embargo for the Nepean Management Zone 2 in which the majority, or all, of the mining operation is located.

The majority of the groundwater that seeps into the mining operation is returned to the environment when discharged into the Wingecarribee River, which is the ultimate discharge area for the regional groundwater. There is an argument to pose that the water extracted by the mine is not lost from the system.

6.3 Proposed groundwater monitoring program

6.3.1 Surface water/ groundwater connectivity

The degree of the connectivity between surface water, aquifers and the mine will be investigated further in a two stage study. The first stage of this study will involve age dating water samples from the Wingecarribee River, bores and the underground mine to understand the degree of connectivity. The age of water samples will be determined with a suitable method such as radiocarbon, tritium or CFC analysis. The age of the water samples will help to understand the magnitude of the interconnection between the flows in the Wingecarribee River and the seepage observed in the mine.

If the age dating is inconclusive then it may be necessary to progress to the second stage, which would include installing a number of monitoring bores adjacent to the Wingecarribee River and the mining operation. These bores would be used to compare hydraulic heads in the Wingecarribee River and the adjacent aquifers to determine if the river is a “loosing” or “gaining” system for groundwater. However, there are significant issues with gaining access to optimal drilling sites because of the rugged nature of the terrain and the majority of the land is private property. Only if the first stage of age dating is inconclusive, will the second stage of investigation be undertaken.

6.3.2 Monitoring bore network

The existing and proposed network of groundwater monitoring bores described in the EA will be augmented with new bores. There are plans to construct monitoring bores and/or to install vibrating wire piezometers in coal resource holes, which will improve the understanding of groundwater levels in the immediate area of the mining. Additional regional monitoring bores will be constructed surrounding the mining area, in addition to proposed new bores in existing resource drill holes local to the mining. It is likely the regional monitoring bores will be constructed in the road reserve due to the difficulties with land access surrounding the mine. The exact location and number of monitoring bores will be determined in consultation with NOW and OEH during the development of the Groundwater Management Plan for the project.

The additional monitoring bores will also serve to determine the magnitude of drainage induced by subsurface fracturing, which was an issue raised by OEH.

The potential to augment the monitoring bore network with stock and domestic bores will also be further investigated. Access to stock and domestic bores for water level measurement may help to fill in any gaps in the monitoring network where land access for installation of new bores is not possible.

All new bores will be equipped with electronic data loggers (similar to the existing bores) to monitor groundwater levels on a 6 hourly basis. This frequency will be sufficient to record fluctuations induced by mining, recharge or pumping from stock and domestic bores.

6.3.3 Groundwater dependent ecosystems and stygofauna

The government submissions commented that there had been only limited assessment of the potential for groundwater dependent ecosystems (GDEs) and/or stygofauna to be present in the area of mining. An integrated ecology and hydrogeology study will be undertaken to understand the potential for GDEs to be present. This study will utilise data from the additional monitoring bores and the surface water/aquifer connectivity work to understand the potential for GDEs to be present. All new monitoring bores constructed for the project will have samples collected and analysed for the presence of stygofauna. Data loggers will be installed in the bores to monitor for water level fluctuations induced by use of water by vegetation. Ecosystems where shallow groundwater is present will be surveyed to determine if any species known to be groundwater dependent are present. A survey of aquatic species in the Wingecarribee River will be undertaken.

6.4 Suggested conditions of approval

The following commitments for the Colliery were sought by NOW:

- preparation of Groundwater Management Plan to include, but not limited to:
 - water quality parameters to be monitored;
 - monitoring frequency for quality (minimum of monthly sampling);
 - water level monitoring (installation of water level loggers);
 - monitoring GDEs;
 - measured and predicted site water balance;
 - trigger criteria to detect impacts from operation;
- submit a report of monitoring and outcomes within one month of the completion of the baseline monitoring program to NOW for review and assessment of longer term monitoring requirements; and
- an annual report to include all GW, SW and GDE monitoring and any exceedances in trigger criteria is to be submitted to NOW.

Boral has included commitments to prepare the abovementioned Groundwater Management Plan and additional investigations, and to submit a report of monitoring and outcomes in the revised Statement of Commitments (Appendix B). The water quality parameters/trigger criteria will be those presented in Table 7.1 for water quality monitoring.

As required under the NSW *Mining Act 1992*, Berrima Colliery prepares an AEMR which includes results of all monitoring programs at the Colliery. The AEMR is provided to the relevant government agencies, including NOW. The Statement of Commitments in the EA included a commitment by Boral to continue to prepare the AEMR, which would include groundwater and GDE monitoring, and provide it to the relevant government agencies.

Following a review of the draft Response to Submissions report, NOW recommended further assessments be undertaken as part of the ongoing management of potential groundwater impacts at the mine, these were:

- prior to any increase of production above the current extraction of 220,000 tpa, Boral must develop and submit additional groundwater investigations to NOW for assessment and endorsement. The additional actions/information are to be provided by Boral in consultation with and to the satisfaction of NOW; and
- implementation of a program to monitor the response of GDEs to extraction of groundwater and depressurisation of surrounding geological strata to be developed in consultation with and to the satisfaction of NOW.

Boral is agreeable to these proposed conditions; however, would prefer the trigger for the additional groundwater investigations to be within nine months of the granting of Project Approval to allow sufficient time for the required investigations to be undertaken and programs developed.

Following a review of the draft Response to Submissions, OEH also recommended further commitments regarding groundwater monitoring and management, these were:

- an examination of the effect of the Berrima Coal mine on local groundwater aquifers and groundwater fed surface streams with a draft report submitted to DP&I, SCA, OEH and NOW containing a proposed program for the GW investigation no later than 31 March 2012; and
- development of a program and associated study must be developed in consultation with NOW and OEH.

Boral requests that the timeframe associated with the above conditions be extended to no later than nine months from the granting of Project Approval to allow sufficient time for the required examinations to be undertaken and program developed.

WSC have requested copies of water monitoring reports be made available to the public. As discussed previously, results of all monitoring programs at the Colliery including groundwater monitoring are reported on by Boral in their AEMR which is provided to the relevant government agencies, including WSC. Boral will make the AEMR available to the public on their website.

7 Water quality

7.1 Overview

A Water Quality Assessment for the Berrima Colliery EA was undertaken by Strategic Environmental and Engineering Consulting (SEEC). The main author was Mark Passfield a Principal Environmental and Geotechnical Engineer who has considerable experience in water quality management. The assessment was summarised in Chapter 14 of the main volume of the EA and provided in full in Appendix J of the EA. The scope of the assessment considered the potential surface water and water quality impacts resulting from the proposed continued operations at Berrima Colliery. The colliery currently discharges groundwater that flows into the underground workings at a licensed discharge point near the V-Notch Weir into the Wingecarribee River.

Soil and Water Management Plans were also prepared by SEEC for the Berrima Colliery Pit Top and the Loch Catherine stockpile area. These plans were summarised in Figures 14.2 and 14.3 and detailed in full in Appendix K to the EA.

The matters raised in relation to surface water and water quality in the submissions generally relate to the following:

- assessment methodology;
- impacts to surface water;
- waste water management;
- water quality monitoring;
- aquatic ecology monitoring;
- water quality management;
- waste water management; and
- reuse of mine water.

7.2 Response to matters raised

7.2.1 Assessment methodology

In OEH's submission there is a comment that the SEEC report states that "no active gauging stations on the Wingecarribee River were found on the NSW Water Information website" though there are four gauging stations downstream of the Colliery. The report does state this, however, in the same sentence it goes on to state that the Sydney Catchment Authority (SCA) monitors the river flow at Berrima Weir which is upstream of the site. This station is the nearest gauging station to the Colliery and is considered the most relevant to the site particularly in terms of flow pattern. Flow data from this station was obtained from the SCA and reported on in SEEC's report (see Section 4.2).

OEH states that an assessment of the likely impacts of pollutants in the mine water is needed and that the assessment should be undertaken in accordance with the ANZECC 2000 guidelines. This has been undertaken in SEEC's report which assessed the likely impacts of pollutants in the mine water against the

ANZECC 2000 guidelines for drinking water or 'aesthetic purposes'. The mine water was also assessed against SCA's water quality objectives, the values in the Healthy River Commissions 1998 report and NOW's health requirements for high risk potable water. This approach was used as Wingecarribee River is part of Sydney's drinking water catchment and this was seen as the primary use of the river.

Boral notes that OEH has requested that the ANZECC guidelines used for the assessment should be for 'ecosystem health' rather than 'aesthetic purposes'. The water quality monitoring data for the Wingecarribee River monitoring points has been assessed against the 'ecosystem health' guidelines and the water quality generally does not exceed these guidelines and when it does the exceedance is observed both upstream and downstream of the discharge point. It is also important to note that instances of Manganese levels in the mine water discharge, which exceeded the ANZECC 'aesthetic purposes' guideline of 100 µg/L, do not exceed the 'ecosystem health' guideline which is 1900 µg/L. Regardless the levels of Manganese in the Wingecarribee River were on average below the more conservative level, the 'aesthetic purposes' guideline, as reported in SEEC's report (see Section 4.1.2).

NOW has questioned why there has been no water quality monitoring undertaken within Mandemar Creek which may potentially be impacted on by the Berrima Colliery Operations. The discharge point is downstream of Mandemar Creek and, therefore, the mine water discharge would not impact this tributary. Water quality monitoring in Mandemar Creek would only be beneficial to determine if this is the source of any upstream contamination sources during exceedances. However, this would also be able to be determined through comparisons between data collected at the drift conveyor and the upstream monitoring point in Berrima, which are both upstream of the discharge point and the tributary of Mandemar Creek lies between them.

Currently not all of the parameters in the ANZECC guidelines for 'ecosystem health' are being tested for. There is therefore a need to expand the existing water quality monitoring program to ensure that these parameters are included. The proposed future water quality monitoring program for the colliery is described in the next section.

NOW have requested that the *Water Sharing Plan for the Greater Metropolitan region Unregulated River Water Sources 2011* be considered. Consideration of the Water Sharing Plans was discussed in Section 6.2.2 of this report.

7.2.2 Water quality monitoring

The Colliery currently conducts a comprehensive water quality monitoring program involving weekly samples of mine discharge, monthly samples in Wingecarribee River both upstream and downstream of the discharge point, monthly samples from various locations within the mine works and quarterly samples from groundwater monitoring bores. This program includes water quality parameters, outside of those specified in the EPL. The monitoring program was developed under the current Subsidence Management Plan (SMP) for the colliery which was approved by the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS). The SMP and its water quality monitoring program were also reviewed by relevant government agencies including OEH and NOW prior to its approval.

Water quality monitoring data has been collected from the Wingecarribee River since 2008. The parameters/indicators tested for and the frequency of monitoring is shown in Appendix 1 of SEEC's report. The discharge from the colliery is required to achieve certain water quality criteria under the EPL, which are presented in Table 14.4 of the EA, though a number of metals and biological contaminants are also tested for. The data collected shows that the quality of the Wingecarribee River and the discharged mine water does generally achieve the specified guidelines. However, Boral recognises that the parameters currently tested for are limited in scope and longer periods of monitoring are needed to accurately determine the characteristic of the groundwater discharged from the mine and the impacts of

Wingecarribee River. The current water quality monitoring program will therefore be expanded to include, amongst other things, a wider range of parameters as shown in Table 7.1. These parameters have been derived from the ANZECC guidelines specified for assessment of 'ecosystem health' and SCA drinking water guidelines and the Healthy River Commissions 1998 report.

Table 7.1 Water quality parameters

Revised water quality default triggers	
<i>Parameter</i>	<i>Concentration limits (µg/L unless shown otherwise)</i>
Turbidity	< 15 NTU
pH	6.5 - 8
Total Phosphorous	20
Total Nitrogen	250
Chlorophyll-a	5
Arsenic (III & V)	24 & 13
Barium	NA
Boron	370
Cadmium	0.2
Chromium (CRVI)	1
Cyanide	7
Lead	3.4
Mercury (organic)	0.6
Nickel	11
Selenium	11
Silver	0.05
Aluminium (pH>6.5)	55
Ammonia (as N)	900
Chlorine	3
Copper	1.4
Manganese	1900
Zinc	8
Nitrate	700
Hydrogen Sulfide	1
Salinity	350 µs/cm
Benzene	950
Naphthalene	16
Filterable reactive phosphate (µg/L)	15
Oxides of Nitrogen (µg/L)	15
Ammonium (µg/L)	13
Dissolved Oxygen (%sat)	90-110
Required water quality targets for direct human contact	
<i>Parameter</i>	<i>100th percentile limit (unless shown otherwise)</i>
E Coli	<1 cfu/100 ml
BOD	< 10 mg/L
pH	6.5 – 8.5
Turbidity	< 2 NTU (95th percentile) < 5 NTU (100th percentile)

The monitoring program will be designed to the requirements of the Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC and ARMCANZ 2000). The water quality monitoring program will also be integrated with an appropriate ecological monitoring program as described in the next section. Water quality will continue to be tested both upstream and downstream at the locations identified in Figure 14.1 of the EA on a monthly basis. The monitoring will test against the trigger criteria identified in Table 7.1. An exceedance of the criteria in Table 7.1 will 'trigger' further assessment, as described in Section 4.4 of SEEC's report.

The monitoring program will incorporate event based sampling which will cover a range of river flows. Ultimately, it will be able to group the monitoring data and interpret it under various flow conditions (events). Flow data will be used from the SCA's Berrima Weir gauging station. The data obtained under conditions of low river flow would be of greatest interest, as it is then that the consistent discharge from the mine would be at the highest concentration. NOW has requested in their submission that flow monitoring sites also be established at Wingecarribee River and Mandemar Creek. This is considered unnecessary as the existing gauge station at Berrima Weir has a similar flow pattern to those near the mine and the data from this station is readily available from SCA. There are also four gauging stations downstream from which data can be obtained if necessary.

Boral notes that OEH has requested that the ANZECC guidelines used for the assessment should be for 'ecosystem health' rather than 'aesthetic purposes'. The default triggers in the water quality monitoring program presented in the EA have therefore been revised to the values from ANZECC 2000 (for ecosystem health). These are presented in Table 7.1 above. After two years of water quality monitoring a site-specific suite of trigger values will be determined in consultation with the authorities. Until then the default trigger values given in Table 7.1 will be used.

If the default triggers in Table 7.1 are exceeded downstream of the mine, reference will be made to the concurrent upstream water quality modelling to see if they are also exceeded (to the same extent). If the trigger is exceeded both upstream and downstream, the issue is likely to be unrelated to the mine water discharge. If the trigger is only exceeded downstream, reference would be made to the aquatic ecology monitoring program described below as, ultimately, it is the river's ecology that monitors the river's health. As the mine water discharge has long been a part of the river flow it is possible that exceedances of the guidelines resulting from the mine water discharge have been naturally adapted to by the rivers ecology. Additionally, the water quality data available, whilst limited, does suggest that the triggers will not be greatly exceeded and, if they are, they are likely to be exceeded because of upstream influences. However, mitigation options, if required, would be developed under the water quality monitoring program.

The above aspects of the water quality monitoring program have been included in Boral's Revised Statement of Commitments provided in Appendix B.

7.2.3 Aquatic ecology monitoring

As discussed above, the proposed water quality monitoring program will be integrated with an appropriate ecological monitoring program. An adaptive aquatic monitoring program is proposed for the Colliery to measure and act upon changes to river health within the Wingecarribee River from mine discharges. The program will include seasonal sampling of sites upstream and downstream of the discharge area using the Australian River Assessment System (AusRivAS) model. Consultation with OEH will be undertaken during development of this program.

The AusRivAS protocol assesses the ecological health of segments of rivers and creeks by sampling the aquatic biota. Macroinvertebrate communities are sampled using rapid sampling techniques and compared to models based on the habitat present and reference communities. Biological responses to

changes in river condition indicate the presence and magnitude of an impact on the site's ecological health (Chessman 1995).

The monitoring results will detect changes to water quality and habitat condition as a result of the discharges, by comparing the difference between the upstream and downstream monitoring locations. Quantitatively determined effects to river health from discharges, in terms of ecotoxicity, would be determined by the results of the water quality monitoring program (described above) by assessing against the ANZECC 2000 guidelines for 'ecosystem health'.

Mitigation and management of any negative impacts would feed back into the operation of the Colliery and the monitoring program would be adapted accordingly.

7.2.4 Impacts to surface water

SCA requested the Soil and Water Management Plan (SWMP) for Loch Catherine prepared by SEEC (Appendix K of the EA) be updated to include the expansion area and the separation of clean and dirty water. The SWMP for Loch Catherine has been updated accordingly and is included as Appendix C to this report.

7.2.5 Waste water management

OEH have raised queries about improvements to waste water system and further details on the Site Sewerage System. OEH also comments that the lack of information presented in the EA was raised as a deficiency during its review of the EA for adequacy. It was understood that OEH's request was only for clarification of the current method of on-site sewage treatment and disposal as well as a request for commitment to upgrade the system where it does not meet contemporary standards. Accordingly, these were provided in Section 5.11 of the EA. There was a request from OEH for further information on the upgrades to the surface water system at Loch Catherine and the pit top. This was summarised in Section 14.4.2 of the EA and provided in detail in Appendix K of the EA; however, this wasn't interpreted to include the upgrades to the sewerage system.

Boral propose to upgrade the existing septic treatment system by the installation of a modern Aerated Wastewater Treatment System (AWTS) which has been designed to cater for 45 persons. The system will include:

- primary treatment/septic tank;
- secondary treatment/collection well containing:
 - two aeration chambers containing two packs of BTM200 Bio Tube media;
 - settling chamber;
 - chlorine disinfection pump chamber;
 - irrigation pump chamber;
- chlorine disinfection unit installed on the outlet of the settling chamber;
- air supplied to the aeration chambers by an air pump; and
- 10 metre head submersible irrigation pump with automatic pump control.

The tanks will be buried in a location adjacent to the current primary settling tank and plumbed into the existing pipe work from the bathhouse and ablutions. The treated wastewater will be irrigated over the grassed area between the treatment tanks and the access roads, to the east of the bathhouse. The new plant will require approval from WSC and SCA and it is expected that the applications will be made by the end of November 2011.

7.2.6 Reuse of mine water

OEH has requested that information be provided in the form of written advice from NSW Health on the acceptability of reuse of mine water by the public. As mentioned in Section 14.3.1 of the EA, a portion of the groundwater that is produced at the colliery is pumped from the underground workings to the Pit Top facilities for non-potable use. The mine water has been made available to the residents at Medway Village since 1926 with current use of groundwater approximately 300 L on average per day. The water is made available to the residents strictly for non-potable use only.

The reuse of the mine water for non-potable uses has been assessed under the requirements for direct human contact given by NOW (see Sections 3.1.1 and 4.1.1 of SEEC's report). The water has been assessed as suitable for domestic re-use. It is considered that OEH's request for written advice from NSW Health was required if the water was supplied for potable use. Since this is not the case, such advice is not considered necessary.

7.3 Suggested conditions of approval

A number of commitments for the Colliery were sought by NOW. These are detailed below with response to each commitment provided.

1. that all licences for the current operation to be finalised and applications for any additional water requirements for the extension to be submitted and discussed with NOW prior to project approval;

As stated in Section 3.2 of the EA, Boral lodged an application in early 2009 with NOW to extract groundwater at Berrima Colliery under Part 5 of the *Water Act 1912*. This application has been accepted and registered and is currently being assessed by NOW.

2. geomorphic description of streams and rivers within and downstream of the project site;

The requirement for a geomorphic description of streams and rivers within and downstream of the project site is not considered necessary based on the established impacts of the Colliery. There are no streams or rivers within the project site and those downstream from the site include Wingecarribee and its tributaries. The low flow volume discharged from the Colliery is unlikely to cause erosion within the Wingecarribee River or its tributaries and the SCA's frequent and extended releases of up to 400 ML/day would entirely mask any effect the Colliery's discharge might have.

3. that an annual report to include all GW, SW and GDE monitoring and any exceedances in trigger criteria is to be submitted to NOW;

As previously discussed, the Statement of Commitments in the EA included a commitment by Boral to continue to prepare an AEMR. The AEMR includes results of all monitoring programs at the Colliery, including water quality monitoring, and would continue to be made available to the relevant government agencies, including NOW.

4. the Surface Water Management Plan must be updated in consultation with NOW and include the following:

- a) A detailed water quality monitoring program to be implemented for Wingecarribee River and Mandemar Creek to coincide with the groundwater monitoring to inform the surface/groundwater connectivity studies; and
- b) development of trigger criteria for detecting impacts to the water courses due to the mining operations.

The Surface Water Management Plan will be updated to reflect these commitments sought by the NOW.

Following a review of the draft Response to Submissions, OEH recommended that there be conditions imposed regarding the discharge of mine water and its characteristics. OEH requested that the possible impact of the mine water discharge through LDP1 on Wingecarribee River be assessed using the risk based process described in ANZECC 2000. A draft report would be prepared and provided to DP&I and OEH containing a proposed program for the assessment of discharged mine water in accordance with National Water Quality Management Strategy and ANZECC 2000 no later than 21 March 2012. The program and associated study must be developed in consultation with OEH. Boral requests that the timeframe associated with this recommendation be extended to no later than nine months from the granting of the Project Approval to allow sufficient time for the program and associated study be developed.

Additionally, OEH provided further commitments regarding the upgrading of the onsite wastewater management system. OEH requested:

- the improvement the sewage management system to the satisfaction of the Director-General by replacement of the existing septic tank and adsorption trench with a STP and a disposal or re-use scheme that meets contemporary standards no later than 31 December 2012. A written report on the integrated wastewater system, demonstrating how the prescribed environmental performance objectives will be satisfied, must be provided to the department.

WSC have requested the following conditions in their submission related to water quality:

- that Boral be required to operate within legislative limits to reduce the impacts of water quality for local residents and the environment;
- copies of regular water monitoring reports be made available to the public through Councils offices and website; and
- that all appropriate reports and applications in relation to the septic tank and disposal system upgrade be made to WSC within six months of this consent.

The proposed water quality monitoring program described in this chapter is in accordance with the relevant guidelines to minimise impacts on the community and the environment. As discussed previously, results of all monitoring programs at the Colliery including water quality monitoring are reported on by Boral in their AEMR which is provided to the relevant government agencies, including WSC. Boral will make the AEMR available to the public on their website.

As discussed above in Section 7.2.5, applications for the upgrade to the septic system are intending to be lodged with WSC before the end of November 2011 and following approval installed early in 2012. A report in response to the OEH requirements on the system installed will be submitted prior to the end of 2012.

OEH have requested an assessment of possible arrangements for continued discharge or cessation of flow following eventual closure. This would be undertaken following the results of the aquatic ecology monitoring and would utilise these results and the results of the water quality monitoring to determine whether continued discharge or cessation of flow following closure is required.

8 Subsidence

8.1 Overview

The Subsidence Assessment (SA) was undertaken by Ditton Geotechnical Services Pty Ltd (DgS), and was summarised in Chapter 9 of the main volume of the EA and provided in full in Appendix C of the EA. The principal author was Steve Ditton who has over 20 years experience in the civil and coal mining industries as a geotechnical engineer, including 15 years of mine subsidence related work. The assessment considered the potential subsidence impacts resulting from the proposed continued operations at Berrima Colliery. The subsidence assessment was based on an assessment prepared for the approved SMP.

Some matters were raised in the OEH and NOW submissions in relation to subsidence impacts. Those generally related to the following aspects:

- impacts to groundwater; and
- subsidence assessment methodology and modelling.

A detailed response to OEH's comments by DgS is provided in Appendix E to this report. A summary of the response is provided below.

8.2 Response to matters raised

8.2.1 Impacts to groundwater

OEH commented in their submission that the EA was deficient in regards to the assessment of:

- the potential for connecting cracking between the workings and the surface; and
- the groundwater hydrology regime at Berrima Colliery.

OEH also noted that the magnitudes of tensile and compressive strains measured at Berrima are similar to the magnitude of strains in the Bulli PAC report, which were described as "contributing to bedrock fracturing".

The measured strains at Berrima Colliery have been reviewed several times by DgS for Subsidence Management Plan reporting purposes since 2007. Based on discussions with the contracted mine surveyor (Craven Elliston & Hayes), the survey pegs above the underground workings at Berrima, which are located on farming properties, are often disturbed by livestock and agricultural activities. The absence of any surface cracking confirms that the high strains are unlikely to be 'real' and that external influences are likely to have been the direct cause of the apparent high strain anomalies. Measured subsidence effects above four previous panels at Berrima Colliery show that the actual strain values at Berrima are significantly lower than the Bulli PAC report (see Table 1 of DgS response – Appendix E).

OEH have noted the potential for interaction of discontinuously fractured strata with lower continuously connected fractures (to the workings) if a fault is undermined. This scenario could develop if second workings is attempted in the vicinity of a fault and a stable barrier of coal would be left directly beneath any faults encountered in new panels to avoid such a scenario. Though the likelihood of undermining a

fault with second workings will be low due to the poor roof and rib conditions that are likely to be present in the vicinity of significant geological structure.

OEH have recommended that additional investigations of groundwater resources should be undertaken to assess what the actual height of fracturing is above total extraction areas. It is recognised that further work on understanding the groundwater regime and heights of fracturing above total extraction panels at Berrima is needed. To achieve this, the SA recommended that deep bore extensometers and vibrating wire piezometers to be installed as a general requirement to assessing heights of fracturing. Shallow standpipes to monitor shallow groundwater impacts above extraction panels were also recommended.

Further recommendations have been made by DgS including that deep multi-wire extensometer and multi-piezometer monitoring boreholes be installed to within 10 m height above the workings (see Appendix E). The costs of installation and monitoring are quite high (>\$50,000 per hole) so selection of low risk sites are critical and should be undertaken in consultation with a groundwater consultant. Additionally, construction of boreholes is dependent on obtaining permission from affected land owners. Monitoring of mine water production and shallow ground water levels will also be undertaken to assess the continuous and discontinuous fracturing above a panel.

8.2.2 Subsidence assessment

i Methodology

OEH have commented that the EA states that coal will be extracted using “bord and pillar” mining methodology and that a number of remaining coal pillars will be removed. Uncertainty in what pillars will remain is suggested because it is claimed that the EA discusses “effective pillar widths” but also implies a total pillar extraction methodology will be undertaken.

DgS is unsure where the confusion regarding the proposed mining methodology has arisen as both the Subsidence Assessment and the EA main report clearly describe a total pillar extraction operation with first workings pillars left in between these areas to provide access and ventilation routes. Further, there isn’t any reference to “effective PILLAR width” in either report, except for the design of subsidence control barriers in the calculations spread sheets presented in the Appendices of the Subsidence Assessment. It is believed that reference to “effective PANEL width” in making subsidence effect predictions above the two SW1 Panels and one 406 Panel may have been misinterpreted in this instance.

OEH have also commented that it is unclear whether some or all of the first workings pillars have been removed from the NW2, 401 - 405 and 500 Panels (excluding the subsidence protection zones) as shown in Figure 1 of the SA Report. It is also suggested that the EA report has “presented a chequer board mine layout that implies coal pillars remaining”.

Figure 1 of the SA report has been revised to better show the zones of first workings headings and standing pillars in between or outside the limits of the pillar extraction (i.e. second workings) areas at Berrima Colliery (see Figure 1 in Appendix E). The LHS portion of the SW1 panel that has been ‘totally extracted’ to-date is also shown. It is understood that the dark grey shaded zones in Figure 1 were ‘totally extracted’ unless remnant coal pillars had to be left behind to provide temporary roof support in difficult ground conditions.

OEH has requested clarification of the location and method of determining the first and second workings areas at Berrima Colliery. The previous and proposed first and second workings areas shown in Figure 1 are understood to be correct. Historically, the first workings pillars in a given panel were lifted or extracted down the LHS first on the advance, then lift the pillars on the RHS on retreat. First workings pillars were recommended to be left within a Subsidence Protection or Control Zone based on a design

angle of draw line taken down from the existing residences to the workings. Following the recent handover between mine operators, a mine planning decision was made to leave the central access headings pillars as shown in Figure 1 in Appendix E.

ii Modelling

OEH has raised concerns about the potential impact of mine subsidence on agriculture particularly since the shallow depth of cover could result in “very site specific and localised” impacts. It is understood that agricultural practices above the Berrima underground workings have not been directly affected by mine subsidence impacts to-date, with maximum subsidence effects similar to the predicted values for SW1 (refer to Table 1 in Appendix E). The supply of water has not been disrupted to cause any impact to the land users. Further, the findings of an ACARP funded research project in 2010 (refer to Project No. C15013) on “Monitoring the Effect of Longwall Mine Subsidence on Native and Agricultural Environments” indicated that no statistically significant effect could be related to mine subsidence for the 2 year project duration. It is also disputed that the relative shallow cover depth has resulted in any “very site specific or localised impacts” due to the lack of surface cracking or erosion etc above any of the extracted panels to-date.

OEH have requested that the EA clearly identify all features that require protection and closely linked to the subsidence impact performance measures that are required to protect them, such as 3rd order streams, GDEs, sensitive flora/fauna communities and agricultural. As noted in the Subsidence Assessment, there are no permanent streams or drainage channels within the proposed mining area. The closest stream of importance is Mandemar Creek which is located some 600m south-east of the main development roadways and it is considered unlikely that direct hydraulic connection to the panels will occur. The Terrestrial Ecology Assessment in Appendix L of the EA (OzArk 2010) identified two Endangered Ecological Communities within the SMP area. However, the predicted subsidence was unlikely to place these communities at risk of local extinction nor any threatened species dependant on these and other communities within the SMP area as habitat.

NOW has requested in their submission that mitigation measures to prevent/limit incision and subsequent degradation of stream channels for each longwall and the cumulative subsidence envelope be established. There are no longwalls as the operations uses bord and pillar extraction. Further, as discussed above there are no permanent stream channels within the mining area with the closest stream some 600m to the south-east.

OEH commented that the calibration of the SDPS model resulted in a reasonable match for subsidence above 404 Panel, but did less well for tilt and curvature, and was poor for strain. It was also noted that a measured compressive strain of 4 mm/m at chainage 300 m on the panel cross line (between pegs 404/17-18) was unable to be verified by the model. A complete review of the model calibration has been undertaken by DgS to include more recent survey data and to better reflect the tilts and strains over the 404 Panel (see Appendix E). Some amendments were made to subsidence predictions but overall the outcomes of the EA or Subsidence Assessment reports were not changed. The strain peak at chainage 300 m appears to be due to an input error made during the 19/10/07 survey. This has been corrected in the recalibrated model.

In their submission, OEH comments that the predicted tensile strains above SW1 panels are not sensitive to “effective PILLAR width” (ie “effective PANEL width” as discussed earlier). OEH uses this discrepancy as an example of the limitations of the model. However, it is clear from the K-charts for the Southern Coalfield that it was appropriate to estimate K from local data for the proposed panels and it is considered incorrect to say that the prediction model is not sensitive to the effective panel width as the predicted tensile and compressive strain values presented in the table are “rounded” to the nearest whole number and are consistent with measured Berrima data to-date.

There were further comments made by OEH about limited information on model calibration details and concerns on the reliability of the model. The requested additional model calibration details have been provided in DgS's letter (see Appendix E). The predicted subsidence effects of the model when compared against measured subsidence effects show that the model is reliable in its predictions with the predicted subsidence and tilts within 10% of the measured values.

The modelling, and subsequent conclusions contained within the SA are based on the Subsidence Management Plan, approved by an inter-departmental panel, and reviewed by DII engineers as part of the subsidence management plan approvals process, that was prepared as part of the current Mining Operations Plan (MOP 2007). Further review of available subsidence data will be on-going as mining progresses.

9 Ecology

9.1 Overview

The Terrestrial Ecology Assessment was undertaken by OzArk Environmental and Heritage Management Pty Ltd (OzArk), and was summarised in Chapter 15 of the main volume of the EA and provided in full in Appendix L of the EA. The principal author was Philip Cameron an Ecologist who has been working as a biologist and environmental manager for the past ten years. The assessment considered the potential terrestrial ecology impacts resulting from the proposed continued operations at Berrima Colliery including some clearing of land for an extension area at Loch Catherine and for Asset Protection Zones at both Loch Catherine and the pit top.

The matters raised in the submissions regarding terrestrial ecology impacts generally relate to the following aspects:

- vegetation clearing within the Asset Protection Zones (APZs); and
- impacts to flora and fauna.

9.2 Response to matters raised

9.2.1 Vegetation clearing within the Asset Protection Zones

The OEH and SCA submissions have requested that offsets should be provided for the 3.6 ha of vegetation to be cleared at Loch Catherine and the Pit Top to offset impacts to ecological communities and water quality. OEH states that 2.25 ha of vegetation would be cleared at Loch Catherine for extension of the stockpile area, however, only approximately 1.07ha of native vegetation would be fully cleared to provide the extension area to Loch Catherine. The remaining 2.53 ha of vegetation (1.17 ha at Loch Catherine and 1.35 ha at the pit top) is within APZs, and full clearing of the vegetation would not be required. Major trees would be retained within the APZs (including large trees with hollows as recommended by OEH) and the understorey cut/trimmed to reduce fuel loads. Offsets are not required under the NSW *Native Vegetation Act 2003* for clearing within APZs which would be in accordance with a bush fire management plan. The extension to Loch Catherine is only minor and the native vegetation to be cleared does not contain protected ecological communities. Further, surface water management improvements will be implemented at both the Pit Top and Loch Catherine, as seen in Appendix K of the EA and Appendix C to this report. The provision of offsets under the proposal is, therefore, not considered necessary to offset ecological or water quality impacts.

Clarification on the areas of vegetation to be cleared was requested in one of the public submissions. The areas of vegetation to be cleared were provided correctly in Section 15.3.1 of the EA and in the Terrestrial Ecology Assessment (Appendix L of the EA). However, there were some references to areas in other sections of the EA which were misinterpreted and one reference in the EA which was described incorrectly. Clarification of the areas referred to in the public submission is provided below.

- Vegetation clearance at Loch Catherine:
 - Executive Summary, Section ES3 – reference to clearing of 2.24 ha of vegetation within the Loch Catherine extension area and APZ is correct.

- EA report, Section 5.4 – reference to clearing of 1 ha of vegetation should only refer to the vegetation within the Loch Catherine extension area and not the APZ area.
- EA report, Section 15.1 – references to clearing of 3.6 ha is correct and refers to clearing within both the Loch Catherine extension area and the APZs at Loch Catherine and the pit top.
- Vegetation clearance at the Berrima Colliery pit top:
 - Executive Summary, Section ES3 - reference to clearing of 1.35 ha of vegetation within the APZ at the pit top is correct.
 - EA report, Section 5.8 – references to an area of 3.74 ha within the pit top APZ is correct and includes vegetated area that is to be cleared (1.35 ha) and previously disturbed area that does not require vegetation clearing (2.39 ha).

9.2.2 Impacts to flora and fauna

OEH has requested that the closure/modification of old mine adits or entrances be undertaken in consultation with OEH due to the potential for bats to roost within these structures and the presence of the threatened Eastern Bentwing Bat at the site. In Section 5.10 of the EA it is noted that there are four unsealed mine adits to the old Loch Catherine Colliery and that closure of these adits was currently being discussed with the then Department of Industry and Investment (now DRE). DRE is the approval authority for closure of disused mine adits. A Review of Environmental Factors (REF) under Part 5 of the EP&A Act for the closure of the four adits at Loch Catherine has since been prepared and submitted to DRE for approval. The method of closure has been chosen to ensure there are no impacts to bats that roost in these adits. Prior to approval Boral understands the REF will be referred to OEH by DRE for their consideration.

One of the public submissions raised concerns about the clearing of the vegetation communities within an areas or poor sandstone derived soils with marginal vegetation, and that such examples of harsh environment generally support unique flora and fauna, to which impacts should be avoided not just mitigated. While it is true that the sandstone vegetation communities within the study area are poor soils with low nutrient levels this is generally the case for much of the Australian landscape. Many of Australia's plants and animals have adapted to these low-nutrient soils over millions of years and such 'harsh' environments can support high levels of biodiversity.

With respect to the Berrima Colliery study area, it is agreed that there is ecological diversity within the poor soil environment on sandstone, though not so to substantiate a 'unique' diversity of species in the assemblage. Much of the study area has previously been disturbed and it is considered that biological diversity is 'poor' within the disturbed areas. The community within the study area with the highest biological diversity, considered to be 'good' or 'rich', was recorded on the sandstone which is not afforded state or national legislative protection as these types of soils are not farmable. As this community is not subject to agricultural pressures, it is well represented in the region.

The EA does include measures to 'avoid' impacts to some flora and fauna. Avoidance of the rare tree species *Eucalyptus apiculata* will be undertaken during clearing and pre-clearing checks and retention of hollow trees will be undertaken to minimise impacts to fauna species.

9.3 Suggested conditions of approval

DRE has requested that Boral prepare a Rehabilitation Plan within three months from the grant of project approval and that this plan be prepared in accordance with DTIRIS guidelines and approved by DTIRIS in consultation with DP&I. As stated in Section 5.10 of the EA there is a current Rehabilitation Environmental Management Plan (REMP) for the Berrima Colliery. This REMP was approved in 2007 under the current MOP by the then Department of Primary Industries (now DTIRIS).

This application is for approval of the existing operations at Berrima Colliery that were the subject of the 2007 MOP. No aspect of the operations has changed significantly to warrant revision of the MOP or the REMP. The rehabilitation plans within the REMP have been amended to include the APZ and extension area at Loch Catherine and the APZ at the pit top as shown in Figures 5.3 and 5.4 of the EA respectively.

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10 Other matters

10.1 Overview

A number of submissions raised more general concerns or issues that are addressed below.

10.2 Response to matters raised

10.2.1 Heritage

OEH's submission included some comments in relation to Aboriginal Cultural Heritage. These related to:

- Aboriginal community consultation was undertaken in accordance with OEH's 2010 consultation requirements but not the 2004 interim Part 3A consultation requirements;
- recommendation for a management statement rather than management plan for the open artefact scatter (BC-OS1); and
- registration of BC-OS1 on the AHIMS register.

The Aboriginal community consultation undertaken by OzArk Environmental & Heritage Management on behalf of Boral was undertaken in accordance with OEH's 2010 *Aboriginal Cultural Heritage Consultation Requirements* as recommended in the OEH 2005 *Guidelines for Aboriginal Cultural Heritage impact Assessment and Community Consultation* for Part 3A assessments. Further, the OEH 2010 requirements are considered to be more comprehensive than the 2004 interim Part 3A consultation requirements.

Boral has no objection to the provision of a management statement in accordance with OEH's recommendations and has included this in its revised Statement of Commitments (see Appendix B).

An open artefact scatter (BC-OS1) was identified during archaeological surveys conducted by OzArk for the purpose of the EA. BC-OS1 was registered on the AHIMS register on 11 April 2011, site ID #52-1-0307.

10.2.2 Existing use rights

As discussed previously, the Colliery has operated legally for many years without a need for a formal approval under the EP&A Act because of its 'existing use rights'. The application for continued operations at the Colliery was lodged because recent changes to the NSW legislation have meant that the colliery can no longer operate under 'existing use rights' and will require planning approval. As the Colliery will be required to operate within the limits of a planning approval for a number of years it is necessary for a forward approach to be taken in the estimation of maximum production levels, potential customer markets etc. To limit the proposed Colliery operations to precisely the current operations would restrict the business's growth and economic opportunities.

The current application is for a new approval outside of its existing use rights. The proposed operations and the associated potential impacts have been assessed in accordance with government regulations. The reference to 'existing use' is therefore only to provide context on the past permissibility of the Colliery's operations and should not be considered a restriction on the operations proposed in the EA. The questioning of whether certain aspects of the proposal (eg production levels, operating hours, and customer base) are in complete accordance with past or existing operations, as was suggested in a number of submissions, are therefore not relevant to the assessment of the application. Nevertheless, for

the purposes of simplifying this application, which is for a relatively short approval timeframe of 8 years, the proposed operations were predominantly based on either current or past operations as discussed in Chapter 5 of the EA.

One public submission queried the legal establishment or evidence of 'existing use rights'. The existing use rights of the mine, and other mining operations, are conferred under NSW legislation. Prior to 2005, Section 74 of the *Mining Act 1992* stated that while a Mining Lease has effect the carrying on of mining operations was exempt from all environmental planning instruments and all regulatory and other provisions of the EP&A Act. Amendments to the EP&A Act in 2005 removed this exemption. However a transitional provision was included within the Environmental Planning and Assessment Regulations that allowed Section 74 of the Mining Act to continue to apply to existing Mining Leases for underground mining. This transitional period will end on 31 December 2011 and the Colliery will require an approval granted by this date.

10.2.3 Hours of operation

One public submission questioned Boral's current operating times and stated that they believed Boral was unable to substantiate approval for these times. As mentioned previously the Berrima Colliery has not been required to obtain a planning approval for its operations in the past and has operated legally under existing use rights. Development consent for the operations, if issued, will condition hours of operation that the Colliery must legally abide by.

The historic operating hours of the Colliery have varied since originally established. In recent years, the operating hours as stated in the EA have been used, and at one time were informally negotiated with the previous Colliery operator and some Medway residents. It is recognised that over time this arrangement has become unclear. As outlined in Section 3.3, both WSC and OEH have recommended noise generating activities such as loading and haulage are restricted to the hours of 7 am to 6 pm Monday to Friday and 7 am to 1 pm Saturdays with no loading and haulage to occur on Sundays or Public Holidays.

Boral is supportive of the application of these restrictions to haulage along Medway Road. However, owing to ongoing operational requirements, the loading and hauling of coal to the Loch Catherine Stockpile will be required to remain in accordance with the existing operations – 6am to 9pm Monday to Friday, 6am to 2pm Saturdays with no transport on Sundays or Public Holidays). Hours of production would also remain as per the existing operations – 24 hours, seven days a week.

10.2.4 Mine subsidence zone declaration

Declaration of the area above the colliery as a mine subsidence zone has previously been requested by WSC. As stated in Section 9.2 of the Berrima Colliery EA such a declaration is the responsibility of the Mine Subsidence Board and is outside of Boral's control.

10.3 Suggested conditions of approval

LPMA have requested that Boral arrange for adjoining land owners to submit applications to close and purchase sections of Crown road identified in its submission. Boral is in the process of seeking to acquire the Crown roads that apply to the Colliery and Loch Catherine. Following discussions with LPMA (Crown Lands), the matter regarding Medway residents purchasing land has been clarified and is no longer a requirement of the LPMA.

11 Submissions in support

11.1 Overview

A total of 46 submissions received on the Colliery EA were in support of the application. The majority of these submissions were from Boral employees that are also residents of Wingecarribee Shire. The matters raised in these submissions were generally in relation to the following aspects:

- longstanding history of operations;
- benefits of project particularly to the local community; and
- socio-economic impacts of closure.

11.2 Response to matters raised

11.2.1 History of operations

A number of submissions in support of the application referred to the longstanding history of the operations at the Colliery. Coal mining has been undertaken in Medway since the late 19th century with the Medway Village established in 1926 to house workers at the mine. Since 1926, the Berrima Cement Works has been the Colliery's predominant customer; though coal has been supplied to other customers prior to and during this time.

The Colliery's operations have remained fairly consistent over time. Previous plans for expansion, in a 1983 application was approved to increase production to 1.5 Mtpa, have not come to fruition and growth of the operations has been minimal to date. In relation to other coal mines in Australia, the Colliery is one of, if not the, smallest operations in terms of production. The current application does not seek an intensive, or even minor, expansion only to continue its current and historic pattern of operations.

As the Colliery has long been a part of the local and regional environment, it can be considered that many of its associated impacts have been assimilated into those environments. Therefore, the continuation of the Colliery's operations would not result in significant adverse environmental impacts and, as discussed below, would result in a significant socio-economic benefit.

11.2.2 Benefits of project

A number of public submissions acknowledged the benefits of the proposal's approval, including:

- security of jobs both at the Colliery and the Cement Works;
- clarity for the local community on the operations through regulation by a formal approval; and
- maintains a cost competitive local and regional cement industry which has associated benefits to the construction industry.

Studies have estimated that the combined economic benefit to the local economy from both the Colliery and Cement Works is approximately \$50 million. The Colliery and the Cement Works have a combined approximate workforce of 180 people. The Colliery's operations also influences other Boral operations the Maldon Cement Plant and the Marulan Limestone Mine. Maldon and Marulan also have an approximately

workforce of 180 people. In addition to direct employment at the Colliery and associated Boral operations the Colliery also provides job security for indirect employment in Berrima and New Berrima, and particularly in the local and regional construction industries which rely on cheap sources of cement from the cement plants at Berrima and Maldon. The continuation of the Colliery's operations will ensure that the economic and social benefits to the local and regional communities are sustained.

The Colliery will continue to supply its existing customer base but Boral is conscious that supplementary customers will be needed in the future to keep the operation viable and to keep the price of coal supplied to the Cement Works and other operations low which turn keeps the prices of their associated products low.

A number of public submissions, which were from residents in Wingecarribee Shire, asserted that their views were not adequately represented in other public submissions nor the submission from WSC.

11.2.3 Socio-economic impacts of closure

A number of public submissions expressed concern on the impacts to them and the community on closure of either the Colliery or the Cement Works. As discussed above, the continuation of the operations is important for the continued employment and economic viability of the local and regional cement and construction industries. If the Colliery is forced to close, either from refused approval of the current application or restriction on the economic viability of the operations, there would be significant socio-economic impacts as a result. The recent closures of the Kandos Cement Plant and the BlueScope Steel blast furnace at Port Kembla have already resulted in pressures on the construction sector of NSW.

In preparing this application, Boral was mindful of ongoing industry pressures and increasing operational costs. The proposed production rates and opportunities to diversify their customer base are considered necessary requirements for the Colliery's ongoing function and viability and to maintain a cost-effective supply to the Cement Works and other customers. These will also help maintain Boral's, and the Australian cement industry's, competitiveness which is currently under pressure from cheaper imports.

Response to Submissions Volume B

Berrima Cement Works DA No. 401-11-2002-i MOD 6



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12 Introduction

12.1 The proposal

The proposed modification was to increase the existing coal stockpile at the Berrima Cement Works from 15,000 t to 20,000 t and to allow the sale of the coal to be stockpiled. The modification was proposed in response to community complaints in relation to large truck movements during haulage campaigns from the Berrima Colliery and to improve transport management from both the Colliery and the Cement Works.

On 14 June 2011 an application under Section 75W of the EP&A Act was lodged on the 14th June 2011 with the NSW Minister for Planning for modification of the existing Berrima Cement Works consent No. 401-11-2202-i. Accompanying the application was an EA prepared by EMM which included a Traffic Impact Assessment prepared by Arup and a Road Traffic Noise Assessment also prepared by EMM. The EA and its supporting documents were exhibited between 28 June and 22 July 2011.

12.2 Overview of submissions

As of 11 August 2011, a total of 67 submissions have been received, including:

- 62 submissions from residents of Wingecarribee Shire, 42 of which were in support of the application (67% in support, 33% in opposition);
- two submissions from public interest groups, one of which was in support of the application;
- a submission from WSC which opposed certain aspects of the application; and
- three submissions from state government agencies.

The state government agencies that provided submissions on the Cement Works EA included DRE, OEH, and RTA. DRE had no objections or comments on the proposal.

A draft Response to Submissions report was sent to NOW, OEH and SCA for their comment on 30 September. Additional comments received have been addressed in this report.

The submissions received have been categorised according to the issue raised. These issues have been summarised and tabulated in Appendix A. The majority of issues raised were categorised into technical disciplines, and are considered in this report according to the number of submissions received, including:

- traffic;
- noise;
- air quality;
- community and consultation; and
- other matters including water quality impacts, greenhouse gas emissions and change of use of the Cement Works.

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13 Traffic

13.1 Overview

The Traffic Impact Assessment undertaken by ARUP Pty Ltd was summarised in Section 6.2 of the main volume of the EA and provided in full in Appendix 2 of the EA. The principal author of the TIA was Dr Tim Brooker who has considerable experience (over 20 years) in the preparation of TIAs. The assessment considered the potential traffic impacts resulting from the Cement Works EA.

The campaign haulage of coal from the Colliery in January 2011 generated a number of concerns among the residents of Medway with larger volumes of truck movements than usual over a period of 5 – 7 days. Therefore, the proposed modification was sought as an alternative to campaign haulage to improve traffic management practices and reduce the concentration of truck impacts on Medway residents.

Some of the submissions received on the Cement Works EA raised matters in relation to traffic impacts which generally relate to the following aspects:

- external sales;
- assessment methodology;
- assessment of alternatives;
- use of B-Doubles
- need for road improvements; and
- public safety.

13.2 Response to matters raised

13.2.1 External sales

The main confusion associated with resident's perception of the purpose of both the Berrima Colliery's continued operations project application and the Berrima Cement Works modification application is in relation to the external sale of coal produced at the Colliery. Internal sales are defined as sales between Boral operations, for example, between the Colliery and the Cement Works. External sales are defined as all sales to non-Boral owned companies and would include sales to domestic and international customers. In the past the Berrima Colliery has sold product both internally and externally.

The Berrima Colliery application refers to a total of 340,000 tpa being made available for both internal sales (not including sales to the Cement Works) and external sales. A portion of this (ie 100,000 tpa) will be stockpiled and sold through the Cement Works, if the modification application is approved, with the remainder (ie 240,000 tpa) stockpiled at Loch Catherine or delivered straight to customers from the Colliery. Transport to external customers is currently trucked and this will not change with similar truck movements from the Cement Works during haulage campaigns. External sales to international customers would likely be loaded onto ships at Port Kembla and the impacts of truck movements through key intersections on route to Port Kembla have been assessed in the Traffic Impact Assessment (Arup 2011) as not significant.

A number of residents and WSC have called for prohibition of external sales to international customers. A restriction on the available market for the external sale of product (ie prevention of sales to international customers) is a restriction on Boral's free trade rights and a constraint on the economical opportunities of the Colliery. Due to market pressures, the cost of producing coal primarily for the Cement Works has become extremely high, resulting in an increase in the overall cost to produce cement. Accordingly, Boral has been seeking to increase sales volumes from the Colliery to lower these costs. The type of coal mined from Berrima Colliery does not have a high domestic demand and, as a result, Boral has sought sales opportunities internationally.

As mentioned above, since the external sale to international customers, as opposed to domestic customers, would not change the method of transportation or number of truck movements from the Colliery or the Cement Works this prohibition is not considered to be justified. Further, Boral has been seeking these additional sales to make the Colliery more competitive thus improving the longevity of the Colliery and the Cement Works as local suppliers and employers.

13.2.2 Assessment methodology

The submission from OEH sought to clarify exact number of truck movements predicted to occur during a haulage campaign. The maximum haulage volume of 25,000 t over a minimum period of 5 days was assessed in the Cement Works EA as a "worst case" scenario. Up to 20,000 t of this would be hauled from the Cement Works and up to 5,000 t hauled from the Berrima Colliery stockpiling area at Loch Catherine. However, it is likely though that the actual volume hauled during a typical haulage campaign would be around 10,000 t and could be hauled over a period of 7 days so the traffic impacts described in the EA and below are considered conservative.

Under the "worst case" scenario a total of 242 truck movements per day would be required to and from the Cement Works. However, during a haulage campaign the 120 truck movements per day currently transporting clinker from the Cement Works and the 60 truck movements per day from Berrima Colliery to the Cement Works would be suspended. This means that only 62 additional truck movements per day (ie 31 truck loads) would occur from the Cement Works during a haulage campaign.

The "worst case" truck movements required to and from Loch Catherine on Medway Road during a haulage campaign would be 60 per day. As mentioned above, normal haulage between the Colliery and the Cement Works (60 truck movements per day) would be suspended during a haulage campaign and there would, therefore, be no increase in current truck movements along Medway Road.

13.2.3 Assessment of alternatives

Both WSC and OEH expressed a need for the ongoing consideration of the economic viability of rail-based coal transport in their submissions. There is currently infrastructure within the Cement Works for rail loading of clinker and cement. To load and unload coal would require additional coal loading infrastructure for which construction of isn't currently economical for the Cement Works.

13.2.4 Use of B-Doubles

The Medway Residents Group submission questioned the reference to 50 t B-Doubles throughout the Cement Works EA, noting that WSC have advised that B-Doubles have capacities of 33 t, 36.5 t and 40 t, depending on length. The heavy haulage industry in NSW, including Boral Logistics, routinely uses overload permits, which for the payment of an annual fee for each truck, permit the trucks to operate with axle loadings typically 1 tonne higher than the standard axle loadings. With "overload permits" the largest type of B-Double trucks can operate with a total combined weight when fully loaded of 62.5 t and can carry a payload of approximately 50 t.

It is important to note that the TIA used tri-axle semi trailers or truck and dog trailer combinations (with an average load of 33 t) for its truck movement calculations. If 50 t B-Doubles were used during haulage campaigns, there would be only 160 truck movements to and from the Cement Works and 40 truck movements from Loch Catherine which is less than the “worst case” scenario assessed by Arup. Additionally, as vehicles up to 19m can utilise Medway Road without approval, 19m B-Doubles could already be used on Medway Road during haulage campaigns and for daily deliveries between the Colliery and the Cement Works, which would further decrease the number of truck movements.

13.2.5 Need for road improvements

WSC and Medway Residents Group expressed the need for improvements to Medway Road. As discussed above, normal haulage along Medway Road between the Colliery and the Cement Works would be suspended during campaign haulage so there will be no increase in truck movements. The modification would also result in an improvement from campaign haulage undertaken only from the Colliery. Upgrades to Medway Road as a result of the modification are therefore not warranted.

Some public submissions have also requested upgrades to Taylor Avenue. Under a ‘worst case’ scenario, the proposed modification would result in an 8% increase in traffic volumes on Taylor Avenue for a maximum period of 7 days, four times a year. Given the minor and periodic impacts involved, upgrades to Medway Road as a result of the modification are not warranted.

13.2.6 Public safety

Concerns were raised in one public submission about impacts on safety from the use of B-Doubles and potential collisions between trucks and school buses. As explained above the use of B-Doubles would decrease the number of trucks on the local road network. B-Doubles also have improved safety performance than articulated trucks, such as semi trailers and truck and dog trailers, because the double articulation in B-Doubles makes them more stable and they are subject to higher vehicle and operating conditions.

Truck drivers travelling to and from the Colliery currently communicate with school bus drivers through the use of radio and this measure will be included in Boral’s Driver Code of Conduct. Boral will also minimise truck movements during school bus run times. There is also a commitment in the Berrima Colliery EA that school bus warning signs be erected at each end of Medway Road with the wording “7:30-9AM and 3-4:30PM SCHOOL DAYS NEXT 5KM”. Compliance with these safety measures and appropriate behaviour by drivers on Medway Road will be ensured through Boral’s Driver Code of Conduct by which all Colliery and Cement Works staff will be made aware of and any Boral truck drivers or contractors will be engaged under. Substantial road upgrades to Medway Road were also proposed in Section 2.2.7 of this report.

In the RTA’s submission they requested that sufficient parking be made available within the boundaries of the Cement Works for waiting trucks, particularly during coal export campaigns, to avoid the need for queuing on public roads. The site access and circulation at the Cement Works is shown in Appendix C of the TIA. The coal stockpile is located in the rear south-west corner of the site. There is more than sufficient space within the Cement Works so as to prevent queuing of trucks on public roads. Trucks would only be paused briefly at the site entry access on Taylor Avenue to confirm their identity and for Boral personnel to activate the automatic gate. There is a distance of 50 m between Taylor Avenue and the site gate and the potential for trucks to become queued here whilst waiting for the gate to open (a matter of seconds) is unlikely.

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14 Noise

14.1 Overview

The Road Traffic Noise Assessment, undertaken by EMM, was summarised in Section 6.4 of the EA and provided in full in Appendix 3 of the EA. The main author was Najah Ishac who is a Principal Acoustic Engineer with almost two decades experience in noise assessments. The assessment considered the potential noise impacts resulting from the Berrima Cement Works EA. The issues raised in relation to noise impacts in the submissions generally relate to the following:

- requirement for noise impact assessment;
- assessment methodology; and
- road traffic noise impacts.

14.2 Response to matters raised

14.2.1 Requirement for a Noise Impact Assessment

OEH in their submission recommended that a Noise Impact Assessment should be undertaken for these works in accordance with the INP for the following reasons:

- the potential for noise impacts from the proposed intensification of coal handling activities at the site; and
- the close proximity of the nearby New Berrima Township.

The Cement Works is regulated by way of EPL 1698, which includes noise limits. The specified limits are 43 dB(A) for the day and evening periods, and 40 dB(A) for the night period for residences at Taylor Avenue. These limits are considered appropriate for the current proposal as there is an existing stockpile on the site and only a 5,000 t increase is proposed. Stockpiling activities would also use existing equipment so no additional noise sources would be created.

The proposal for additional stockpiling activity and associated truck movements on site is shown in Figure 6.1 of the Modification 6 report. Also highlighted are the current entry and exit roads on site. It is shown that stockpiling and associated trucking activities are well south and removed from residences of New Berrima and are at similar or further distance than existing operations on site including existing truck movements. Hence, proposed trucking noise from site will be similar or lower than existing truck noise received at New Berrima.

The proposed stockpile area is approximately 500 m south of the closest residence at Taylor Avenue. At this distance, noise from a single road truck is estimated to be 35 dB(A), or 38 dB(A) for two trucks and therefore under the stricter night time EPL limit of 40 dB(A). A similar contribution can be expected from say a front end loader operating in this area.

14.2.2 Assessment methodology

OEH have sought clarification on the meaning in the EA of "including site" and "excluding works". The reference "including site" refers to total road traffic including the traffic to or from the cement works. The

reference “excluding works” refers to this total road traffic, minus all traffic to or from the cement works (not just traffic associated with the proposal). This latter volume is essentially the baseline road traffic noise without the site.

In the context of the above, the results in Table 3.2 of the noise assessment show, for example, that night time traffic noise (excluding all cement works related traffic) on Taylor Avenue is 56 dB(A) $L_{eq,1hour}$ which exceeds the night time 55 dB(A) criterion derived from OEH’s ECRTN by 1 dB. When including cement works related traffic, including traffic under the proposed modification, night time traffic noise on Taylor is 61 dB(A) $L_{eq,1hour}$ which exceeds the OEH ECRTN criteria by 6 dB. However, the minor increase in traffic movements proposed by the modification would only contribute to a portion of this exceedance with the majority resulting from the current approved operations.

Though the baseline traffic noise is above the relevant criteria, it is proposed to develop a noise management plan for the Cement Works which will include reasonable and feasible mitigation strategies to minimise noise impacts from on road trucking activities. This may include using alternate routes to minimise the number of residents exposed to traffic noise associated with site and reduction in movements during the more sensitive night time periods. This is not a current requirement for the Cement Works and, therefore, the modification application will result in an improvement in road traffic noise management.

14.2.3 Road traffic noise impacts

Some public submissions have stated that truck noise is an existing issue in New Berrima with engine braking, and acceleration uphill on Taylor Avenue generating significant noise. Not all heavy vehicles on Taylor Avenue are associated with the Cement Works or the Colliery, however, the noise management plan mentioned above, will include a truck driver policy that requires all drivers to follow appropriate practice associated with residential neighbourhoods and minimise the use of engine brakes.

One public submission stated that the modification would result in more noise from conveyors needed to load and unload at stockpile. No new conveyors are proposed under the modification; therefore, there would be no further noise impacts as a result.

15 Air quality

15.1 Overview

Air quality impacts from the Cement Works modification was discussed in Section 6.3 of the EA. Consideration was given to the potential air quality impacts resulting from the increase in coal stockpiled at the site and from truck movements.

The issues raised in relation to air quality impacts in the submissions generally relate to the following:

- air quality monitoring and management;
- best management practice;
- requirement for an Air Impact Assessment;
- public health impacts; and
- complaint register.

15.2 Response to matters raised

15.2.1 Air quality monitoring and management

In its submission, OEH states that recent dust deposition monitoring by Boral identified exceedances of the impact assessment criteria for deposited dust and is concerned that the intensification of coal storage at the site will aggravate the “existing dust issue”. It is important to note that exceedances in September 2009 and February 2010 were isolated events with the former likely to be the result of state wide dust storms. There have been no further exceedances since as shown in Figure 6.2 of the EA. OEH’s rolling annual average guideline was exceeded, likely also a result of the February 2010 exceedance (see Figure 6.3 of the EA). Apart from these exceedances, overall dust levels from the Cement Works are compliant.

Coal is already stockpiled at the site and it is proposed to increase this stockpile by 5,000 t. There are a number of measures to manage potential dust impacts already in place, these include:

- use of dedicated main haul roads and restriction of use of other unsealed roads and areas;
- progressive sealing of unsealed haul roads;
- watering of haul roads when required;
- potential use of viable dust suppression agents to reduce use of water for dust suppression;
- restriction of speed to 20 km/h on unsealed roads;
- installation of ‘rumble grids’, and consideration of water sprays/wheel washes, where unsealed roads transition to sealed roads to prevent tracking of dust;
- compaction of stockpile batters to minimise wind pick-up of dust;

- installation of water sprays or use of water cart to keep the stockpile surface wet if dust is being created; and
- cessation of stockpile creation and extraction during periods of high wind if dust generation cannot be controlled.

These measures would continue to be applied to the existing stockpile. The haulage, stockpiling and removal of coal already take place at the site, and while they are proposed to occur with greater frequency and volume, given the proposed stockpile's distance from New Berrima village the management measures contained in the EA are considered adequate to mitigate any potential dust impacts.

15.2.2 Best management practice

OEH recommended the application of best management practice to air quality management at the Cement Works in their submission and that Boral utilise the Katestone report (2011) in order to aid in the implementation of these best management practice. The report is comprehensive and covers a wide range of matters related to PM emissions, and identifies best practice operational methods and controls for minimising PM emissions from coal mining, which in relation to matters faced at the Cement Works, include:

- application of suppressant on haul roads and application of water to control emissions from grading; and
- use of water application or suppressants on coal stockpiles.

The measures identified above are, in part, already in place at the Cement Works. Dust management currently involves watering of haul roads, stockpiles and stockpile area and occasional sweeping. The use of suppressants to reduce the need for water is also an alternative if current management methods are considered inadequate.

15.2.3 Requirement for an Air Impact Assessment

OEH raised concerns regarding the lack of an Air Impact Assessment (AIA), prepared in accordance with the *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* (2005), being undertaken for the site. The Cement Works is a large industrial site with several dust emission sources. The existing coal stockpile likely contributes a minor or negligible percentage of dust emissions from the site and the minor increase of 5,000 t to this stockpile would not increase its contribution. An AIA is therefore not considered warranted. Further, as outlined in Section 15.2.1, a number of dust management measures are already in place at the Cement Works to manage potential air quality impacts from the proposed modification.

15.2.4 Public health impacts

Some public submissions raised concerns regarding the health impacts of coal dust, specifically particulate matter and heavy metal content. Queensland Health (2010) investigated the health impacts from ambient coal dust levels on the community of Gladstone, Queensland's largest commodity port. The study found that exposure to coal dust in itself was not posing a specific risk to human health over and above any risks that could be attributable to particulate matter generally, and concluded that, based on black carbon measurements at Auckland Point in Gladstone, coal dust levels were more than 1,000 times lower compared with the exposure levels for respirable coal dust known to be associated with adverse health effects resulting from occupational exposure. Queensland Health further noted that National

Environmental Protection Council's National Environment Protection Measure (NEPM) ambient air quality standards issued for particulate matter, in both Queensland and NSW, were sufficiently protective of risks posed by coal dust.

The NSW Health (2007) notes that it is thought that fine particles below $2.5\ \mu\text{m}$ in diameter may be of a greater health concern than larger particles as they can reach the air sacs deep in the lungs. However, coarse particles (PM 2.5-10) may also be associated with adverse health effects. Combustion sources release air pollutants which generally comprise fine particulates that contain acidic and carcinogenic substances, and heavy metals such as mercury which can be detrimental to a person's health. Particulate releases from mining, and storage by extension, contain a smaller fraction of fine particulates and also a relatively less amount acidic and carcinogenic substances. It is important to understand that the health-based criteria set by OEH are based on studies undertaken in urban areas with large populations where there is higher exposure of air pollutants from combustion sources, that is emissions from traffic fumes and industrial sources. As the application only proposes an increase in stockpiling volume, and no change to cement production, it will have a negligible effect on fine particle levels in the vicinity.

Further, Boral installed a High Volume Air Sampler at the Cement Works in 2009 and voluntarily conducts TSP and PM₁₀ monitoring at the site. Monitoring results show that when the HVAS was installed in 2009 there were some exceedances of the OEH annual average TSP air quality goal of $90\ \mu\text{g}/\text{m}^3$ and of the NEPM PM₁₀ 24 hour standard of $50\ \mu\text{g}/\text{m}^3$. Improved air quality management at the Cement Works has been effective in bringing PM₁₀ and TSP concentrations under the above mentioned air quality goals with no exceedances since October 2009 and December 2009 respectively.

15.2.5 Complaint register

One public submission that raised public health concerns addressed in Section 15.2.3 also noted that there is no recourse with the company regarding air quality impacts. Boral and the Cement Works have an open line of communication with the community and maintain a complaints register. At the most recent Community Liaison Committee meeting on 15 September 2011, Boral asked for feedback on the complaints handling procedures and what the community expected in terms of response. The feedback from the meeting was that most community members would like a simple phone call response explaining what action the company has made regarding the concern raised. This feedback will be incorporated into the complaints handling procedure for both the Cement Works and the Colliery.

Boral takes complaints very seriously and, in the future, a summary of complaints received will be addressed at the Berrima Cement Works and Berrima Colliery Community Meetings.

15.3 Suggest conditions of approval

Following a review of the draft Response to Submissions, OEH recommended the following conditions in relation to air quality at the site and surrounds:

- preparation and implementation of an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General;
- implementation best practice air quality management on site, including all reasonable and feasible measures to minimise the off-site odour, and dust emissions generated by the project including those generated by any spontaneous combustion on site;
- minimisation any visible air pollution generated by the project; and

- regular assessment of the real time air quality monitoring and meteorological forecasting data, and modification and/or suspension of operations on site to ensure compliance with the relevant Conditions of this Approval to the satisfaction of the Director-General.

Boral is agreeable to the suggested conditions, however, due to the minor nature of the modification, is not supportive of the inclusion of real time air quality monitoring for the Cement Works.

16 Community and consultation

16.1 Overview

The matters raised in the submissions in relation to community and consultation generally relate to:

- the perceived lack of consultation with the community during preparation of the application; and
- impacts to the community.

16.2 Response to matters raised

16.2.1 Community consultation

At the community information sessions for the Berrima Colliery application in February 2011, the issue of the management of campaign haulage of coal associated with the export sale through Port Kembla in early January 2011 was raised and Boral suggested a number of measures that could be implemented to mitigate impacts of any future export sales through Port Kembla. As described earlier, the Cement Works modification is solely at mitigating impacts associated with truck movements during an export sale.

No formal consultation was held regarding the Cement Works modification. However, an explanation of the intent and implementation of the application was discussed during the June 8 2011 community meeting, and an information sheet was circulated to the Medway and New Berrima communities during July 2011.

Boral understands the community's concerns around communication with the community for the Berrima Colliery application. For example, it is also now recognised that past communications have been hampered by the absence of a regular mail service to Medway with some residents that maintain PO Boxes at the Berrima Post Office not receiving letters till some time after they were delivered. Since the information sessions in February, Boral has put measures in place to significantly improve the way it communicates with the communities of both Medway and Berrima. Matters relating to Berrima Colliery are now included within the CLC meetings that have regularly held for the Berrima Cement Plant since 2003 but used to focus on the Cement Works and residents in New Berrima only. These are publicly advertised in the local newspaper, through Boral's website, letters/emails to residents on the database and notices in the New Berrima General Store and Berrima Post Office. Community members are also invited by way of the community database that was established earlier in the year.

16.2.2 Impacts to the community

Impacts to the community associated with the Cement Works modification are addressed in various sections of this report.

16.3 Suggested conditions of approval

WSC requested that a VPA between Boral and WSC be entered into for an appropriate local community contribution. Boral agrees to enter into a VPA with WSC. The basis of this agreement has been the matter of recent negotiations with Council and are addressed in other sections of this report.

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17 Other matters

17.1 Overview

A number of submissions raised more general concerns or issues regarding the EA that are addressed below.

17.2 Response to matters raised

17.2.1 Water quality

OEH notes in their submission that the EA proposes the use of dust suppression agents to reduce the use of water for dust suppression and requires that the EA clearly demonstrate that pollution of water will not occur. The use of suppressants is a potential air quality management measure if needed for the unsealed haul roads. There are chemical surfactants for use on haul roads available which have undergone ecotoxicity testing and found to be harmless. If suppressants are used the products selected will be researched to determine their ecotoxicity to avoid impacts on water quality in consultation with OEH.

17.2.2 Greenhouse gas emissions

One public submission raised concerns about the increased carbon dioxide emissions that will occur from the additional coal sales to international customers. As discussed in Section 15.2.2 the coal stockpiled at the Cement Works for external sales will not be additional to the tonnages available for external sales that were assessed in the Greenhouse Gas Emissions Assessment (EMM 2011). This assessment concluded that there were unlikely to be any measurable environmental effects due to the burning of coal sold from the Colliery.

The public submission also claimed that Boral “have stated publicly that the income derived from coal exports is required in part to offset the costs of the Federal Government’s proposed carbon tax”. As mentioned previously, due to market pressures the cost of producing coal primarily for the cement works has become extremely high resulting in an increase in the overall cost to produce cement. Accordingly, Boral has been seeking to increase sales volumes from the Colliery to lower this cost base. The type of coal mined from Berrima Colliery does not have a high domestic demand, and, as a result, Boral has sought sales opportunities internationally.

17.2.3 Change of use

A number of public submissions stated that the stockpiling of 25,000 t at the Cement Works changes the operations from a Cement Works to a Coal Works according to the Office of Environment and Heritage (OEH). Under the NSW *Protection of the Environment Operations Act 1997* (POEO Act) certain types of activities, referred to as ‘scheduled activities’ are regulated by the OEH through the issue of Environment Protection Licences (EPLs). Schedule 1 of the POEO Act defines ‘scheduled activities’ which are required to be regulated under an EPL. The ‘schedule activities’ listed in the EPL for the Cement Works currently only includes ‘cement works’.

The stockpiling of more than 5,000 t of coal at an existing coal mine or a separate coal industry site is a ‘scheduled activity’ for ‘coal works’ under the POEO Act. The Cement Works currently stockpiles 15,000 t but this is used only as a fuel for the cement kiln not for sale and, therefore, does not fall under the category of a coal industry site and has not needed to include ‘coal works’ on the list of ‘scheduled activities’ in its current EPL. However, since the modification will mean that 20,000 t of coal will be

stockpiled at the Cement Works and made available for sale this means that the existing EPL will need to be varied to include 'coal works' in its list of schedule activities. This variation would be undertaken through an application to OEH.

The variation to the EPL, to include 'coal works' in its list of 'scheduled activities', is a simple procedural matter and does not change the primary use of the site from a Cement Works. Further, the variation to the EPL does not mean that the modification would result in a change in use from what is currently approved for the Cement Works.

One public submission stated that the modification application would allow the future mining operations within the Sutton Forest exploration lease to load coal from the Cement Works. This is incorrect as the application does not propose to build coal loading facilities, as discussed in Section 13.2.3 of this report, and the application only refers to receiving coal from the Colliery. Therefore, the modification application would not allow other mining operations to load coal from the Cement Works.

18 Submissions in support

A total of 43 submissions received on the Cement Works EA were in support of the application. The majority of these submissions were from Boral employees that are also residents of Wingecarribee Shire. The matters raised in these submissions were generally in relation to the following aspects:

- longstanding association with Berrima Colliery;
- benefits of project particularly to the local community; and
- socio-economic impacts of closure.

18.1 Response to matters raised

18.1.1 History of operations

A number of submissions in support of the application referred to the longstanding history of the operations at Berrima Colliery and its association with the Cement Works. Coal mining has been undertaken in Medway since the late 19th century. The Colliery has sold coal to the Cement Works, since its construction in 1926, as a fuel supply for its kiln.

Coal has been trucked to the Cement Works from the Colliery for almost 50 years. The Cement Works already has approval to stockpile coal and other materials at the site. The application proposes to increase the maximum amount to be stockpiled at the site by 5,000 t and a small increase in daily truck movements will be required to account for this additional amount. However, the application will likely have no perceived difference in the effects on local residents.

18.1.2 Benefits of project

A number of public submissions acknowledged the benefits of the proposal's approval, including:

- security of jobs both at the Colliery and the Cement Works;
- clarity for the local community on the operations through regulation by a formal approval;
- better traffic management; and
- maintains a cost competitive local and regional cement industry which has associated benefits to the construction industry.

Studies have estimated that the combined economic benefit to the local economy from both the Colliery and Cement Works is approximately \$50 million. The Colliery and the Cement Works have a combined approximate workforce of 180 people. The Colliery's operations also influences other Boral operations the Maldon Cement Plant and the Marulan Limestone Mine. Maldon and Marulan also have an approximately workforce of 180 people. In addition to direct employment at the Colliery and associated Boral operations the Colliery also provides job security for indirect employment in Berrima and New Berrima, and particularly in the local and regional construction industries which rely on cheap sources of cement from the cement plants at Berrima and Maldon. The proposal will ensure that the economic and social benefits to the local and regional communities are sustained.

A number of public submissions, which were from residents in Wingecarribee Shire, asserted that their views were not adequately represented in other public submissions nor the submission from WSC.

18.1.3 Socio-economic impacts of closure

A number of public submissions expressed concern on the impacts to them and the community on closure of either the Colliery or the Cement Works. As discussed above, the continuation of the operations is important for the continued employment and economic viability of the local and regional cement and construction industries. If the Colliery is forced to close, either from refused approval of the current application or restriction on the economic viability of the operations, there would be significant socio-economic impacts as a result. The recent closures of the Kandos Cement Plant and the BlueScope Steel blast furnace at Port Kembla have already resulted in pressures on the construction sector of NSW.

In preparing this application, Boral was mindful of ongoing industry pressures and increasing operational costs. The proposed production rates and opportunities to diversify their customer base are considered necessary requirements for the Colliery's ongoing function and viability and to maintain a cost-effective supply to the Cement Works and other customers. These will also help maintain Boral's, and the Australian cement industry's, competitiveness which is currently under pressure from cheaper imports.

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Appendix A

Summary of submissions

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Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
TRAFFIC			
T.1	At no time were any residents consulted or had any input into the risk management process for the EA, in particular in relation to heavy vehicle movements on Medway Rd.	WSC	Colliery EA
T.2	AUSTROADS design requirements, inc. sealing of shoulders, protection of cyclists, urban sections, school bus stops and incident roads in their assessment of road standards for Medway Rd. Road should be at least 10 m wide (currently 7 m).	Medway Resident's Group; WSC	Colliery EA
T.3	Clarification of discrepancies in tonnages for export between EA and ARUP report. EA (Vol. 1, section 5.6) states amount of coal for export would not exceed 340,00tpa, but in Arup's TIA states 100,00tpa would be exported.	Medway Resident's Group; Robert Parker	Colliery EA
T.4	Boral wants 66 trucks per day, each carrying 27 tonnes- this equates to 1782 tonnes per day. Haulage is carried out over 340 days as Boral proposes, this equates to 605,880 tpa.	Medway Resident's Group	Colliery EA
T.5	WSC does not concur with the 'collector' road classification of Medway Rd, within Medway village pursuant to DECCW guidelines for noise assessment.	WSC	Colliery EA
T.6	Separation of access through Medway village through the construction of a separate haul road around the village.	WSC; Medway Resident's Group	Colliery EA
T.7	TIA deficient in its scope of assessment. Limited to: assessment of existing site and transport arrangements; review of site parking provision and management; determine forecast traffic generation with proposal and it impact on surrounding road networks; assessment of truck ingress, egress and circulation into the site and its impact on external road network; and impact of proposal on road network traffic safety and efficiency. Consideration of B-Doubles not included. Also impacts from Mod application that compound issues on Medway Rd.	WSC; Medway Resident's Group	Colliery EA
T.8	Throughout the EA there would appear to be conflicting figures, within the EA and between the EA and Mod: 1. EA (p.62)- general delivery times are 6am to 9pm; Mod (p.34) commenting on export campaigns "approximately 4000 and 1000t per day of export coal will be transported from each site between the hours of 4am and 4pm each weekday"; and 2. EA (p.62)- approx existing number of coal truck deliveries per day 32; TIA (p.23)- approximate number of coal truck deliveries per day 23 (average). Raising concerns within the community and unfortunately contributed to a level of suspicion by local residents.	WSC	Colliery EA
T.9	50t B-Doubles referred to throughout application; WSC advises B-Doubles have capacities of 33t, 36.5t and 40t depending on length. Therefore, calculations in applications must be erroneous and need to be revised.	Medway Resident's Group	Cement Works EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
T.10	EA needs to provide details of exact number of truck movements that will occur during an export campaign. OEH has deduced it may be up to 242 truck movements per day to Port Kembla. An additional 62 truck movements on top of the 180 per day set for clinker which campaign haulage will replace.	WSC	Cement Works EA
T.11	EA notes rail is available at Berrima, but coal loading facilities are not economically viable at this time. OEH recommends Boral continue to investigate opportunities for rail haulage (should be included as a statement of commitment or condition of approval).	WSC; OEH	Cement Works EA
T.12	Significant for the Berrima Cement plant because of the proposed mining of coal at the Sutton Forest exploration lease owned by Hume Coal. With exports from that deposit being in the region of 1.5 million tpa, a very likely option would be to locate a coal loader at the Berrima Cement Plant with a second option being at the existing Medway mine. Other options would not be as cost effective for loading out the coal from Sutton Forest.	Robert Parker	Cement Works EA
T.13	Concerned about the use of B-doubles and hold grave concerns over the ability of Boral and the local council to execute their duty of care in relation to the safety of residents. Please remember that under this proposal Boral is suggesting that I will be subjected up to a B-Double travelling approx 10m from my family home every 7-8 minutes.	Nigel Browne	Cement Works EA
T.14	There are no dedicated bus parking bay in the village and busses stop at resident's driveways to collect children. Daily I have grave concerns for my children as they wait for the school bus and I fear the day a truck and bus collide due to this situation.	Nigel Browne	Cement Works EA
T.15	Taylor Avenue New Berrima is not a road of sufficient standard to handle the mass movement of B-double trucks. Taylor Ave is only about 16 metres wide. There is no extra pavement for trucks or other vehicles to use when passing vehicles turning right into Adelaide, Brisbane, Melbourne or Sydney St's. Taylor Ave is too narrow currently for the amount of traffic it carries. Taylor Ave is a dangerous road to use. I note that where Taylor Ave changes its name to Berrima Rd at the intersection of Collins Rd that about 500 metres of Berrima Rd has been widened to provide safer turning conditions for traffic. Road widening should be a minimum condition if this application is to be approved. All truck movements to and from the New Berrima cement works should use Argyle St this would remove all traffic passing four of the major streets in the residential area of New Berrima.	Anonymous	Cement Works EA
NOISE			
N.1	No information provided in the EA in relation to feedback/recommendations from the community on noise impacts.	WSC	Colliery EA
N.2	DGRs require proponent to carry out a comprehensive assessment of the impact of noise "inc. onsite construction and	Medway Resident's Group	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
	operational noise, and offsite road noise and vibration impacts from the haulage of coal along Medway Rd". Do not believe this has been done.		
N.3	EMM's Noise Impact Assessment fundamentally flawed: - Monitoring locations do not adequately assess impact on most affected residents. - does not accurately depict closest and potentially most exposed residences in Fig 3.1 for assessment locations R1 - R15. - Selectively excludes haulage between the colliery and Loch Catherine. - Calculated vehicle movements and expected coal production does not add up (66 trucks per day x 27 t x 340 days production = 605,880 t of coal). Noise retesting and analysis to be convened to allow for use of appropriate criteria and representative sample locations.	Medway Resident's Group; WSC; Joshua N Cook	Colliery EA
N.4	No noise graphs provided demonstrating early morning noise level rise, therefore it is not possible to determine whether a shoulder period is justified.	OEH	Colliery EA
N.5	The development of formal operating practices to reduce noise generation often need not be linked to site upgrades, and where feasible these operating practices should be applied at the earliest opportunity. The proponent should document all feasible and reasonable noise mitigation measures including a time-frame for implementation to satisfy the above requirements.	OEH	Colliery EA
N.6	Assumptions have been made that Medway Road is classified as a principal haulage route and a collector road thus increasing the applicable noise criteria. Council would more appropriately classify the road as a local road thereby reducing the minimum criteria to be used for noise assessments. In addition to this the calculated noise measurement 15m from façade to centre line of Medway Road does not present itself as a realistic methodology in this instance. A retesting of noise measurements using appropriate criteria AND at representative sample locations on Medway Road is required to enable a professional assessment of this issue that will also meet legislated due diligence requirements.	WSC	Colliery EA
N.7	Lack of consultation with affected landholders in relation to noise impacts for current/proposed operations (pit top ops, haulage and associated vehicle movements on Medway Rd).	Medway Resident's Group; Joshua N Cook	Colliery EA/Cement Works EA
N.8	OEH recommends that a Noise Impact Assessment should be undertaken for these works in accordance with the NSW Industrial Noise Policy for the following key reasons: 1. The potential for noise impacts from the proposed intensification of coal handling activities at the site; and	OEH	Cement Works EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
	2. The close proximity of the nearby New Berrima Township. This information would not only provide information on any potential noise impacts associated with the modification but also detail information on any feasible or reasonable noise mitigation measures if required.		
N.9	Clarification sought on the meaning in the Assessment of "including site" and "excluding works", as OEH is unable to clearly interpret the noise levels proposed in the assessment.	OEH	Cement Works EA
N.10	Table 3.2 of the Assessment states that existing levels of traffic noise exceed the nominated Environmental Criteria for Road Traffic Noise (ECRTN). EA should document any reasonable and feasible mitigation measures as per the ECRTN. OEH recommends that one such measure that should be investigated should be truck haulage time restrictions.	OEH	Cement Works EA
N.11	Truck noise is an issue in New Berrima. The main entrance for the cement works is at the bottom of a hill. Truck movements start before 5am, six days a week. Engine braking and acceleration uphill generate significant noise.	OEH	Cement Works EA
AIR QUALITY			
AQ.1	'Major obfuscation'- Residents subjected to continual dust deposition on the roofs, water tanks, cars and washing; throughout homes and wheezing as a consequence. Cause is clearly evident.	Medway Residents Group; Robert Parker	Colliery EA
AQ.2	Medway and surrounds are not on reticulated water. Tank water collect from roofs. Coal dust emitted from trucks and Loch Catherine, and dust from LC road settles on roofs and is washed into water tanks.	Medway Residents Group	Colliery EA
AQ.3	Coal delivery to Loch Catherine continuously hauled by overloaded uncovered trucks. Coal spillage on road verges. Accumulated coal dust on roofs. (photos provided in submission).	Medway Residents Group	Colliery EA
AQ.4	Large amounts of dust generated on entrance to Loch Catherine. Dust blows across village in westerly and south-westerly winds. No mitigation measures in place. Clearly presents health hazard and nuisance.	Medway Residents Group; Joshua N Cook	Colliery EA
AQ.5	Need for improvement in dust management at the site. No long term monitoring at colliery; WSC and OEH recommend best practice initiatives be in place, should include sealing of colliery and LC Stockpile access roads and regular sweeping of these roads. OEH commissioned a report on international best practice to prevent/minimise particle emissions associated with coal mining- OEH recommends this report be consulted when preparing additional info.	WSC; OEH	Colliery EA
AQ.6	No information provided in the EA in relation to feedback/recommendations from the community on dust impacts.	WSC	Colliery EA
AQ.7	Anecdotal evidence of coal trucks travelling along Medway Rd with uncovered loads.	WSC; Medway Residents Group	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
AQ.8	OEH recommends that Boral install and operate a dust deposition, and fine particulate (TSP and PM 10) monitoring network around the Medway pit top. This should be used to confirm the predictions in the EA and to monitor ongoing environmental performance.	OEH	Colliery EA
AQ.9	Proposed mitigation measures are based on management measures, including watering roads, sweeping, and speed limits for vehicles. In relation to unpaved trafficable areas, the EA recommends that dust control efficiency can rise from 60% to 80% by increased watering. However, the EA provides no information on how this would be achieved nor measured.	OEH	Colliery EA
AQ.10	The proposed stockpile storage and handling area is approximately 500 metres from the New Berrima township. Recent dust deposition monitoring by the company at a location close to the township has identified exceedances of the impact assessment criteria for deposited dust. EA is however unclear on the actual measure that will be implemented and a time-frame for when this will be achieved. For example, progressive sealing is proposed, however there is no time frame for when these works will be completed. In addition, stockpiles will only be provided with water sprays if dust is being created. OEH is concerned that the intensification of coal storage and handling activities at the site will aggravate an existing dust issue at the site. OEH recommends that the Katestone report be consulted.	OEH	Cement Works EA
AQ.11	An Air Impact Assessment in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005) has not been undertaken for the site. Such an assessment would have provided an opportunity to confirm the adequacy of the proposed dust management controls.	OEH	Cement Works EA
AQ.12	The potential health impacts from particulate matter from coal dust and other fine matter that is produced from the burning of coal as a fuel. Creates particles that can be PM10 particle smaller than 10um in diameter. The presence of heavy metals like mercury is a high risk to public health. Concerned for the health of my 2 year old child living only a few hundred meters from the Boral plant on Taylor Avenue. The prevailing wind is from the south, this means that New Berrima is in a fallout zone for any particle laden dust plume that is emitted from the Boral Cement works. It's a regular occurrence to find your car and house covered in cement dust. There is no recourse with the company for this matter. The issue of 'Mine Dust' emissions a recognised health Issue, the NSW Department of Health has produced a public fact sheet.	Anonymous	Cement Works EA
COMMUNITY AND CONSULTATION			
CC.1	Residents and local community concerned that Boral has failed to adequately consult with community; specifically respond to the DGRs and comply with 'Guidelines for Major Project Community Consultation'.	Medway Residents Group; Joshua N Cook	Colliery EA
CC.2	EA lacks factual information; information provided is inconsistent and possibly duplicitous.	Medway Residents Group	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
CC.3	At no time did Boral or WSC attempt to consult with local community regarding B-Double haulage on Medway Rd.	Medway Residents Group	Colliery EA
CC.4	At no time did Boral attempt to consult with the community regarding the export campaign carried out in Jan 2011. A few residents were informed just before the fact.	Medway Residents Group	Colliery EA
CC.5	In the two years that Boral had been preparing to lodge the EA, it chose not to use its independent facilitators to engage with the community in its preparation.	Medway Residents Group	Colliery EA
CC.6	At the time of preparing this submission, Boral staff had not provided residents with factual and quantifiable data in response to questions asked at the consultation meetings post-lodgement.	Medway Residents Group	Colliery EA
CC.7	p.28/29 of EA does not detail the number and type of meetings, the number of people attending/engaged with or how many people were notified of any proposed consultation.	WSC	Colliery EA
CC.8	Aboriginal community consultation conducted in accordance with OEH 2010 consultation requirements, not 2004 interim Part 3A consultation requirements. While use of OEH requirements satisfies OEH, DoPI needs to determine whether OEH requirements adequately match up with DoPI's requirements.	OEH	Colliery EA
CC.9	Following the community's outrage at this campaign, Boral surreptitiously submitted Stockpile Mod without any attempt to consult with the community or gain any "informed views or community's preference".	Medway Residents Group	Colliery EA/Cement Works EA
CC.10	Views and concerns of residents are not included in the EA.	Medway Residents Group	Colliery EA/Cement Works EA
GROUNDWATER			
GW.1	NOW identifies water sharing rules/legislation/licensing, including the draft <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011</i> and draft <i>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011</i> . WSC supports proposals in EA, expects draft 'NSW Aquifer Interference Policy' to be considered in assessment of application. (Note- Stage 1 of the Aquifer Interference Regulation commenced on 1 July 2011.)	NOW; WSC	Colliery EA
GW.2	Not satisfied with overall quality of water quality assessment; including but not limited to groundwater, surface water and groundwater dependent ecosystems assessment. Additional SW, GW and GDE investigations required to be undertaken and submitted to NOW/OEH for assessment prior to project approval.	NOW; OEH	Colliery EA
GW.3	Not acceptable to use three production bores used by local landholders as stock and domestic bores for monitoring and hydrogeological information. Addition of only two monitoring bores for mining area to detect impacts is inadequate to	NOW	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
	detect impacts. Not satisfied with current knowledge of hydrogeology within mining area due to minimal information provided being unrepresentative and unquantifiable.		
GW.4	No attempt to determine SW/GW connectivity within both water sources and information on water quality in EA is limited. Lack of simultaneous sampling of mine discharge water and Wingecarribee River does not allow for representative and quantifiable comparison and detection of impacts.	NOW; OEH	Colliery EA
GW.5	EA only considered upland swamps as being GW dependent, field inspections reflected this. Base flows within watercourses or aquifers themselves not considered GDEs.	NOW	Colliery EA
GW.6	Predicted increases in mine water due to expanded mine roof area needs greater detail than provided in EA.	OEH	Colliery EA
GW.7	Assessment of possible arrangements for continued discharge or cessation of flow following eventual closure. Environmental and social impacts should be broadly considered.	OEH	Colliery EA
GW.8	EA contains limited information on shallow GW aquifers inc. potential water bearing zones at the soil-bedrock interface.	OEH	Colliery EA
GW.9	p.67 states 'stable rainfall from 2005 ... no indication of a significant period of drought' then on page 68 the document says 'starting in 2007 a declining trend in ground water levels....attributed to below average rainfall'. How can both of these statements both be correct? There is a drought with lower than average rainfall or there is no indication of drought. This is another example of inconsistencies in this report.	Debra and Rachel Hebbard	Colliery EA
GW.10	A realistic appraisal of the hydrogeology needs to be completed. Neither of the assessments includes data on individual aquifers. Mostly they rely on existing water bores. If Culpepper Monitoring Bore was drilled for one of the assessments, its details are not provided on Table 3. Because individual water samples are not available/were not obtained for aquifers within the Hawkesbury Sandstone (HS) or for the aquifer within the Wongawilli Seam, the conclusions in Section 6.8 are not valid.	Ray Nolan	Colliery EA
GW.11	It is correct that "The upper part of the (Wongawilli) Seam hosts interbedded carbonaceous shale, mudstone and shaly coal". Therefore, it is most unlikely that the seam contains a "10m thick coal seam aquifer" as stated in paragraph 2, page 10. Only the lower, coal-rich porous mining section is a likely significant aquifer.	Ray Nolan	Colliery EA
GW.12	Section 6.5- Registered Bores. Water is quoted as having low salinity if it has Electrical Conductivity (EC) of less than 1,000us/cm. I do not argue with that definition but suggest that the very low EC for water normally from the basal HS is sufficiently low, at less than 100us/cm, that it would be in the category of "fresh water", as used in Section 6.8 Water Quality. As such, as mentioned above, it should be excluded from contact with/mixing with more saline waters, such as in the Wongawilli seam.	Ray Nolan	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
GW.13	Section 6.6- Hydraulic Parameters. As mentioned previously, it may be an offence to combine very low salinity water from the basal HS with much more saline water from the Wongawilli Seam. Also, I cannot see the objective as the transmissivity and storativity determined refer to what? The hydraulic conductivity is estimated for "a 73m thick aquifer zone" but even if the true 19m zone (119m–138m) is considered, it includes some Hawkesbury Sandstone and some Illawarra Coal Measures, each with vastly differing rock types and, presumably, with varying hydraulic conductivity and other parameters.	Ray Nolan	Colliery EA
GW.14	Section 6.7- Groundwater Level and Hydraulic Gradients. As mentioned, no details are provided in Table 3. Also, it would appear that the Belbin and Culpepper bores are production bores and that the hydrostatic levels rose and fell according to "pumping". Does that mean that water was extracted? If so, are the tests valid? The last paragraph on page 11 indicates that AGECC are dubious of those results.	Ray Nolan	Colliery EA
GW.15	Section 6.10- Recharge and Discharge. The discussion of chloride concentration, to indicate a recharge rate of 10% does not appear to be valid. The "40mg/l in groundwater samples collected from the colliery" cannot be related to 4mg/l in rainfall, to show a 10% recharge rate. The colliery samples include water from some part of the Wongawilli Seam, as well as from the HS.	Ray Nolan	Colliery EA
GW.16	Table 4: Groundwater Inflow Estimates. The 2.83ML/day "is within the observed range of 2ML/day to 3.5ML/day range measured in the colliery". Does the range include water introduced to the mine and used by mining machinery?	Ray Nolan	Colliery EA
GW.17	Section 9.2- Installation of Additional Monitoring Bores. The Water Biodiversity Committee (2003) Guidelines referred to appear to be the same as Minimum Construction Requirements for Water Bores in Australia (2003). Chapter 6 of that Standard requires that formation and water sampling be carried out "to determine the nature and type of strata beneath the site and the water quality in any water bearing formation (my emphasis). Reliable information on specific geological materials and aquifer conditions at a site is necessary to establish the optimum design for various elements of a final production bore."	Ray Nolan	Colliery EA
	Like many other hydrogeologists, who have reported on this Shire, AGECC have not considered individual aquifers and have not allowed for the differing water quality in the various formations. Therefore, some of their conclusions are not well founded.	Ray Nolan	Colliery EA
WATER QUALITY			
WQ.1	EA has not addressed event-based sampling under a representative range of rainfall events. Event-based sampling should be included to enable a comparative evaluation of the water quality impact of the proposed development in relation to	SCA	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
	external watercourses.		
WQ.2	While the SCA is generally satisfied with the conceptual Soil and Water Management Plans (SWMPs). It considers that this SWMP be updated to reflect the extension to the stockpile area and ensure an appropriate separation of clean and dirty water, which is a fundamental aspect of effective water quality management.	SCA	Colliery EA
WQ.3	Not satisfied with overall quality of water quality assessment; including but not limited to groundwater, surface water and groundwater dependent ecosystems assessment. Additional SW, GW and GDE investigations required to be undertaken and submitted to NOW for assessment prior to project approval.	NOW; OEH	Colliery EA
WQ.4	No attempt to determine SW/GW connectivity within both water sources and information on water quality in EA is limited. Lack of simultaneous sampling of mine discharge water and Wingecarribee River does not allow for representative and quantifiable comparison and detection of impacts.	NOW; OEH	Colliery EA
WQ.5	Likely impacts of pollutants in Mine water needs assessment in accordance with ANZECC 2000, specifically guidelines for ecosystem health or trigger values for toxicants that protect freshwater species. EA uses trigger values based on "aesthetic purposes" rather than "ecosystem health". Relevant environmental values in the Healthy River Commission's Independent Enquiry into the Hawkesbury Nepean River System Final Report 1998 should also be assessed with associated ANZECC 2000 guidelines.	OEH	Colliery EA
WQ.6	Lack of data on mine water and its characterisation. No data provided on contaminants other than metals.	OEH	Colliery EA
WQ.7	Limited background information on the receiving water flows of the Wingecarribee River, and no quantitative information on discharge effects on river health, in terms of ecotoxicity, and changes in in-stream biota.	OEH	Colliery EA
WQ.8	Identification of any mitigation options in response to any adverse river health impacts from the mine water discharge.	OEH	Colliery EA
WQ.9	Information (written advice from NSW Health) on acceptability of reuse of mine water by public in Medway village.	OEH	Colliery EA
WQ.10	EA proposes the use of dust suppression agents to reduce the use of water for dust suppression. If dust suppression agents are proposed for the site, the EA needs to clearly demonstrate that pollution of water will not occur. Details should be provided on the proposed dust suppression agent including any relevant ecotoxicology or risk assessment information.	OEH	Cement Works EA
SUBSIDENCE			
S.1	Uncertainty on methodology for extraction. EA states 'bord and pillar', however further states a number of pillars will be removed. Whilst EA discusses 'effective pillar widths' it implies an extraction methodology similar to 'total extraction'.	OEH	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
S.2	Detailed information required on current and future Mine Plan and associated extraction methodology. Should include, but not limited to: 1. information on what pillars will remain over current and proposed mine layout; and 2. Details on process that informs what pillars remain and how this is undertaken during operations.	OEH	Colliery EA
S.3	EA should demonstrate that there will be no significant impacts on agricultural land and its productivity; may include changes to drainage lines, drying of soils due to subsidence cracks and soil erosion. Further advice should be sought from DTIRIS.	OEH	Colliery EA
S.4	EA should clearly identify all features that require protection, should be linked with subsidence impact performance measures required to protect them.	OEH	Colliery EA
S.5	Subsidence Assessment (SA) uses an influence function-based Subsidence Contour Prediction Model to predict subsidence over mine layout. In DgS Report, Model provided reasonable match for subsidence over 404 Panel, did less well for tilt and curvature and poorly for strain. Model unable to predict significant levels of compressive strain measured at approx. the 300 m chain of the 404 panel.	OEH	Colliery EA
S.6	Need for further refinement of model for prediction purposes.	OEH	Colliery EA
S.7	Limited information on model calibration, raises questions of reliability. Additional calibration data required, inc. associated verification information of Model. Should also include, but not limited to: 1. areas where coal has been entirely removed, inc. any subsidence monitoring results to verify past subsidence predictions; 2. if subsidence predictions not met, identify any subsequent consequences and adaptive responses; and 3. details on Model's limitations.	OEH	Colliery EA
S.8	Potential for connective fracturing from mine to the surface. Such shallow mining increases potential for connective fracturing (CF), which may impact on local GW systems and contribute to loss of SW. EA states max. tensile strains as 0.5 to 4.7 mm/m over previous workings, while max compressive strains between 0.5 to 11 mm/m. OEH considers such subsidence parameters similar to those identified by Bulli Seam PAC report as contributing to bedrock fracturing. DgS report identified risk of CF to within 61 m of surface and disconnective fracturing (DF) to within 10 m of surface. DF can cause aquifer depressurisation. Presence of dykes and faults in the area increases possibility of DF becoming CF. Subsequent long-term increases in vertical permeability or free drainage into workings.	OEH	Colliery EA
S.9	Only the immediate residents have been considered. The possible subsidence again links back to alterations in the	Debra and Rachel Hebbard	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
	movement of ground water.		
S.10	Mine Subsidence Board should be consulted on need for the declaration of a mine subsidence zone in mining affected areas.	WSC	Colliery EA
ECOLOGY			
E.1	EA does not propose offsets for the clearing of an additional 3.6 hectares of vegetation. The SCA considers that revegetation of an adequate area of other nearby cleared land should be undertaken to offset the water quality impact associated with the clearing 3.6 hectares of native woodland vegetation.	SCA	Colliery EA
E.2	Closure of adits of Loch Catherine undertaken in close consultation with OEH.	OEH	Colliery EA
E.3	If native vegetation is to be cleared for the expansion of the Loch Catherine coal stockpile this clearing should be offset to achieve an improve or maintain outcome for the ecological communities that will be affected. Any offset proposals should be developed with reference to the 'Principles for the use of biodiversity offsets in NSW' and in consultation with OEH.	OEH	Colliery EA
E.4	Discrepancies in the figures relating to the amount of vegetation proposed to be cleared for the Loch Catherine Stockpile and pit top APZs, as follows: 1. Loch Catherine APZ- p.13 states 2.24 Ha to be cleared; p.36 1 Ha to be cleared; and p.112 states 3.6 Ha to be cleared in both areas. 2. Pit top APZ- p.13 states 1.35 Ha to be cleared; and p.38 3.74 Ha to be cleared.	Debra and Rachael Hebbard	Colliery EA
E.5	The vegetation community being cleared for the expansion of the stockpile and the increase in the APZ is poor sandstone derived soils with marginal vegetation. These harsh environments generally support unique flora and fauna. Any danger to these creatures must be avoided, not mitigated.	Debra and Rachael Hebbard	Colliery EA
OTHER MATTERS			
OM.1	Seems Boral's activities are now more focused on coal. If we are not careful Boral will be the new Hardie that will affect all people in our country of Australia. Their greed will ensure they produce coal and coal seam gas for the sake of false prosperity and bugged who stands in their way.	Hercules Caratzas	Colliery EA/Cement Works EA
OM.2	More than doubling production to 460,000 tpa, and exporting up to 340,000 tpa from Port Kembla is not in line with existing use or 'business as usual'. Should constitute a separate DA.	Medway Resident's Group; WSC; SHCAG; Joshua N Cook	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
OM.3	Thorough review of capability of existing mining facilities and support structures to cope with potential doubling of production.	SHCAG	Colliery EA
OM.4	Need for legal establishment/evidence of 'existing use rights'.	SHCAG; Medway Resident's Group	Colliery EA
OM.5	Boral claims that they are able to operate 6am-9pm on weekdays and 6am-1pm on Saturdays. However, we believe that Boral is unable to substantiate approval for these times.	S&D McColl; Joshua N Cook	Colliery EA
OM.6	EA lacks valid and verifiable data that supports the stockpile at New Berrima constituting a minor modification.	Medway Residents Group	Cement Works EA
OM.7	Stockpiling of 25,000t will mean the cement plant would become a 'coal works' (in accordance with Schedule 1 of POEO Act).	Medway Residents Group; Robert Parker	Cement Works EA
SUBMISSIONS IN SUPPORT			
SIS.1	Submission in support of proposal. Boral has long history in the area. Present sites have existed since the 1920s.	SHM; Submissions in support (SIS); Stephen Jones	Colliery EA/Cement Works EA
SIS.2	Closure of colliery would negatively impact economic prosperity and employment in the region.	SHM; Stephen Jones	Colliery EA/Cement Works EA
SIS.3	Potential exporting of coal needed to keep site viable and functioning, to maintain a cost-effective supply to cement works.	SHM	Colliery EA/Cement Works EA
SIS.4	Granting of approval will benefit community. More security will be offered to employee's jobs, and for the colliery's neighbours, the introduction of a documented consent will provide clarity on activities on-site, and will allow Boral to plan and manage these accordingly.	SHM; SIS	Colliery EA/Cement Works EA
SIS.5	Current combined (Colliery and Cement Works) workforce of approx. 180 people, an additional 180 people at Boral's Maldon and Marulan operations are influenced by Berrima's output.	SIS	Colliery EA/Cement Works EA
SIS.6	Colliery's original and primary purpose has been to supply an energy source to the Berrima Cement Works.	SIS	Colliery EA
SIS.7	Jobs reliant upon the Colliery's role in our business. Firmly supportive of the initiatives Boral seeks through this application; including proposed maximum production limit and formalisation of coal export, both required to support colliery's ongoing operations.	SIS	Colliery EA

Table A.1 **Summary of submissions**

Matter reference	Issue raised	Submitting party	Colliery EA or Cement Works EA
SIS.8	Colliery operation is one of the smallest in Australia. In the face of rising operational costs Boral needs to look at options to keep the site viable and functioning for supply to the Cement Works. Increased production and the opportunity to sell to external customers will help achieve this. Will help maintain Boral's competitiveness against cheaper imports.	SIS	Cement Works EA
SIS.9	By allowing stockpiling at the cement works, truck movements can be better managed so effects on community are minimised. This will deliver outcomes which will benefit both the Medway community and Boral.	SIS	Cement Works EA
SIS.10	Coal (along with other materials) is already stockpiled at the site. There will be no noticeable difference in the perceived effects on New Berrima residents from additional stockpiling.	SIS	Cement Works EA
SIS.11	Australian cement industry under pressure from cheaper imports. Operations are closing, meaning people like me (the submitter) are now looking for new jobs.	SIS	Colliery EA/Cement Works EA
SIS.12	As local residents, would like to raise that any submission received on behalf of the 'community', especially from Council, is not representative of our view.	SIS	Colliery EA/Cement Works EA
SIS.13	Residents of the areas surrounding the colliery and Cement Works are right to raise issues, however concerns need to be balanced against the employment and economic benefits resulting from these applications.	Stephen Jones	Colliery EA/Cement Works EA
SIS.14	Significant weight should be given to the fact that the colliery and Cement Works have existed in the area for over 90 years.	Stephen Jones	Colliery EA/Cement Works EA

Note: Reference to 'Medway Residents Group' includes individual submissions from members of Medway Residents Group submitted separately.

SHCAG = Southern Highlands Coal Action Group

'SIS' refers to submissions in support of the two applications.

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Appendix B

Revised Statement of Commitments

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17 Revised Environmental Management and Commitments

17.1 Introduction

This chapter provides a description of the revised commitments made by Boral throughout the life of the proposal to manage potential impacts identified within the EA. Commitments include management, mitigation or monitoring measures as set out in the individual chapters of ~~this the EA~~ and the Response to Submissions report.

17.2 General

Boral will undertake the following general commitments:

- Boral will carry out the proposal generally in accordance with the systems, plans and mitigation measures identified throughout ~~this the EA~~ and the Response to Submissions report; and
- Boral will obtain and maintain all permits, licences and approvals required throughout the life of the proposal, as required;
- ~~_____~~ results of monitoring programs as detailed in ~~this chapter and technical chapters within this report~~ the EA and the Response to Submissions report will continue to be provided in the colliery's AEMR as well as any recommendations arising from these. A copy of the AEMR will continue to be provided to relevant government agencies as well as to the public on Boral's website.

These commitments do not replace any obligations Boral has under statutory requirements.

17.3 ~~Environmental~~ Bushfire management

Boral will commit to the preparation and implementation of a Bush Fire Management Plan, which will include the ~~creation~~ development and maintenance of APZs.

17.4 Socio-economic

~~Under the proposal~~ Boral will establish and operate a CCC which is likely to comprise an independent chair and appropriate representation from Boral, WSC and the general community such as surrounding landowners. This CCC may form part of the CLC Boral has implemented for the Berrima Cement Works.

Boral will continue to keep a complaints register and a sign will be erected at the entry to the Colliery displaying the complaints number. The complaints register and actions arising from any complaints received will be reported on annually in the AEMR, PER and to the CCC.

17.5 Subsidence

~~Berrima Colliery currently has a SMP in place which will be amended in accordance with the findings of the EA and Boral will undertake~~ the following commitments ~~specific to the proposal in relation to subsidence~~:

- Boral will implement SPZs with first workings only below the Renahan ~~property~~ residence located above extraction panel 406 and the two embankment dams located above extraction panel 59;

- Boral will ensure no further damage is caused from subsidence to the Alcorn and Belbin properties/residences;
- Boral will implement monitoring programs as recommended by DgS (Appendix C of the EA and Appendix C of the Response to Submissions Report).

17.6 Groundwater

Boral will undertake the following commitments in relation to groundwater:

- construction of additional groundwater monitoring bores which will involve the following:
 - drilling of two additional groundwater monitoring bores shown in Figure 14.1 of the EA;
 - drilling of additional groundwater monitoring bores with exact numbers and locations to be developed in consultation with NOW and OEH;
 - construction of additional bores in abandoned coal resource holes which have not been cemented or, if these are found to be not suitable, at locations east and north of the colliery;
 - installation of electronic water level loggers in new and existing bores;
 - obtain licences from NOW for any new bores;
 - any new monitoring bores will be constructed by an appropriately licensed water bore driller according to the Land and Water Biodiversity Committee (2003) guidelines;
- implementation of a groundwater monitoring program to address certain existing data gaps in groundwater monitoring at the site as well as monitoring the following:
 - flows in Wingecarribee River;
 - zone of depressurisation in the coal seam;
 - manual water level monitoring of new and existing bores undertaken on a quarterly basis;
 - water quality testing of new and existing bores on a six monthly basis and analysis against the WQOs provided in ~~Section 14.3.1~~ Table 7.1 of the Response to Submissions report for two years;
 - investigate the degree of connectivity between surface water, aquifers and the mine through a two stage study described in Section 6.3.1 of the Response to Submissions report;
 - monitoring of GDEs present in mining area by utilising data from monitoring bores and surface water/aquifer connectivity work;
 - samples collected and analysed for the presence of stygofauna;
 - groundwater inflows at the V-notch weir;

- submit a report of monitoring and outcomes within one month of the completion of the baseline monitoring program to NOW for review and assessment of longer term monitoring requirements; and
- data collected as part of the groundwater monitoring program will be managed and reported on annually as part of the colliery's AEMR by a suitably qualified hydrogeologist.

17.7 Traffic

Boral proposes to undertake the following two phases of upgrades and contributions for maintenance of Medway Road:

- Within 12 months of receiving Project Approval, fund the widening of the 50km/h section of Medway Road through Medway Village to 10 m wide. This would involve retaining the existing 7 m of pavement and providing 1.5 m shoulders with 50 mm asphalt. Additionally, this work will also include repairing already damaged sections of Medway Road with asphalt spray seal.
- Within 6 months of sales volumes reaching 330,000 tpa, or following a year in which sales volume exceeded 250,000 t but no earlier than 2015, commence an upgrade of the remaining 80 km/h section of Medway Road to 10 m. This second phase of upgrade would involve upgrading the remaining 80kmh 'section' of Medway Road to 10 m width (excluding the approximately 300 m section of Medway Road adjoining the Hume Highway which already meets this width). Works would again involve the retaining of the existing 7 m wide pavement and providing 1.5 m shoulders on each side with asphalt spray seal. They would also include AUSTROAD 'BAR' and 'BAL' treatments to nine driveways, as well as treatment to 20 m of Liebmans Road. This second phase of upgrade is contingent on the Colliery still being in operation.
- Pay a maintenance levy of 15 cents per tonne of coal transported from the Colliery along the full length of Medway Road for the ongoing maintenance of the road. This levy would apply for the life of the Project Approval.

Boral proposes to manage both phases of these upgrades itself or, if it elects, to pay Council contributions not exceeding \$1 million (exc GST) for the first phase, and not exceeding \$1.7 million (exc GST) for the second phase.

Boral will undertake the following commitments specific to traffic:

- Boral will work with WSC and the local community to further mitigate impacts associated with trucks on Medway Road. Based on preliminary discussions with Council, mitigation measures include:
 - the erection of school Bus warning signs at each end of Medway Road with the wording "7.30-9AM and 3-4.30PM SCHOOL DAYS NEXT 5 KM";
 - that edgelines and centrelines be marked on Medway Road from the Hume Highway to Medway;
 - that sight distance for vehicles exiting Liebmans Road at Medway Road be improved by reducing vegetation on the north-eastern corner;
 - that street name signs and advance street name signs for Liebmans Road be installed on Medway Road;

- Boral trucks will not transport coal on the Macquarie Pass, i.e. the Illawarra Highway; ~~and~~
- ~~Boral will implement a “Truck Driver Code of Conduct”, principally involving conduct on Medway Road (See Appendix F~~ of the EA), which will be updated to include communication between truck drivers and school bus drivers on Medway Road and Taylor Avenue;
- Boral will consult with the Shoalhaven Cycle Club on race dates/times for Medway Road.

It should be noted that these measures are outside of any measures that may be required if Medway Road is gazetted for use by B-doubles.

17.8 Noise

Boral will commit to the preparation of a Noise Management Plan, which will set out noise monitoring requirements and any management or mitigation measures required. Quarterly attended noise monitoring will be conducted at the ~~three monitoring locations~~ nearest sensitive residential receivers (ie 1 – 4) shown in Figure 12.2 of the EA for a period of two years by a suitably qualified professional. Reporting of noise monitoring results will be provided in the AEMR. After this two year period, a suitable long term monitoring program will be developed in consultation with OEH.

17.9 Air quality

Boral will undertake, in addition to current dust control measures described in Section 13.2.1 of the EA, the following commitments in relation to air quality:

- ensure effectiveness of watering on unpaved roads through a control efficiency of 80% or, if found not to be achievable through watering, by applying water extender chemicals or chemical road stabilizers;
- maintain paved road silt loadings below 2 g/m² through preventative measures and periodic sweeping;
- implement a speed limit of 30 km/hr on road sections in the vicinity of the Medway village for haul and delivery trucks;
- maintain the current dust deposition monitoring network at Berrima Colliery;
- undertake a six month fine particulate monitoring campaign at or near the pit top;
- seal a portion of the Loch Catherine access road from the intersection with Medway Road;
- purchase or lease a street sweeper for use on internal and local roads at both the Berrima Colliery and the Berrima Cement Works; and
- conduct all monitoring in accordance with applicable Australian Standards.

17.10 Surface water

Boral will commit to the following measures in relation to surface water:

- preparation of a SWMP which will contain:

- requirements for water quality monitoring at, upstream and downstream of, the V-notch weir;
- process for further assessment triggered by exceedances of the ~~WQOs~~ water quality parameters as described in ~~SEEC 2010 (Appendix J)~~ Section 7.2.2 of the Response to Submissions report;
- implementation of an aquatic ecology monitoring program to assess impacts of mine water discharges on the Wingecarribee River as described in Section 7.2.3 of the Response to Submission report;
- incorporation of event based sampling; and
- upgrades to Berrima Colliery's and Loch Catherine's existing surface water management as shown in Figures 14.2, 14.3 and in Appendix K of the EA and in Appendix C of the Response to Submissions report.

17.11 Ecology

The following commitments in relation to ecology will form part of the proposal:

- annual monitoring of the health status, nature and extent of EECs as required;
- induction of works crews prior to land clearing for avoidance of *Eucalyptus apiculata* and *Kunzea cambagei* within the Berrima Pit Top APZ and the Loch Catherine expansion area and APZ;
- induction of works crews prior to land clearing for avoidance of large hollow bearing trees within the Berrima Pit Top and Loch Catherine APZs;
- general mitigation and pre-clearing precautions in all areas requiring tree clearing as detailed in the ecological assessment (Appendix L);
- Koala specific pre-clearing precautions within the Loch Catherine expansion area and APZs such as pre-clearing inspections, assessments and inductions of work crews;
- implementation of tree removal methods to reduce risk to threatened microbat species; and
- installation of five microbat boxes and five nest boxes suited for small parrots within land managed by the colliery to compensate for loss of tree hollows with annual monitoring of the boxes and replacement as required.

17.12 Aboriginal heritage

Boral will undertake the following commitments in relation to Aboriginal heritage under the proposal:

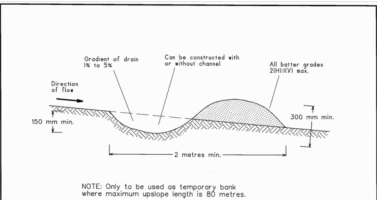
- an Aboriginal Cultural Heritage Management Plan Statement shall be prepared and implemented in consultation with the registered Aboriginal stakeholders for the proposal, and will include subsidence monitoring for the landform where Boral-OS1 is located;
- item Boral-OS1 will not be directly impacted by the proposal;
- no ground surface disturbing activities will occur outside the APZs; and

- should any Aboriginal sites or 'objects' be identified during the course of the proposal, work in that area will cease and the OEH South-eastern Region Office contacted to discuss how to proceed.

Appendix C

Loch Catherine Soil and Water Management Plan

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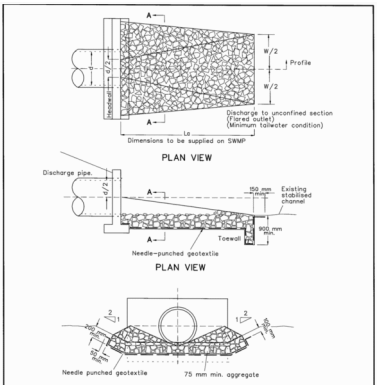


Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW)

SD 5-5



Construction Notes

1. Compact the subgrade to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch out piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the spacing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

ENERGY DISSIPATER

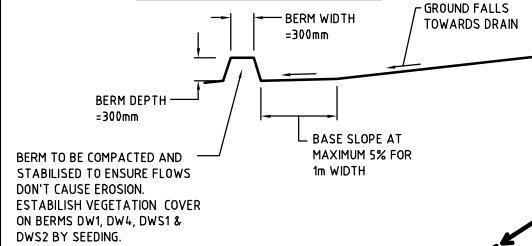
SD 5-8

DIVERSION DRAIN DETAILS

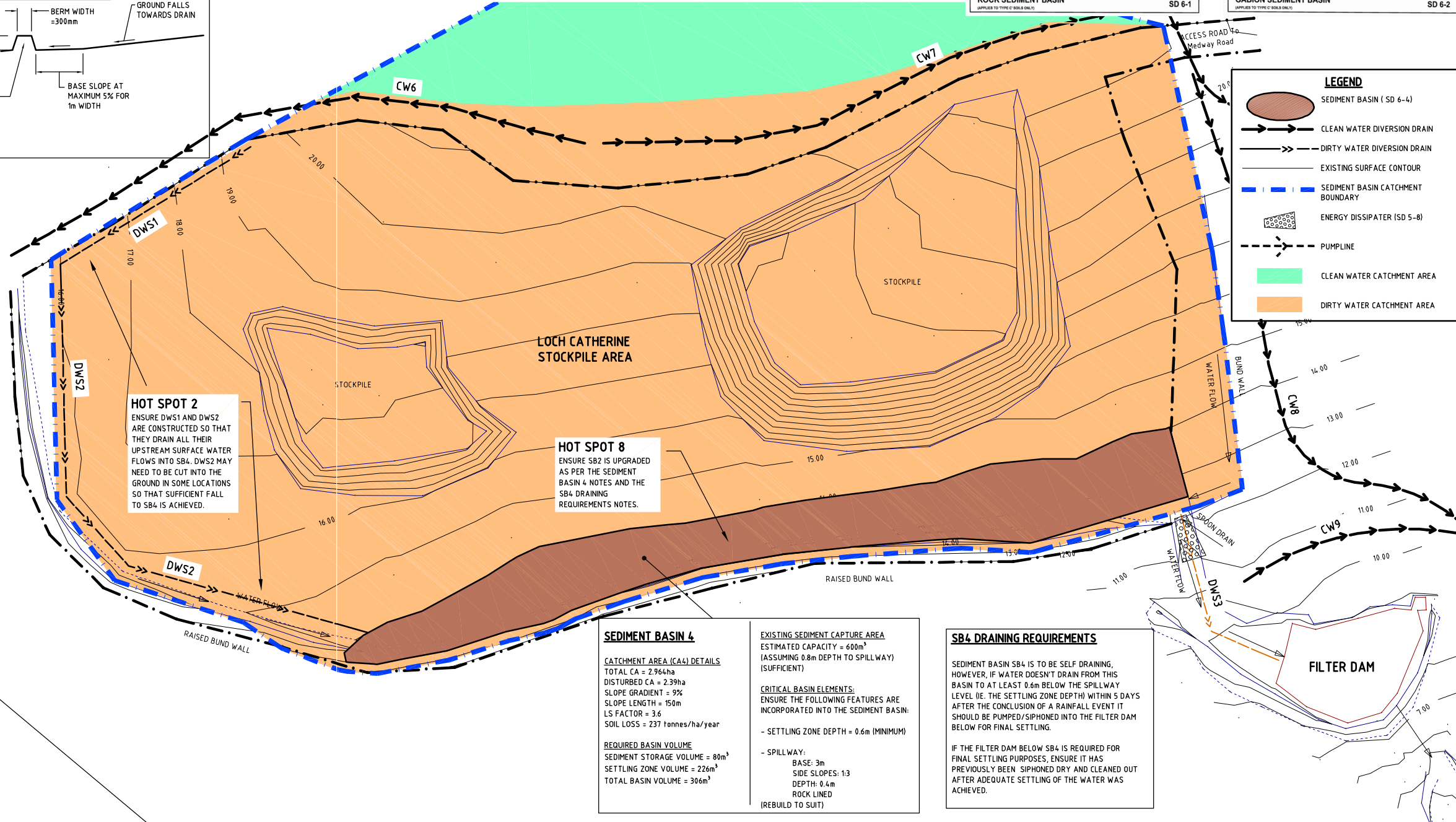
DIVERSION DRAIN	TYPE	COMMENT	DIVERSION DRAIN	TYPE	COMMENT
CW1	EXISTING ROADSIDE DRAIN	SATISFACTORY	P1	EXISTING PIPE CULVERT UNDER ACCESS TRACK	SATISFACTORY
CW2	EXISTING ROADSIDE DRAIN	SEDIMENT BASINS SB2 & SB3 HAVE SUFFICIENT SIZE TO TAKE CLEAN WATER FLOWS ENTERING FROM CW2, CW3, CW4, CW5, GD1 & GD2 IF THEY SHOULD FAIL.	DW1	NEW DIRTY WATER DIVERSION DRAIN	CONSTRUCT AS PER DIVERSION DRAIN DETAIL
CW3	EXISTING CLEAN WATER DIVERSION DRAIN		DW2	NEW DIRTY WATER DIVERSION MOUND	CONSTRUCT AS A LOW FLOW EARTH BANK (SEE SD 5-5)
CW4	EXISTING CLEAN WATER DIVERSION DRAIN	THEREFORE THESE DRAINS DO NOT NEED TO BE SIZED TO TAKE THE DESIGN STORM EVENT.	DW3	EXISTING DIRTY WATER DIVERSION DRAIN	UPGRADE AS PER DIVERSION DRAIN DETAIL
CW5	EXISTING CLEAN WATER DIVERSION DRAIN		DW4	EXISTING DIRTY WATER DIVERSION DRAIN	UPGRADE AS PER DIVERSION DRAIN DETAIL AND DETAIL 1
GD1	EXISTING GRATED DRAIN ACROSS ROADWAY	HOWEVER, THESE DRAINS SHOULD STILL REMAIN AND BE PROPERLY MAINTAINED IN ACCORDANCE WITH THE MAINTENANCE NOTES) IN ORDER TO MINIMISE THE CLEAN WATER FLOWS FROM MINOR STORM EVENTS ENTERING THE WORKS AREA.	DW5	EXISTING DIRTY WATER DIVERSION	UPGRADE AS PER DIVERSION DRAIN DETAIL AND DETAIL 1
GD2	EXISTING GRATED DRAIN ACROSS ROADWAY		DWS1	NEW DIRTY WATER DIVERSION MOUND	CONSTRUCT AS PER DIVERSION DRAIN DETAIL
CW6	EXISTING CLEAN WATER DIVERSION DRAIN	PROPRIETOR TO ENSURE EXISTING DRAINS ARE IN A SERVICEABLE CONDITION.	DWS2	NEW DIRTY WATER DIVERSION DRAIN	CONSTRUCT AS PER DIVERSION DRAIN DETAIL
CW7	EXISTING CLEAN WATER DIVERSION DRAIN		DWS3	EXISTING SURFACE WATER FLOWS	SATISFACTORY
CW8	EXISTING CLEAN WATER DIVERSION DRAIN	DRAINS SHOULD BE PROPERLY MAINTAINED IN ACCORDANCE WITH THE MAINTENANCE NOTES).			
CW9	EXISTING CLEAN WATER DIVERSION DRAIN				

CW - CLEAN WATER DIVERSION DRAIN - TAKING FLOWS FROM UNDISTURBED LANDS
DW - DIRTY WATER DIVERSION DRAIN - TAKING FLOWS FROM DISTURBED LANDS
GD - GRATED DRAIN
P - PIPE/CULVERT
DWS - DIRTY WATER DIVERSION DRAIN WITHIN THE STOCKPILE AREA SITE

TYPICAL DIVERSION DRAIN DETAIL



BERM TO BE COMPACTED AND STABILISED TO ENSURE FLOWS DON'T CAUSE EROSION. ESTABLISH VEGETATION COVER ON BERMS DW1, DW4, DWS1 & DWS2 BY SEEDING.



BACKGROUND AND CALCULATIONS

RUSLE: A = SOIL LOSS (tonnes/ha/yr) = R.K.LS.P.C.

THE AVERAGE ANNUAL SOIL LOSS CALCULATIONS WERE UNDERTAKEN USING THE "BLUE BOOK" - MANAGING URBAN STORMWATER (LANDCOM, 2004)

R-FACTOR	2200 (MANAGING URBAN STORMWATER, LANDCOM (2004))
K-FACTORS MEASURED	0.027 (MAIN QUARRY AREA - SB1, SB2 & SB3) 0.023 (STOCKPILE AREA - SB4)
LS-FACTOR	SEE INDIVIDUAL SEDIMENT BASIN CATCHMENT AREA NOTES
P-FACTOR	13 - DEFAULT ASSUMED
C-FACTOR	1 - DEFAULT ASSUMED
SOIL LOSS	SEE INDIVIDUAL SEDIMENT BASIN CATCHMENT AREA NOTES

THE "BLUE BOOK" REQUIRES THE INSTALLATION OF A SEDIMENT BASIN IF THE SOIL LOSS > 200 tonnes/yr FROM THE SITE. THEREFORE SEDIMENT BASINS ARE REQUIRED.

SEDIMENT BASIN 4

CATCHMENT AREA (CA4) DETAILS

TOTAL CA = 2.964ha
DISTURBED CA = 2.39ha
SLOPE GRADIENT = 9%
SLOPE LENGTH = 150m
LS FACTOR = 3.6
SOIL LOSS = 237 tonnes/ha/year

REQUIRED BASIN VOLUME
SEDIMENT STORAGE VOLUME = 80m³
SETTLING ZONE VOLUME = 226m³
TOTAL BASIN VOLUME = 306m³

EXISTING SEDIMENT CAPTURE AREA
ESTIMATED CAPACITY = 600m³
(ASSUMING 0.8m DEPTH TO SPILLWAY)
(SUFFICIENT)

CRITICAL BASIN ELEMENTS:
ENSURE THE FOLLOWING FEATURES ARE INCORPORATED INTO THE SEDIMENT BASIN:

- SETTLING ZONE DEPTH = 0.6m (MINIMUM)

- SPILLWAY:

BASE: 3m
SIDE SLOPES: 1:3
DEPTH: 0.4m
ROCK LINED
(REBUILD TO SUIT)

SB4 DRAINING REQUIREMENTS

SEDIMENT BASIN SB4 IS TO BE SELF DRAINING, HOWEVER, IF WATER DOESN'T DRAIN FROM THIS BASIN TO AT LEAST 0.6m BELOW THE SPILLWAY LEVEL (IE. THE SETTLING ZONE DEPTH) WITHIN 5 DAYS AFTER THE CONCLUSION OF A RAINFALL EVENT IT SHOULD BE PUMPED/SIPHONED INTO THE FILTER DAM BELOW FOR FINAL SETTLING.

IF THE FILTER DAM BELOW SB4 IS REQUIRED FOR FINAL SETTLING PURPOSES, ENSURE IT HAS PREVIOUSLY BEEN SIPHONED DRY AND CLEANED OUT AFTER ADEQUATE SETTLING OF THE WATER WAS ACHIEVED.

REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS	North	CLIENT	PROJECT TITLE	DRAWING TITLE	PROJECT NO.	SHEET NO.	REV
A	05/11	A.J.B.	M.P.	MODIFICATION TO LEGEND	DESIGN BY A.J.B. 05/10		BERRIMA COLLIERY	BERRIMA COLLIERY MEDWAY WATER MANAGEMENT UPGRADE	BERRIMA COLLIERY MEDWAY STANDARD DRAWINGS, NOTES & DETAILS	10000019	SWMP02	C
B	09/11	C.N.	M.P.	REVISED DIRTY WATER CHATCHMENT AREA	DRAWN BY A.J.B. 05/10							
C	09/11	C.N.	M.P.	EXISTING CLEAN WATER DRAINS ADDED	FINAL APPROVAL M.P. 05/10							
					SCALE: (on A1 Original) 1 : 500							
					EA							

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Appendix D

ENVIRON response

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26 September 2011

Our Ref: AS121203

Brett McLennan
EMGA Mitchell McLennan
Level 4, Suite 78
330 Wattle Street
Ultimo NSW 2007

Via email: bmclennan@emgamm.com

Dear Brett

**RE: Response to Issues raised by OEH in regard to the Berrima Colliery
Continued Operations Air Quality Assessment**

We have reviewed the comments received from the Office of Environment and Heritage (OEH) in respect of the Berrima Colliery Continued Operations Air Quality Assessment, and hereby provide our response for incorporation within EMGA Mitchell McLennan's submission.

Responses are specifically provided to issues raised in Section 5 of Attachment 1 to the OEH Letter dated 8 August 2011, OEH Comments on Berrima Colliery MP10_0172. OEH comments are presented in italics and addressed subsequently.

OEH Comment: The EA states that air monitoring data has not been historically collected at Berrima Colliery. However, three dust deposition sites were established in October 2009, and the EA reports this data up until June 2010.

Response: The statement that air quality monitoring has not historically been undertaken at Berrima Colliery was intended to indicate why no data prior to October 2009 are referenced in the report. It could have been stated specifically that air quality monitoring was not undertaken prior to October 2009 at which time dust deposition sampling was initiated.

OEH Comment: Background airborne particulate levels in Medway were estimated using OEH data from a Metropolitan Air Quality Monitoring Station at Ridge Road, Oakdale. This site is located in a rural environment, approximately four km from the nearest coal works on Burragorang Road, Nattai.

Response: Justification for the use of air quality data from the OEH Oakdale Air Quality Monitoring Station is provided in Section 4.2 of the Air Quality Assessment. Given that ambient particulate concentrations occurring due to the Berrima Colliery's existing operations were modelled for inclusion in the cumulative assessment, it was applicable to reference monitoring data from a station indicative of air pollutant concentrations in a rural area away from the impact of significant mining sources. The rural background levels were summed with the modelled concentrations from the Berrima Colliery's existing operations to characterise existing ambient particulate concentrations.

OEH Comment: An inspection of the site was carried out by OEH on 17 June 2011. It revealed unsealed internal haulage roads, unsealed work areas around the pit top area, unvegetated exposed open areas, no water sprays on stockpiles and accumulations of coal fines dust beneath conveyors, crushers and loading areas. OEH considers there is a need for improvements in dust management at the site both currently and associated with the proposed project.

Response: The unpaved haul road sections and trafficked unsealed areas of the site are understood to be regularly watered using a water cart. Water cart use was evident when ENVIRON visited the site when conducting the Air Quality Assessment. Other dust management at the site includes covering or partial covering of conveyors, enclosure of the crusher, use of a truck loading chute and occasional sweeping of paved roads and areas. Areas of potential improvement are agreed to include the cleanup of coal fines, stabilisation of exposed areas, and the review of controls for the coal stockpile area. It is also understood that Boral has made a commitment to seal the access road between the Loch Catherine Coal storage area and Medway Village. It is also proposed to purchase a road sweeper at the Cement Plant which would be made available on a weekly basis at the mine. It should also be recognised that the Berrima Colliery Pit Top and stockpiling area is small in comparison with other underground mining operations and combined with a very small production volume results in minimal dust generation. This has been confirmed by the monitoring results over the past 2 years.

OEH Comment: The village of Medway is located in close proximity to the pit-top facilities. A review of the Air Quality Assessment (AQA) reveals that Dust Deposition, TSP and PM₁₀ concentrations are predicted to increase at Medway Village, although are likely to remain less than OEH impact assessment criteria. Although the assessment does not present a cumulative impact assessment for 24-hour PM₁₀ as outlined in the Approved Methods, the semi-quantitative statistical approach provides a reasonable indication of the likelihood of impacts.

Response: No response necessary.

OEH Comment: The AQA is based on the implementation of adequate operational dust management strategies over the life of the proposal. The proposed mitigation measures are based on management measures include watering roads, sweeping, and speed limits for vehicles. In relation to unpaved trafficable areas, the EA recommends that dust control efficiency can rise from 60% to 80% by increased watering. However, the EA provides no information on how this would be achieved nor measured in terms of demonstrating success.

Response: The Air Quality Assessment concluded that Berrima Colliery should “ensure the effectiveness of watering on unpaved roads to achieve a control efficiency of 80% (as calculated based on water application rates). This control effectiveness, if found not to be achievable through watering could be achieved by applying water extender chemicals or chemical road stabilizers.” In response to the OEH’s comment, further information is provided below as to the achievability of the required control efficiency, and methods by which this control efficiency achieved can be demonstrated.

Achievability of Control Efficiency - Watering

The control efficiency of watering is variable, with average control efficiencies estimated within the literature to be in the range of 50% for so-called level 1 watering (2 litres/m²/hour) to 75% for level 2 watering (>2 litres/m²/hour)⁽¹⁾.

Dust control efficiencies achievable by watering may be estimated using the following empirical model developed by Cowherd *et al.* (1988)⁽²⁾:

$$c = 100 - (0.8 p d t)/i$$

where c = average control efficiency (%), d = average hourly daytime traffic rate (hr⁻¹), i = application intensity (litres per m²), t = time between applications (hr), and p = potential average hourly daytime evaporation rate (mm/hr).

A control efficiency of about 80% is estimated for Berrima Colliery Continued Operations based on the following conservative (upper bound) assumptions: peak hourly daytime traffic passes of 16 passes/hour (16 trips/day from the Coal Bin to the Loch Catherine Stockpile area proposed), a time between applications of 2 hours, an extreme hourly evaporation rate of 2 mm/hr (hot windy days) and an application intensity of 2.6 litres/m².

The US-EPA (2006) presents a simple bilinear relationship between the instantaneous control efficiency due to watering and the resulting increase in surface moisture (**Figure 1**)⁽³⁾. The moisture ratio (M) given in the figure is determined by dividing the surface moisture content of the watered road by the surface moisture content of the uncontrolled road. As the watered road surface dries, both the ratio M and the predicted instantaneous control efficiency decrease. It is evident that between the uncontrolled moisture content and a value twice as large (i.e. $M = 2$), a small increase in moisture content results in a large increase in control efficiency. Thereafter, control efficiency grows slowly with increased moisture content.

Based on the bilinear relationship illustrated in **Figure 1** it is evident that doubling the surface moisture content would result in dust control efficiency of 75%, with a moisture ratio of about 2.7 required to achieve a control efficiency of 80%.

1 NPI EETM (2001). National Pollutant Inventory, Emission Estimation Technique Manual for Mining, Version 2.3, December 2001, Environment Australia. Also referenced within revised manual, NPI EETM (2011).

2 Cowherd, C. Jr., Muleski, G.E., Kinsey, J.S., 1988. *Control of Open Fugitive Dust Sources*, EPA 450/3-88-008.

3 USEPA (2006). *AP42 Emission Factor Database*, Chapter 13.2.2 Unpaved Roads, United States Environmental Protection Agency, November 2006.

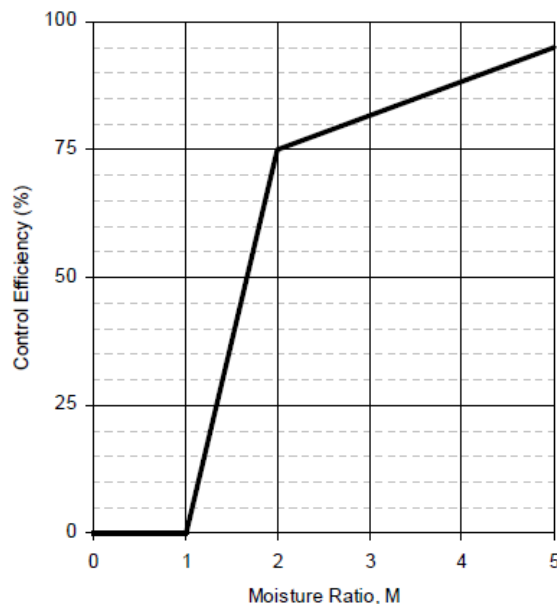


Figure 1. Watering control effectiveness for unpaved travel surfaces⁽⁴⁾.

Achievability of Control Efficiency – Chemical Suppression

It was also indicated in the Air Quality Assessment, that chemical stabilisation may be applied by Berrima Colliery to achieve upper bound road dust control efficiencies. However it is understood that Boral will seal the road with a two coat bitumen seal. This work is scheduled to be completed by December 2011. Chemical additives are therefore not required.

The water truck will still operate around the stockpile and unsealed loading areas.

OEH Comment (continued): Given the above, the proponent should be required to undertake a site specific best management practice determination to identify the most technically and economically feasible measures to minimise dust emissions (TSP, PM10 and PM 2.5). This BMP determination should be transparently linked to the AQA and any relevant Air Quality Management Plans.

For your information, OEH commissioned Katestone Environmental Pty Ltd to research and identify international best practice to prevent and or minimise particle emissions from all activities associated with coal mining in NSW. A copy of this report can be obtained at OEH website: <http://www.environment.nsw.gov.au/resources/air/KE1006953coalminingbmreport.pdf>

4 USEPA (2006). *AP42 Emission Factor Database*, Chapter 13.2.2 Unpaved Roads, United States Environmental Protection Agency, November 2006.

OEH recommends that this report be consulted when preparing the above additional information. This will ensure all practicable and feasible measures to prevent and/or minimise dust are carefully considered and the facility meets contemporary requirements.

Response: Since completion of the Air Quality Assessment in September 2010, OEH has initiated a process whereby existing mines are being required to undertake site specific best management practice (BMP) determinations through pollution reduction programs (PRP) with the outcomes implemented through Environmental Protection Licence conditions. The purpose of the BMP determination is given as the identification of practicable measures to minimise particulate matter emissions from the most significant mine activities. The recent OEH requirement for BMP determinations necessitates additional analysis not required by the OEH *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* and hence not addressed within the Air Quality Assessment. Drawing on the work undertaken for the Air Quality Assessment it is however possible to inform and focus the required BMP determination, as detailed in the paragraphs below.

Guidance in respect of BMP Determinations are given within the OEH's *Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline*. According to the OEH Guidance, mine activities are required to be ranked based on their contribution to annual emissions with the top four mining activities contributing the highest emissions of TSP, PM₁₀ and PM_{2.5} identified for further assessment.

The top four mining activities associated with proposed future Berrima Colliery operations, identified based on estimated uncontrolled TSP, PM₁₀ and PM_{2.5} emissions are wheel generated particulates from unpaved roads, wheel generated particulates from paved roads, wind erosion from coal stockpiles and coal crushing. Boral will investigate the technical and economic feasibility of best practice measures recommended by Katestone Environmental (2010) for the four identified source types for implementation at the Berrima Colliery.

OEH Comment: 5. 1 Dust Monitoring, OEH recommends that Boral install and operate a dust deposition, and fine particulate (TSP and PM 10) monitoring network around the Medway pit top. This should be used to confirm the predictions in the EA and to monitor ongoing environmental performance.

Response: A dust deposition monitoring network comprising three sampling sites was established in October 2009 and has been in operations from that date to present. The first site is situated in close proximity to the Berrima Colliery Offices and coal loading bin. The second site is located immediately north of Medway village. A third site is situated adjacent to, but not in the immediate vicinity of, the unsealed haul road leading to the Loch Catherine stockpile area. A synopsis of all the dust deposition data measured to date is given in **Appendix B**. Average dust deposition rates continue to be well within the OEH criterion of 4 g/m²/month. It is noted that the dust deposition levels recorded at the Medway monitoring location are routinely lower than those recorded at the onsite locations.

It is proposed that Berrima Colliery implement ambient PM₁₀ monitoring to confirm the EA predictions and monitor environmental performance. Removing the requirement for TSP monitoring is warranted given that this indicator is no longer applied in health risk determinations. It would also render the monitoring more cost effective, with a wider range

of options available for conducting the PM₁₀ monitoring. Given the nature and scale of the operation, and the monitoring objectives (prediction verification; source performance tracking), the deployment of continuous PM₁₀ monitoring within limited duration campaigns prior to and following the proposed increase in production, represents a potential alternative to the long term operation of a monitoring station.

* * *

I trust our response to the OEH comments are sufficiently comprehensive, and provides guidance on how to progress with respect to air quality issues. Please contact the undersigned if you have any questions.

Yours faithfully,
ENVIRON Australia Pty Ltd

A handwritten signature in black ink, appearing to read 'Yvonne Scorgie', with a stylized flourish at the end.

Yvonne Scorgie
Senior Manager, Air Quality

Appendix A – Source Ranking for Proposed Future Berrima Colliery Operations

Estimated annual emissions for proposed future Berrima Colliery operations (maximum production of 460,000 tpa), with the top four sources highlighted:

Mine Activity	Uncontrolled			Controlled		
	TSP	PM ₁₀	PM _{2.5} (a)	TSP	PM ₁₀	PM _{2.5} (a)
	tpa	tpa	tpa	tpa	tpa	tpa
Paved roads(c)	37.26	7.16	1.78	11.18	2.15	0.53
Unpaved roads (d)	28.94	7.47	0.75	5.79	1.49	0.15
Stockpile Wind Erosion	5.29	2.65	0.40	5.29	2.65	0.40
Coal Crushing	4.50	1.80	0.27	4.50	1.80	0.27
Unloading from stockpiles(b)	3.38	1.46	0.22	3.38	1.46	0.22
Front End Loader operations	3.26	1.58	0.16	3.26	1.58	0.16
Coal transfer points within plant(b)	0.86	0.41	0.06	0.86	0.41	0.06
Vent Shaft Emissions						
	0.52	0.26	0.04(e)	0.52	0.26	0.04(e)
Loading to stockpiles(b)	0.45	0.19	0.03	0.45	0.19	0.03
Coal loaded to trucks(b)	0.29	0.14	0.02	0.29	0.14	0.02
TOTAL	84.75	23.10	3.72	35.51	12.11	1.88

Notes:

- (a) PM_{2.5} emissions were not included in the Air Quality Assessment. Such emissions were derived to inform this response based on the estimated PM₁₀ emissions and the PM_{2.5}/PM₁₀ ratios provided within the US-EPA AP42 Emission Factor Data Base.
- (b) Emissions aggregated as 'materials handling' within the Air Quality Assessment have been disaggregated as required by the OEH's *Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline*.
- (c) A paved road control efficiency was calculated within the Air Quality Assessment to be about 70%, with the road surface silt loading having been assumed to be reduced from 8.2 g/m² (average silt loading for paved roads within quarries) to 2.4 g/m² (lower bound silt loading for paved roads within quarries). It was subsequently established that Berrima Colliery intend to use a PM₁₀-certified sweeper, the use of which is associated with a control efficiency above 80%.
- (d) An unpaved road control efficiency of 80% was applied within the Air Quality Assessment based on efficient wet suppression or the application of chemical suppression.
- (e) No data available. PM_{2.5} emissions associated to be a factor of 0.15 of the PM₁₀ emissions based on the PM_{2.5}/PM₁₀ ratios for other mining activities such as materials handling.

Appendix B – Dust Deposition Rates Recorded at Berrima Colliery (October 2009 to August 2011)

Date	Dust Deposition (g/m ² /month)(a)		
	Site 1 - Office	Site 2 - Medway village	Site 3 - Stockpile
Oct/Nov 2009	1.2	1.3	1.1
Nov/Dec 2009	4	5.7	2.4
Dec 2009/Jan 2010	1.7	2.2	3.2
Jan/Feb 2010	2.5	2	3.9
Feb/Mar 2010	1.7	1.8	2
Mar/Apr 2010	3.3	1.3	2.9
Apr/May 2010	1.1	1.2	4.1
May/Jun 2010	0.7	0.8	1.1
Jun/ Jul 2010	1	0.4	0.4
Jul/ Aug 2010	2.4	0.6	0.4
Aug/ Sep 2010	0.9	0.8	0.7
Sep/ Oct 2010	1.6	1.7	1.5
Oct/ Nov 2010	5.1	1.4	1.2
Nov/ Dec 2010	5.2	0.3	2.4
Dec 2010 / Jan 2011	2.1	1	1.7
Jan/ Feb 2011	1.1	0.5	2.9
Feb/ Mar 2011	0.7	0.9	0.9
Mar/ Apr 2011	0.9	0.6	0.2
Apr/ May 2011	0.4	0.4	0.2
May/ Jun 2011	2	0.8	0.6
Jun/ Jul 2011	0.2	1.1	0.4
Jul/ Aug 2011	1.6	0.9	0.6
Maximum	5.2	5.7	4.1
Average	2.0	1.4	1.8

(a) As total insoluble solids.

OEH Impact Assessment Criteria for Dust Deposition		
Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2g/m ² /month	4g/m ² /month
Source: AMMAAP, 2005		

Appendix E

Ditton Geotechnical Services response

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



19 September, 2011

Mr Girish Yadwad
Works Manager
Boral Cement
Taylor Avenue
NEW BERRIMA NSW 2577

Report No. BER-003/2

Dear Girish,

**Subject: Subsidence Assessment Review for the Proposed Berrima Colliery
Environment Assessment Application - Response to Office of Environment & Heritage
Letter (8/8/2011)**

As requested, Ditton Geotechnical Services Pty Ltd (DgS) has prepared a response to the issues raised in the Office of Environment & Heritage (OEH) Letter dated 8/8/2011 regarding the Subsidence Assessment (SA) contained in the Berrima Colliery Environmental Assessment (EA).

The issues that were raised in **Attachment 1** of the above letter that were relevant to the Subsidence Assessment have been responded to as follows:

2. Groundwater

Paragraph 2 - The comment is made that the EA was deficient in regards to the assessment of (i) the potential for connecting cracking between the workings and the surface and (ii) the groundwater hydrology regime at Berrima Colliery.

It was noted that the magnitudes of tensile and compressive strains measured at Berrima are similar to the Bulli PAC report, which were described as “contributing to bedrock fracturing”.

Response: The measured strains at Berrima Colliery have been reviewed several times by DgS for Subsidence Management Plan reporting purposes since 2007. Based on discussions with the contracted mine surveyor (Craven Elliston & Hayes), the survey pegs at Berrima are often disturbed by livestock and agricultural activities and has been the direct cause of the apparent high strain anomalies. The absence of any surface cracking confirms that the high strains are unlikely to be ‘real’.

A summary of the measured subsidence effects above four previous panels at Berrima Colliery are provided in **Table 1** below and demonstrate the likely range of tilt, curvature and strain for the measured subsidence.

Table 1 - Summary of Berrima Colliery Subsidence Data

Parameter	Units	Extracted Panels			
		403	404	405	500
Cover Depth (H)	m	135	137	125	125
Panel Width (W)	m	150	210	200	180
Panel W/H Ratio	m/m	1.1	1.6	1.6	1.5
Maximum Subsidence (S_{max})	m	0.6	0.56	0.74	0.54
Mining Height (T)	m	2.2	2.3	2.2	2.2
Panel Extraction Ratio (e)	%	85	85	85	85
Effective Mining Height (Te)	m	1.87	1.96	1.87	1.87
S_{max}/Te	m/m	0.32	0.29	0.40	0.29
Maximum Tilt T_{max}	mm/m	10	11	13	10
Maximum Convex Curvature $+C_{max}$	1/km	0.40	0.47	0.34	0.40
Maximum Concave Curvature $-C_{max}$	1/km	0.30	0.39	0.32	0.58
Maximum Tensile Strain $+E_{max}$	mm/m	2.1 (4.7)	2.2 (-)	2.9 (-)	2.9 (-)
Maximum Compressive Strain $-E_{max}$	mm/m	3.0 (11.0)	4.0 (-)	1.6 (-)	1.5 (-)

(value) - strain data questionable due to peg disturbance.

It is therefore considered that the actual strain values are significantly lower (i.e. tensile and compressive strains are typically 2 - 4 mm/m) than the Bulli PAC report, however, the predicted heights of sub-surface fracturing remain unchanged for the proposed panels.

Paragraph 3 - A comment was made regarding the potential for interaction of discontinuously fractured strata with lower continuously connected fractures (to the workings) if a fault is undermined.

Response: DgS agree that the above scenario could develop if second workings is attempted in the vicinity of a fault and it is recommended that a stable barrier of coal be left directly beneath any faults encountered in new panels. *Note: the likelihood of undermining a fault with second workings will be low due to the poor roof and rib conditions that are likely to be present in the vicinity of significant geological structure.*

Paragraph 6 - OEH recommends that additional investigations of groundwater resources should be undertaken to assess what the actual height of fracturing is above total extraction areas.

Response: DgS agrees that further work on understanding the groundwater regime and heights of fracturing above total extraction panels at Berrima is needed.

The SA report suggested deep bore extos and vibrating wire piezos to be installed as a general requirement to assessing heights of fracturing. Shallow standpipes to monitor shallow groundwater impacts above extraction panels were also a given.

It is recommended that deep multi-wire exto and multi-piezo monitoring boreholes be installed to within 10 m height above the workings. The piezos should be installed immediately upstream or downstream of the mining area to avoid damage from the caving process (changes to the ground water levels will be detected outside the limits of pillar extraction and enable long-term monitoring of groundwater level adjustments). The deep extos should be installed near the centre of an extracted panel to measure the maximum height of fracturing. The risk of borehole shear should also be considered in determining optimum site locations.

The project groundwater consultant should also make comment on these and shallow monitoring wells. Note that the opportunity to measure heights of fracturing above SW1 is probably diminished as LHS has nearly been extracted. The costs of installation and monitoring are quite high (>\$50K per hole) so selection of low risk sites are critical to their success. Monitoring of mine water makes and shallow ground water levels will also be needed to assess the continuous and discontinuous fracturing above a panel.

3. Subsidence Assessment

3.1 Uncertainty on the Methodology for the Extraction of Coal

Paragraph 1 - A comment is made that the EA states that coal will be extracted using “bord and pillar” mining methodology and that a number of remaining coal pillars will be removed. Uncertainty in what pillars will remain is suggested because it is claimed that the EA Report discusses “effective pillar widths” but also implies a total pillar extraction methodology will be undertaken.

Response: DgS has reviewed both the EA and SA reports and is unsure where the above confusion regarding the proposed mining methodology has come from. Both reports clearly describe a total pillar extraction operation with first workings pillars left in between these areas to provide access and ventilation routes.

The reports also describe how the first workings development will be undertaken before lifting coal from both sides of a ‘run out’ on retreat back to central access headings in SW1 Panel. The areas that the second workings have occurred in at Berrima have all been assessed as separate total pillar extraction panels with stable first workings pillars left as shown in Figure 1 of the SA Report.

In regards to making subsidence effect predictions above the two SW1 Panels and one 406 Panel, reference was made to an ‘effective PANEL width’. No reference is made to an ‘effective PILLAR width’ in the text of either report, except for the design of subsidence control barriers in the calculations spread sheets presented in the Appendices of the SA report.

Paragraph 2 - It is commented on that it is unclear whether some or all of the first workings pillars have been removed from the NW2, 401 - 405 and 500 Panels (excluding the subsidence protection zones) as shown in Figure 1 of the SA Report. It is also suggested that the EA report has “presented a chequer board mine layout that implies coal pillars remaining”.

Response: **Figure 1** attached shows the zones of first workings headings and standing pillars in between or outside the limits of the pillar extraction (i.e. second workings) areas at Berrima Colliery. The LHS portion of the SW1 panel that has been ‘totally extracted’ to-date is also shown.

It is understood that the dark grey shaded zones in **Figure 1** were ‘totally extracted’ unless remnant coal pillars had to be left behind to provide temporary roof support in difficult ground conditions. It is not considered critical that every remnant coal pillar location is known about in these second workings areas. Maximum subsidence effect data has only been used from previous panels where a reasonable level of mining geometry confidence is known to the author.

Based on **Table 1**, measured subsidence effect information has been reasonably consistent and there is no reason to doubt the integrity of the subsidence prediction model database applied at Berrima to-date.

Paragraph 3 - OEH has requested clarification of the location and method of determining the first and second workings areas at Berrima Colliery.

Response: The previous and proposed first and second workings areas shown in **Figure 1** are understood to be correct. Historically, the first workings pillars in a given panel were lifted or extracted down the LHS first on the advance. The mine would then lift the pillars on the RHS on retreat out of the panel. First workings pillars were recommended to be left within a Subsidence Protection or Control Zone based on a design angle of draw line taken down from the existing residences to the workings.

During the recent hand over between mine operators, it should be understood that the original mining methodology proposed for the SW1 for the SMP was to extract the LHS of the panel as currently shown, and then removing the RHS pillars on retreat (including the central access main pillars). However, a mine planning decision was subsequently made to leave the central access headings pillars as shown in **Figure 1**.

Unfortunately, the survey line that was meant to be installed above the centre of second workings area was not moved to reflect the above design change. The maximum subsidence for the LHS and RHS panels will now only be measured at 2 cross line locations, whilst the panel centreline will remain above the central access headings.

3.2 Limitations in Subsidence Assessment Model

Paragraph 2 - There are reasonable concerns in regards to the impact of mine subsidence on agriculture. OEH have requested that the proponent should demonstrate that there will be no significant impacts on agricultural land, which may include changes to drainage lines, drying of soils due to subsidence cracks and soil erosion. The shallow depth of cover is also a concern due to the potential that the above impacts could be “very site specific and localised”.

Response: The SA Report indicates that the potential for significant surface cracking, ponding and surface erosion over the slopes and elevated areas of the mining area is likely to be ‘low’ for subsidence < 0.56 m, tilts < 10 mm/m and tensile and compressive strains < 4 mm/m.

The surface topography above the proposed mining area has natural slopes of 2 - 18° and it is assessed that there will be minimal changes to flows along ephemeral drainage gullies and negligible ponding of < 0.1 m. Surface erosion and cracking is also expected to be negligible and therefore unlikely to affect soil moisture contents, dam storage capacity or cause slope instability.

It is also understood that agricultural practices have not been directly affected by mine subsidence impacts to-date, with maximum subsidence effects similar to the predicted values for SW1 (refer to **Table 1**). The supply of water has not been disrupted to cause any impact to the land users.

It is disputed that the relative shallow cover depth has resulted in any “very site specific or localised impacts” due to the lack of surface cracking or erosion etc above any of the extracted panels to-date.

Further advice on this issue should also be sought from an agricultural expert familiar with mine subsidence effects. Reference to the findings of an ACARP funded research project in 2010 (refer to Project No. C15013) on “Monitoring the Effect of Longwall Mine Subsidence on Native and Agricultural Environments” indicated that no statistically significant effect could be related to mine subsidence for the 2 year project duration.

Paragraph 3 - The EA should clearly identify all features that require protection and closely linked to the subsidence impact performance measures that are required to protect them. For example, 3rd order streams, GDEs or sensitive flora/fauna communities and agricultural productivity should have a negligible subsidence impact performance outcome.

Response: As noted in the SA, there are no permanent streams or drainage channels within the proposed mining area. A single first order drainage line lies in a steep gully between the Belbin and Renahan Properties. This drainage line flows into two separate farm dams before flowing over a cleared paddock without a formed channel. A similar watercourse feeds Dams 1 and 2 above the 59 Panel location.

The closest stream of importance is Mandamar Creek which is a third order stream and is located some 600m to the south east from the main development roadways.

Sub-surface fracturing above previous pillar extraction panels with cover depths of 120 m to 145 m and mining heights of 2.2 m to 2.3 m, has not resulted in connective cracking to the surface. As the proposed pillar extraction panels (SW1 and 406) will be significantly deeper or have similar cover depths, it is considered unlikely that direct hydraulic connection to the panels will occur.

Paragraph 4 - It was commented that the calibration of the SDPS model resulted in a reasonable match for subsidence above 404 Panel, but did less well for tilt and curvature, and was poor for strain. It was also noted that a measured compressive strain of 4 mm/m at chainage 300 m on the panel cross line (between pegs 404/17-18) was unable to be verified by the model.

Response: Dealing with the later issue first, the strain peak at chainage 300 m appears to be due to an input error made during the 19/10/07 survey. The bay-length of 14.060 was incorrectly input as 14.006, which when corrected returned a compressive strain of 2.7 mm/m (instead of 4 mm/m). The re-calibrated SDPS model (see below) predicts a compressive strain of ~ 2 mm/m at this location, which is reasonable in regards to the apparent secondary curvatures.

In regards to the calibration issues with SDPS, a complete review of the model calibration has been undertaken. The outcomes in regards to the above issues are summarised as follows:

- The measured subsidence effect data along the XL and CL above 404 Panel have been updated to the last survey on 26/7/11 (see **Figures 2a-d** and **3a-d**). Several curvature and strain anomalies due to peg disturbance have been identified and noted on the figures.
- The predicted subsidence effect contours for the proposed panels have been re-calibrated to better reflect the tilts and strains over 404 panel (see **Figures 4a-e**).
- The results of the measured cross line and centreline profiles v. the predicted SDPS model profiles are presented in **Figures 5a-d** to **6a-d**.

Note: The SDPS plots presented in Figures 9a-d of the SA were incorrectly plotted due to chainages being reversed unintentionally. The corrected plots indicate the predicted subsidence effects are conservative except for several measured secondary curvature 'wiggles' near the toe of the slope above the western end of 404 panel.

- The SDPS model has been recalibrated to estimate tilts to-within 10% of the measured centreline profile by increasing the tan of the influence angle from 1.7 to 2.3. The rest of the panels influence angles were increased to 2.2.
- The predicted maximum subsidence effects provided in Table 2 of the SA report generally remain unchanged, except that the predicted maximum tilt for the panels have all been increased by 1 mm/m. A further comparison with measured tilts and strains based on methodology provided in **Holla and Barclay, 2000** is presented in Table 3 and were used to derive the Table 2 values.

- The predicted SDPS cross line subsidence effects for SW1 LHS and RHS panels compare reasonably well to the empirically-based ACARP, 2003 predicted profiles and Table 2 predictions (see below) in the absence of measured data. The profiles are given in **Figures 7a-d**.

Table 2 - Maximum Subsidence Impact Parameters for 406 and SW1 Panels

Panel #	Cover Depth, H (m)	Panel Width W (m)	Panel W/H	Subsidence	Tilt*	Curvature*	Strain*	
				S _{max} (Berrima Model Limits) (m)	T _{max} tilt (mm/m)	C _{max} sag - hog (km ⁻¹)	E _{min} compressive (mm/m)	E _{max} tensile (mm/m)
406	135	49.5	0.37	0.12 - 0.24	3 - 5	-0.13 - 0.13	1 - 2	1 - 2
	150	49.5	0.33	0.11 - 0.21	3 - 5	-0.11 - 0.11	1 - 2	1 - 2
	190	49.5	0.37	0.09 - 0.17	2 - 4	-0.10 - 0.10	1 - 2	1 - 2
SW1 (LHS)	155	132	0.85	0.20 - 0.55	4 - 11	-0.30 - 0.20	3 - 4	2 - 3
	175	132	0.75	0.15 - 0.49	3 - 9	-0.24 - 0.19	2 - 3	2 - 3
	190	132	0.69	0.11 - 0.45	2 - 7	-0.21 - 0.18	2 - 3	1 - 2
SW1 (RHS)	150	71	0.47	0.16 - 0.31	3 - 6	-0.15 - 0.15	1 - 2	1 - 2
	170	71	0.42	0.14 - 0.27	3 - 5	-0.14 - 0.14	1 - 2	1 - 2
	190	71	0.37	0.12 - 0.24	2 - 4	-0.13 - 0.13	1 - 2	1 - 2

Note:

* - Predictions based on Barclay and Holla, 2000 and K Factors for Berrima Colliery (see **Table 3**).

Bold - Minor changes to predictions due to re-calibration of SDPS and review of updated measured data.

LHS - Left hand side of panel, looking in-bye; RHS - Right hand side of panel, looking in-bye.

[] - Local maximum values.

Actual peak curvatures and strains could be 2 x the predicted 'smooth' profile values shown in table due to discontinuous overburden behaviour (i.e. tensile cracking / shear failures of near surface rock).

Table 3 - Measured "K" Factors for Berrima Colliery Subsidence Data

Panel #	403	404	405	500	Design Value*
Effective Panel Width W (m)	180	210	200	180	
Cover Depth H (m)	135	137	125	125	
Effective Panel Width (W/H)	1.1	1.6	1.6	1.5	
Maximum Panel Subsidence, S _{max} (m)	0.60	0.56	0.74	0.54	
Maximum Tilt, T _{max} (mm/m)	10	11	13	10	
Maximum Tensile Strain, +E _{max} (mm/m)	4.1	2.2	2.9	2.9	
Maximum Compressive Strain, -E _{max} (mm/m)	3.0	4.0	1.6	1.5	
K ₃	2.25	2.69	1.69	3.00	3.0
K ₁	0.92	0.54	0.49	0.67	0.7
K ₂	0.68	0.97	0.27	0.35	1.0

Note:

* - The design K values used to predict tilt and strains.

Maximum Tilt, T_{max} = K₃S_{max}/H (K₃ = T_{max}.H/S_{max})

Maximum Tensile Strain, +E_{max} = K₁S_{max}/H (K₁ = +E_{max}.H/S_{max})

Maximum Compressive Strain, -E_{max} = K₂S_{max}/H (K₂ = -E_{max}.H/S_{max})

The K factor charts for the Southern Coalfield in **Holla and Barclay, 2000** also demonstrate significant variability can occur for a given effective panel width to cover depth ratio of 1 to 3 times (and excluding the apparent anomalous effects) - see **Figures 8a-c**.

It should also be understood that SDPS is a 'smooth profile' or systematic subsidence profile model and will not be able to predict the secondary curvature effects from discontinuous or non-systematic movements associated with natural joints and bedding in a rock mass with varying strength and stiffness properties. The secondary movements can occur randomly along a developing subsidence trough and may also be caused by surface topography interaction such as soil creep on steep slopes.

Therefore, calibrated profiles will tend to be better for subsidence and tilt but worse for curvature and strain **because of** discontinuous behaviour of the rock mass or disturbed pegs from land use activities. The later are usually dealt with by assuming localised increases are possible, if not likely, and can increase smooth profile predictions by 2 to 3 times, depending on near surface lithology and whether cracks develop in rock outcrops (surface cracks are well-known strain concentrators).

Overall, the amendments to the subsidence effect predictions have not changed the overall outcomes of the EA or SA Reports.

Paragraph 5 - OEH comments that the predicted tensile strains above SW1 panels are not sensitive to effective PANEL width, using the example to demonstrate this discrepancy that the LHS Panel compressive strains of 1 to 4 mm/m are higher than the RHS predictions

Note: The reference to 'effective pillar width' in the OEH letter has been assumed to mean 'effective panel width' as discussed earlier.

It is clear from the K-charts for the Southern Coalfield that it was appropriate to estimate K from local data for the proposed panels. It is incorrect to say that the prediction model is not sensitive to the effective panel width as the predicted tensile and compressive strain values presented in the table are "rounded" to the nearest whole number and are consistent with measured Berrima data to-date.

Paragraph 6 - Further comments made by OEH that the report lacked model calibration details and an assessment of the reliability of the model could therefore not be made. Requests were made for confirmation of total extraction panel limits, if subsidence predictions have been exceeded and details of the models limitations.

Response: All of the model calibration details have now been provided in this letter, as well as an attempt to demonstrate the issue that disturbed pegs have on the database of measured strains and curvatures.

Overall it is assessed that the combination of empirical model databases for Berrima and the Southern Coalfield has been used to reliably calibrate the SDPS model and the predicted worst-case subsidence effect contours. Table 4 compares the measured v. predicted SDPS subsidence effects.

Table 4 - Summary of SDPS Model Predictions v. Measured Berrima Colliery Subsidence Data

Parameter	Units	Extracted Panels			
		403	404	405	500
Maximum Subsidence, $S_{\max}$ (m)	Measured	0.6	0.56	0.74	0.54
	Predicted	0.65	0.60	0.75	0.55
	Error	+8 %	+7 %	+1 %	+2 %
Maximum Tilt $T_{\max}$ (mm/m)	Measured	10	11	13	10
	Predicted	11	11	13	11
	Error	+10%	0%	0%	+10%
Maximum Convex Curvature $+C_{\max}$ (km⁻¹)	Measured	0.40	0.47	0.34	0.40
	Predicted	0.29	0.25	0.34	0.32
	M/P	1.4	1.9	1.0	1.25
Maximum Concave Curvature $-C_{\max}$ (km⁻¹)	Measured	0.30	0.39	0.32	0.58
	Predicted	0.39	0.28	0.32	0.32
	M/P	0.8	1.4	1.0	1.8
Maximum Tensile Strain $+E_{\max}$ (mm/m)	Measured	2.1 (4.7)	2.2 (-)	2.9 (-)	2.9 (-)
	Predicted	3.8	3.65	4.4	4.2
	M/P	0.55	0.60	0.66	0.69
Maximum Compressive Strain $-E_{\max}$ (mm/m)	Measured	3.0 (11.0)	4.0 (-)	1.6 (-)	1.5 (-)
	Predicted	5.1	3.6	4.2	4.2
	M/P	0.59	1.11	0.38	0.36

(value) - strain data questionable due to peg disturbance.

Error = (Predicted - Measured)/Measured values appropriate for subsidence and tilt.

M/P = Measured over Prediction Ratio applied to curvatures and strains due to discontinuous behaviour.

Predicted strains = 13 x curvature.

The predicted subsidence and tilts are within 10% of the measured values, which is considered reasonable for the purposes of the SA and EA. The curvatures and strain predictions however are hampered by the discontinuous overburden behaviour or disturbed pegs from agricultural activities. The strain / curvature factor of 13 is considered to be necessarily conservative to ensure reasonably reliable and conservative strain predictions. Further review of available subsidence data will be on-going as mining progresses.

The observations to-date also confirm that there has been minimal impact as a consequence to the apparent model calibration deficiencies.

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

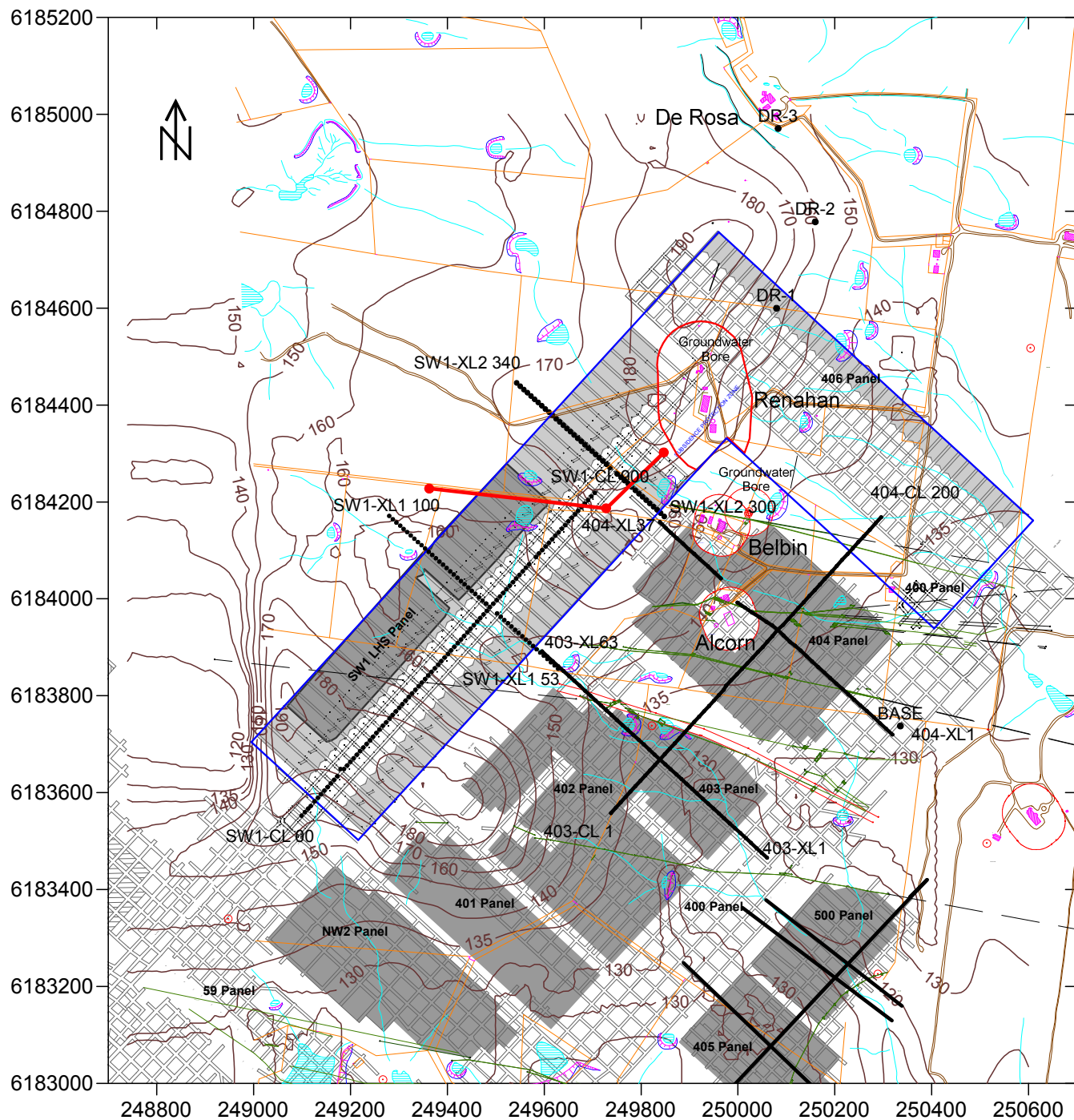
Attachments:

Figures 1 - 8

References:

DgS, 2010. **Subsidence Predictions and General Impact Assessment of the Proposed SW 1, 406 and 59 Pillar Extraction Panels, Berrima Colliery.** DgS Report No. BER-003/1 (September).

Holla and Barclay, 2000. **Mine Subsidence in the Southern Coalfield.** L. Holla and E. Barclay. NSW Department of Minerals Resources.



Key:

	Cover Depth (m)		Water courses (gullies)		Fences		Unsealed Roads/ Tracks
	First Workings		Farm Dams		Buildings/ Sheds/ Tanks		Subsidence Protection Zone Limits
	Completed Second Workings		Faults		Power Poles		Installed Subsidence Lines
	Proposed Second Workings Area		SMP Area Limits		GPS Monitoring Sites		
	Power poles & line						

DgS

Engineer: S.Ditton
Drawn: S.Ditton
Date: 02.09.11

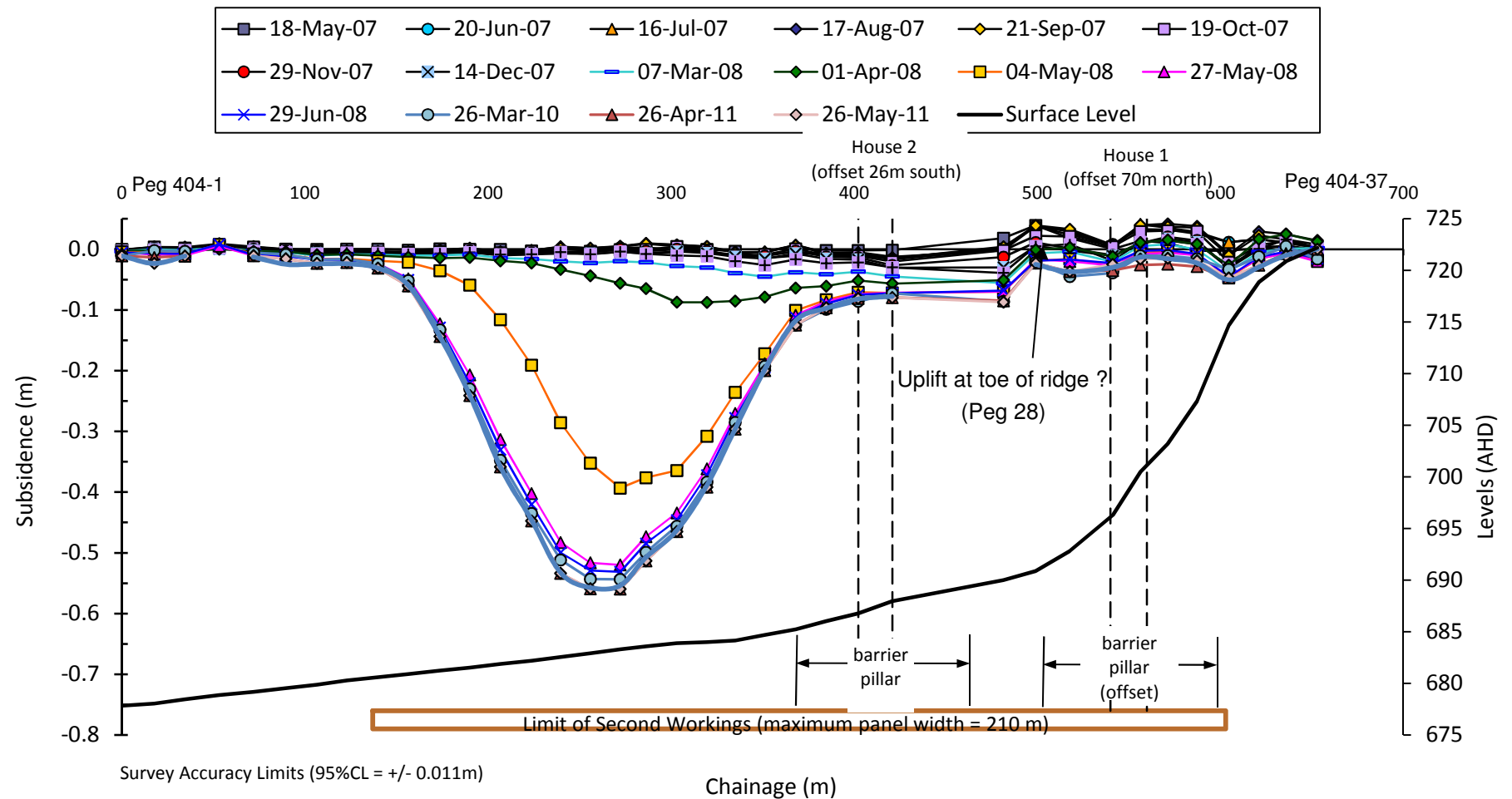
Ditton Geotechnical
Services Pty Ltd

Client: Boral Pty Ltd
BER-003/2

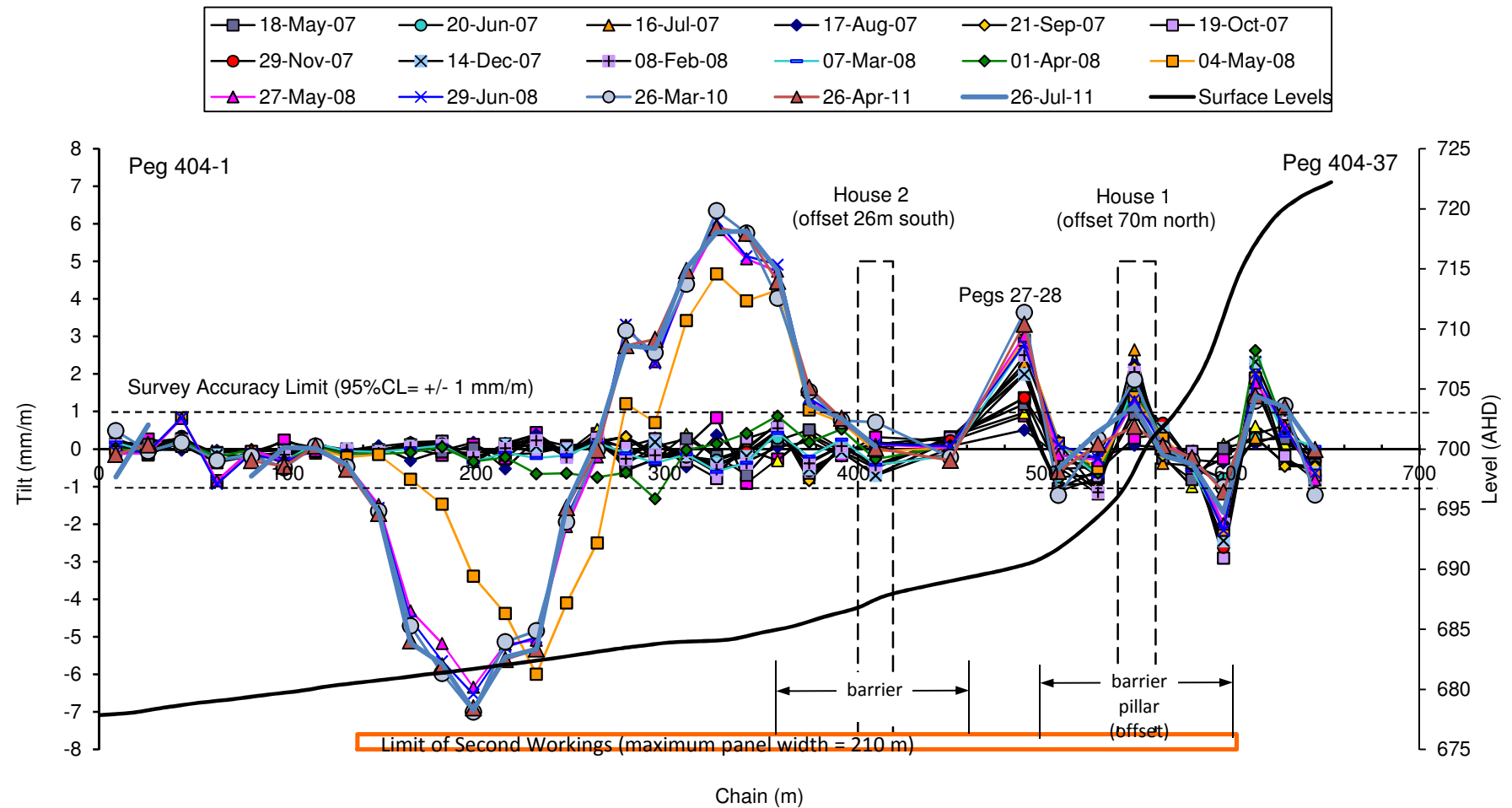
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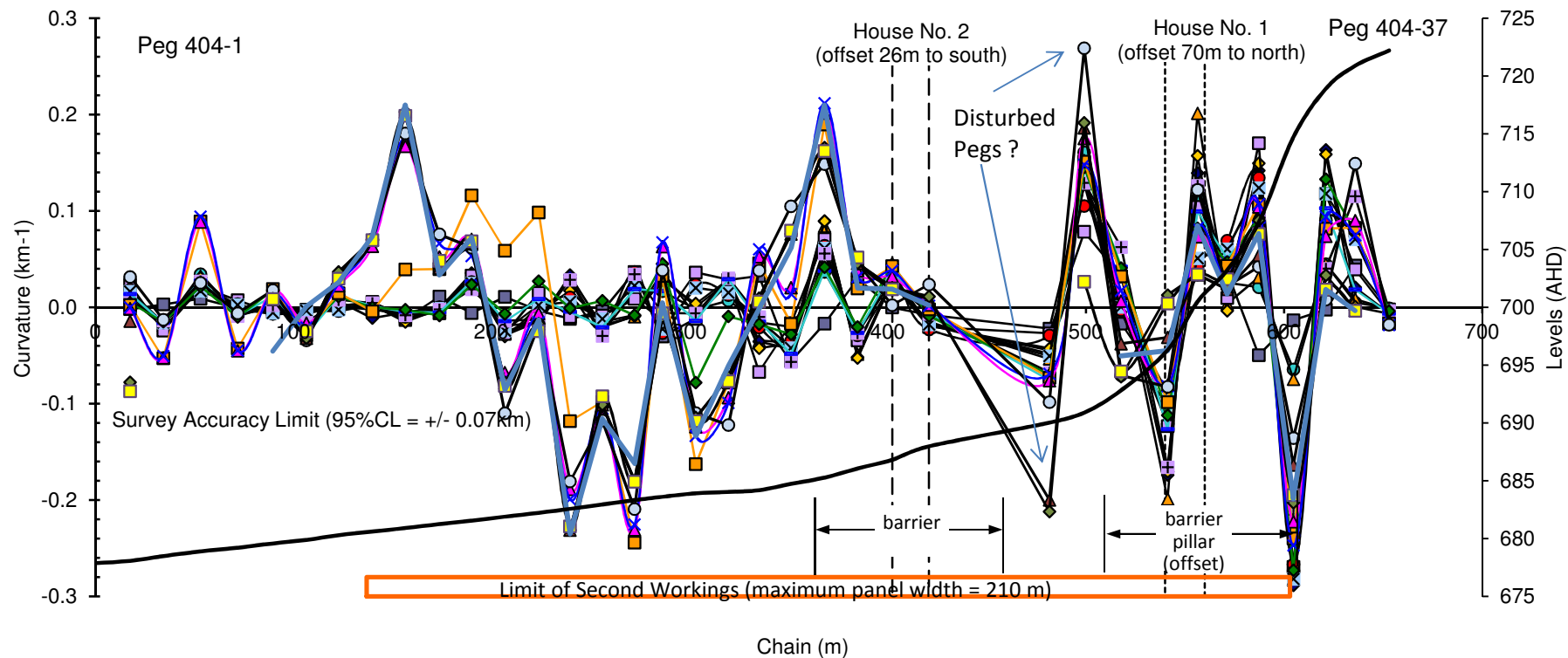
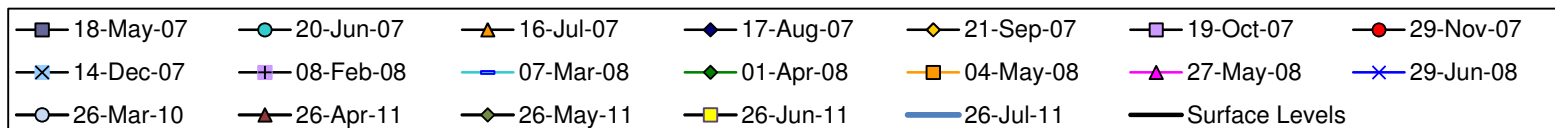
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Date:	15.09.11	Title:	Measured 404 Panel Subsidence Along Crossline XL 1-37 at Berrima Colliery
Ditton Geotechnical Services Pty Ltd		Scale:	NTS
			Figure No: 2a



	Engineer:	S.Ditton	Client:	Boral Cement	
	Drawn:	S.Ditton		BER-003/2	
	Date:	15.09.11	Title:	Measured 404 Panel Tilt Along Crossline XL 1-37 at Berrima Colliery	
	Ditton Geotechnical Services Pty Ltd		Scale:	NTS	Figure No: 2b



DgS



Engineer: S.Ditton

Drawn: S.Ditton

Date: 15.09.11

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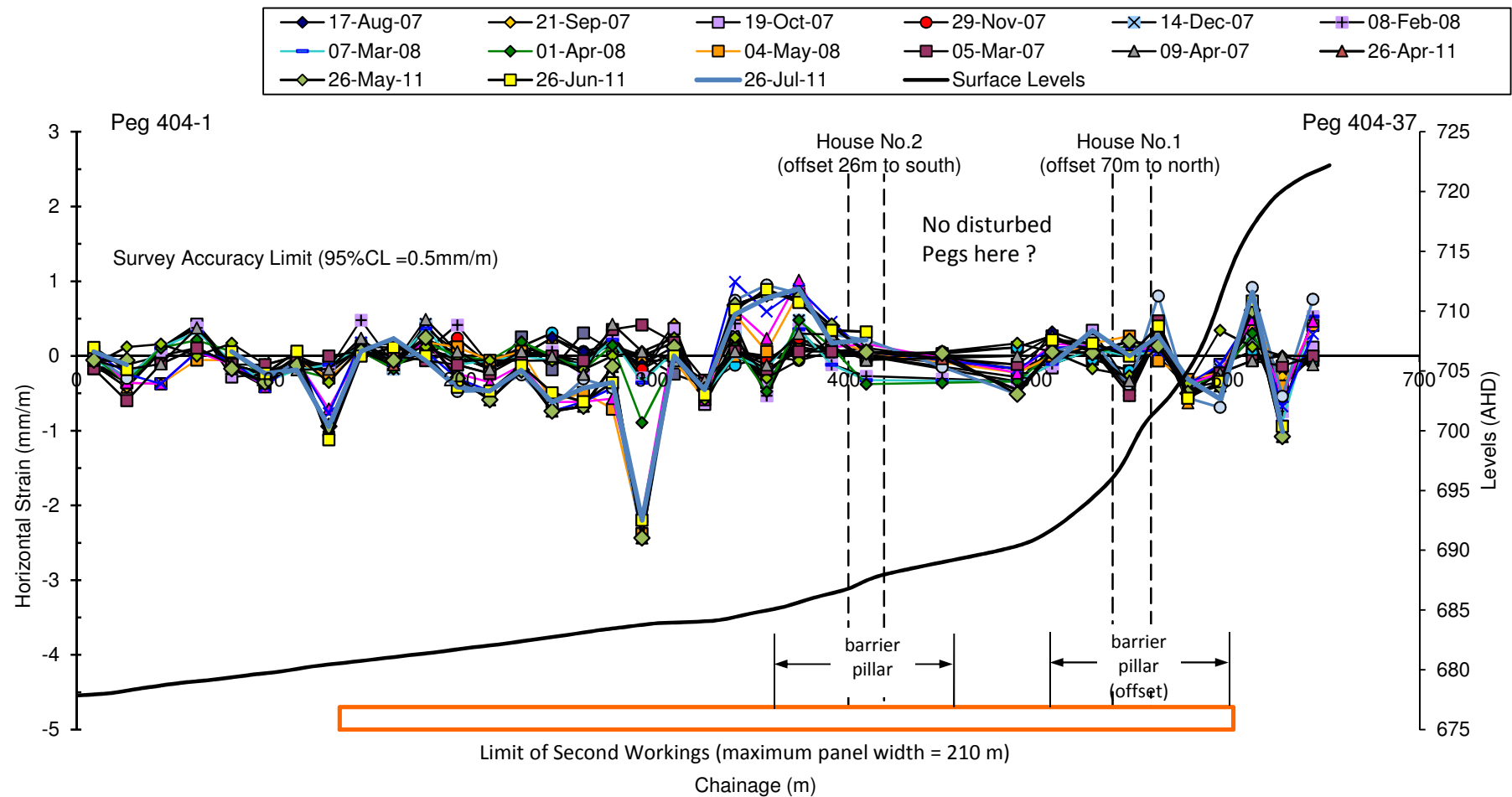
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BER-003/2

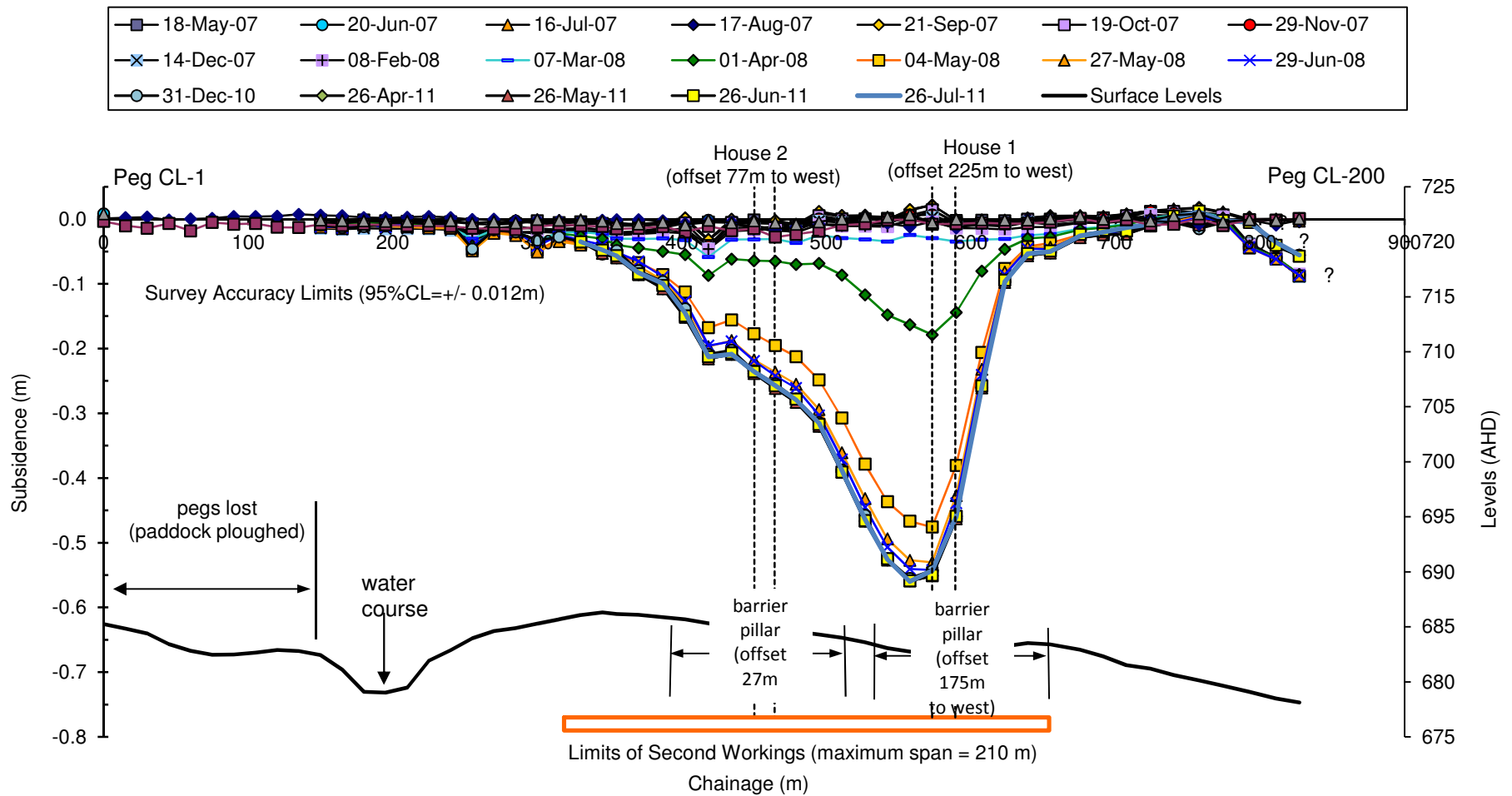
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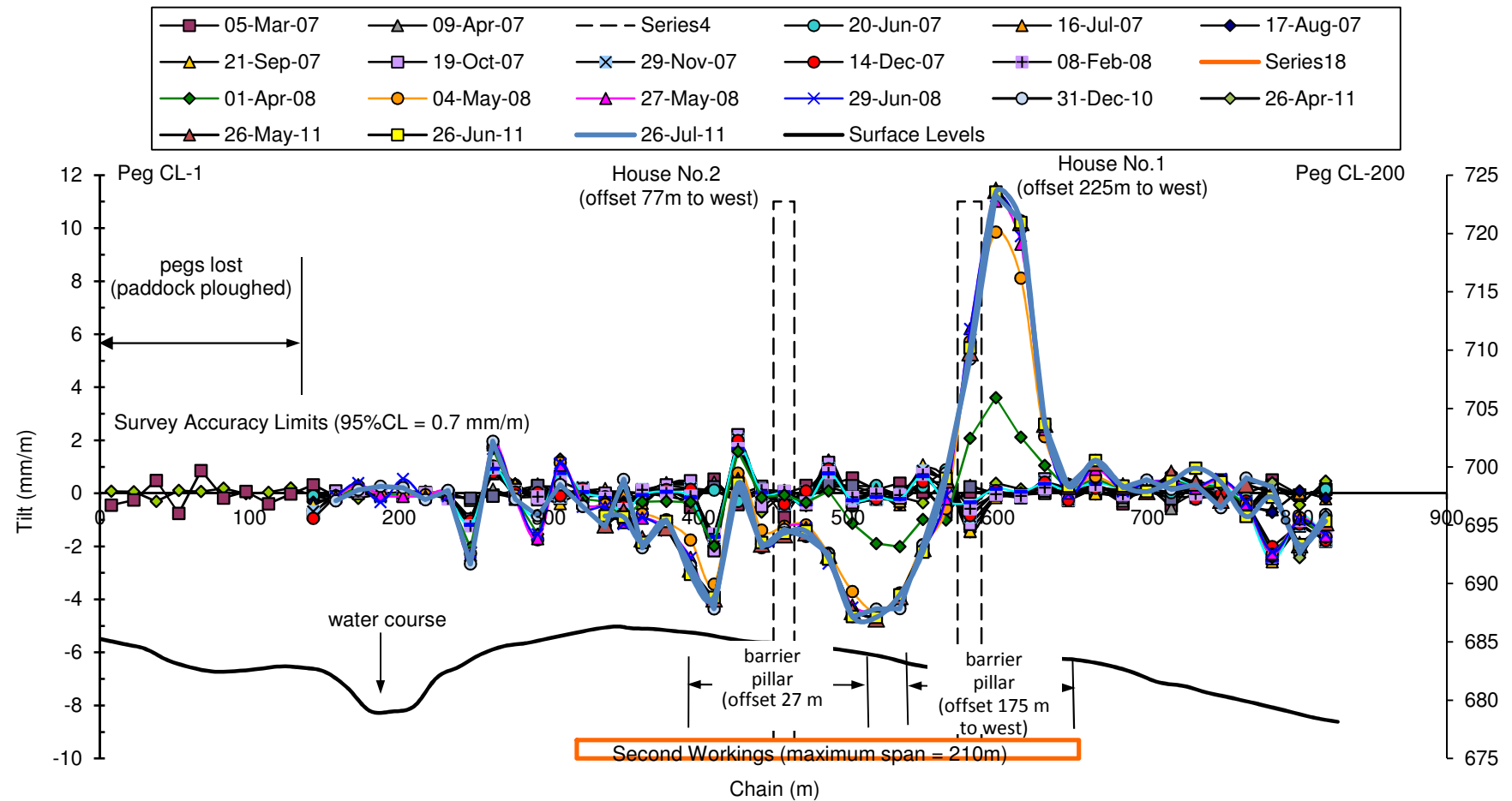
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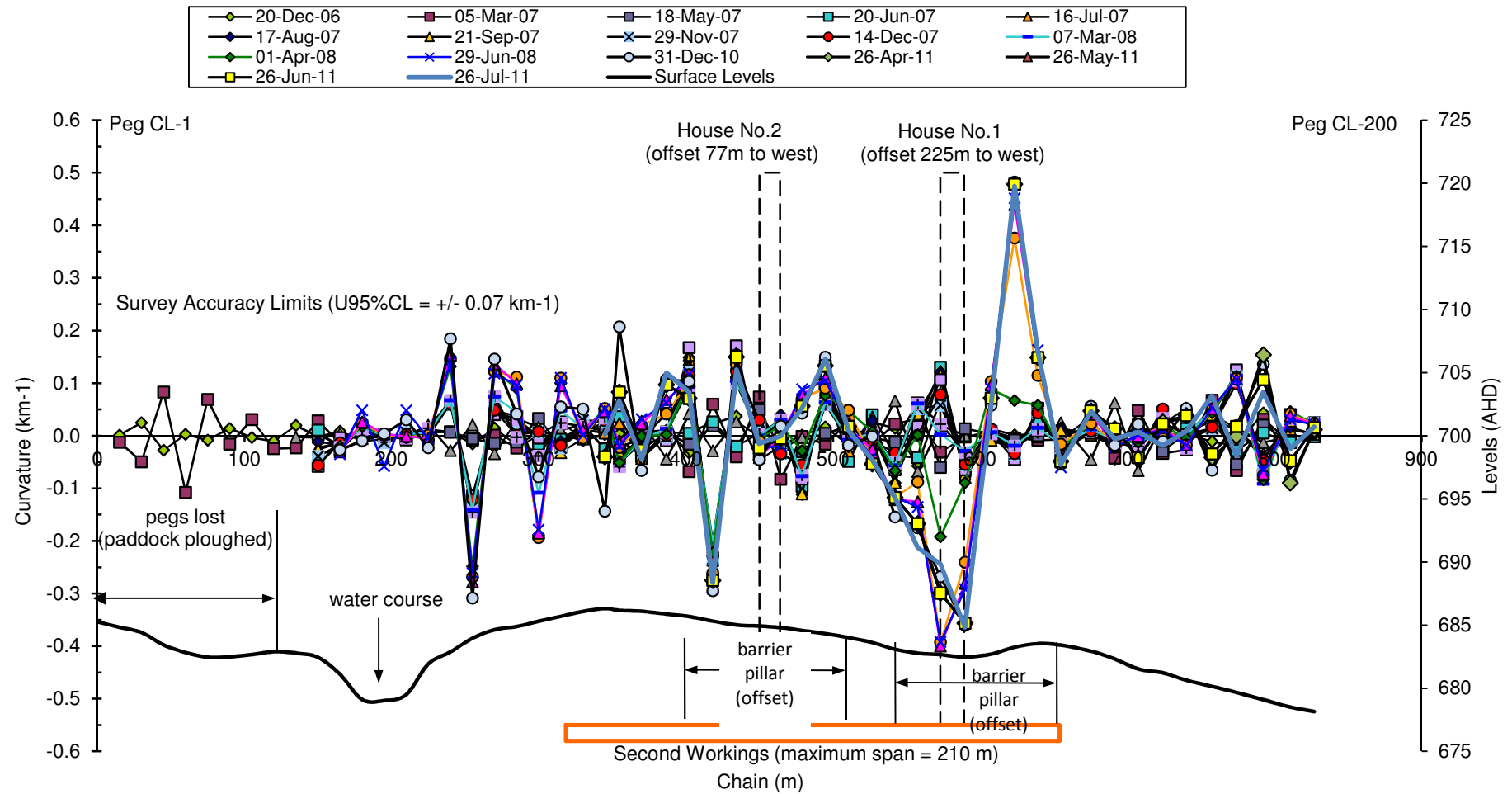
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Ditton Geotechnical Services Pty Ltd		Scale:	NTS
			Figure No: 2d



Engineer:	S.Ditton	Client:	Boral Cement
Drawn:	S.Ditton		BER-003/2
Date:	15.09.11	Title:	Measured 404 Panel Subsidence Along Centreline CL 1-200 at Berrima Colliery
Ditton Geotechnical Services Pty Ltd		Scale:	NTS
			Figure No: 3a



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	Drawn:	S.Ditton		BER-003/2			
	Date:	15.09.11	Title:	Measured 404 Panel Tilt Along Centreline CL 1-200 at Berrima Colliery			
	Ditton Geotechnical						
	Services Pty Ltd		Scale:	NTS		Figure No:	3b



DgS



Engineer: S.Ditton

Drawn: S.Ditton

Date: 15.09.11

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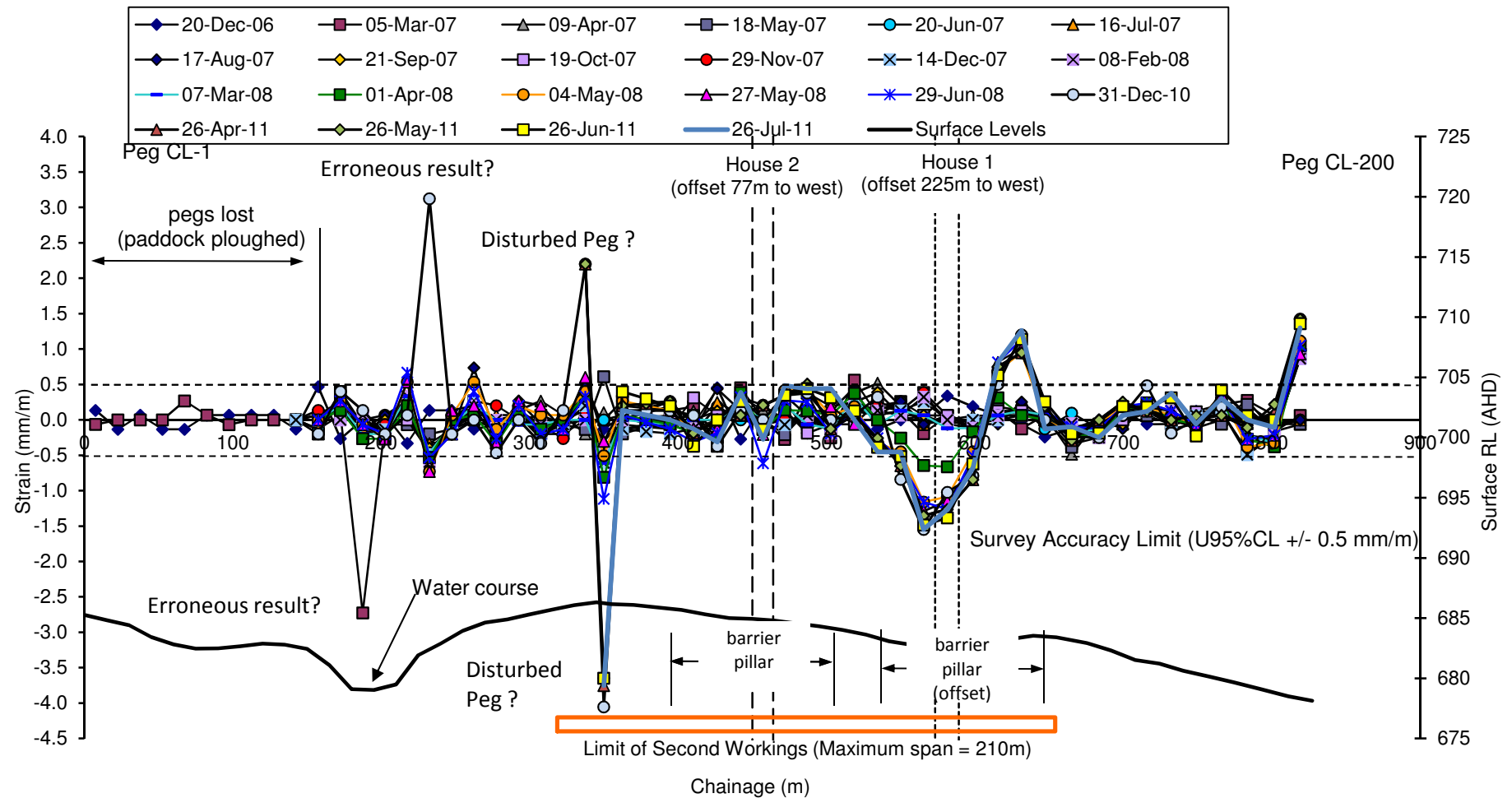
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BER-003/2

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Scale: NTS

Figure No: 3c



DgS



Engineer: S.Ditton

Drawn: S.Ditton

Date: 15.09.11

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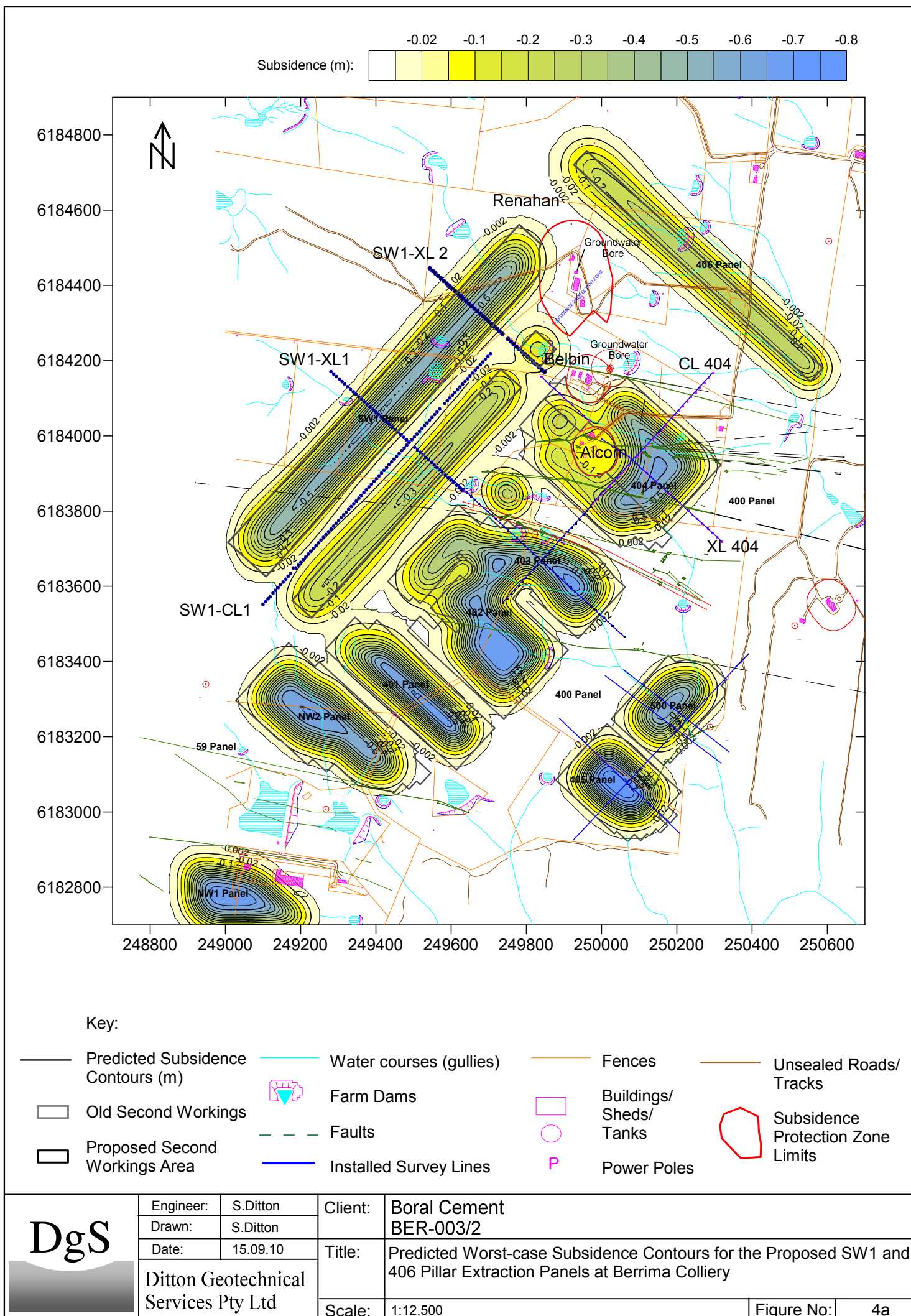
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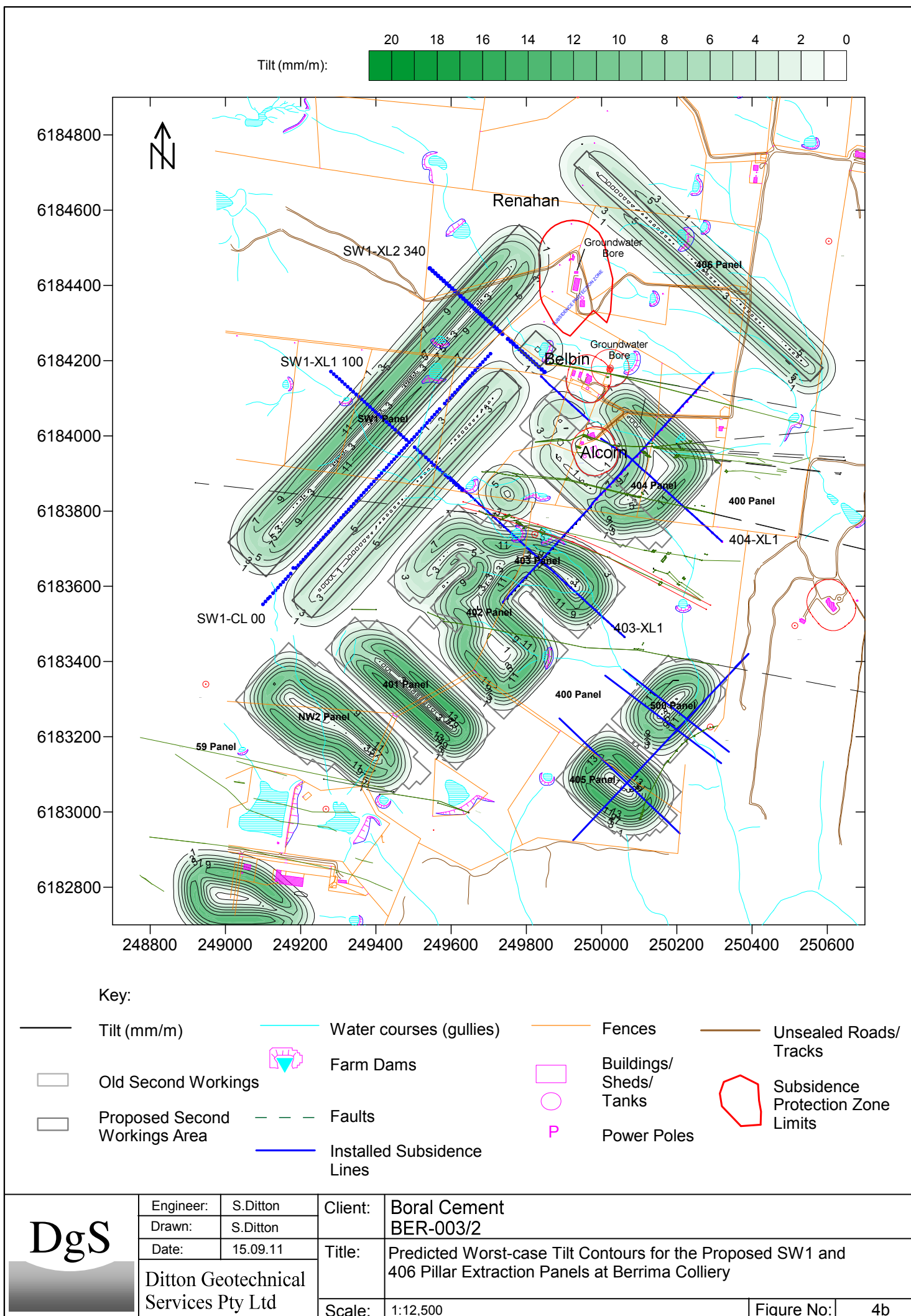
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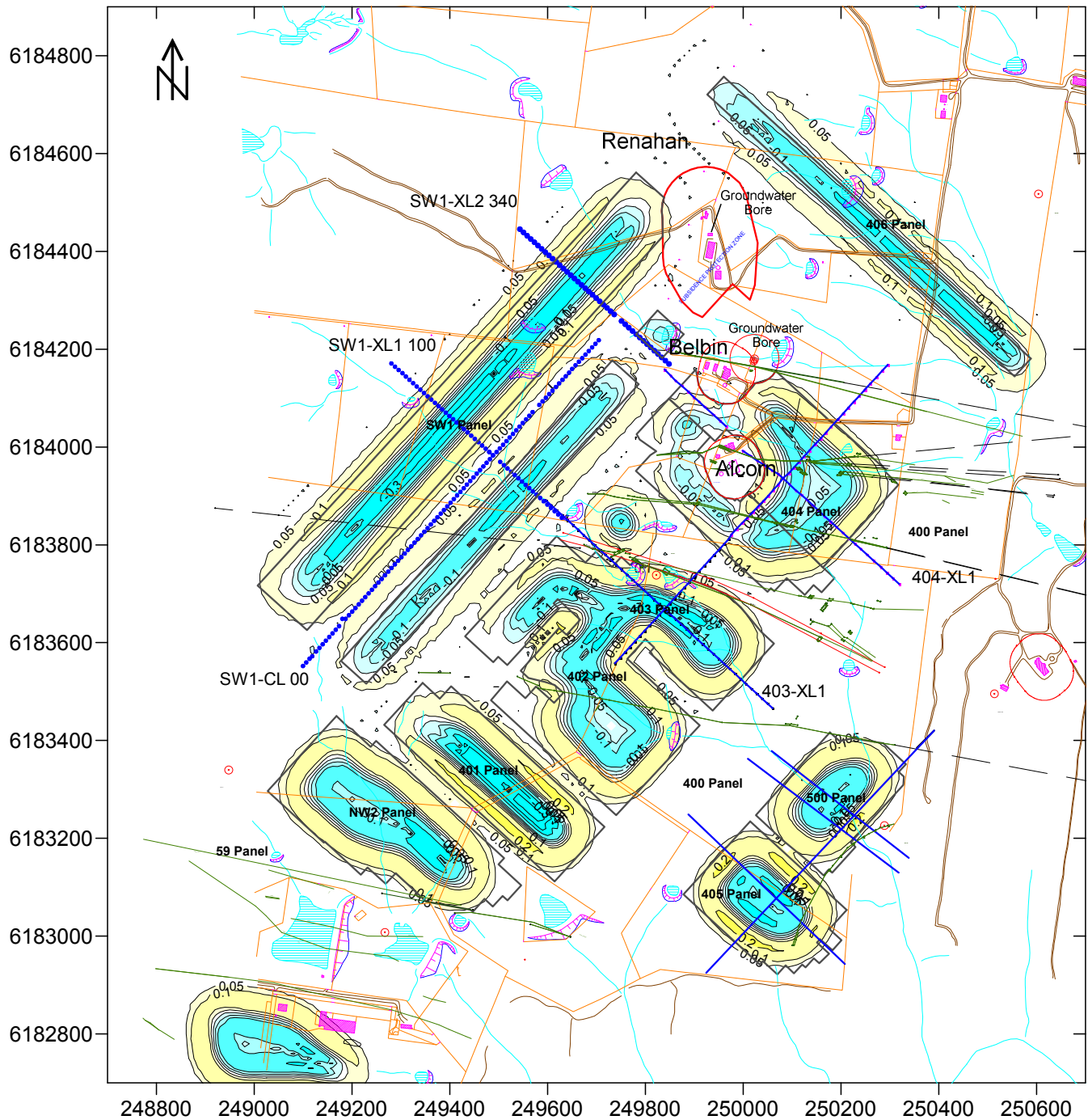
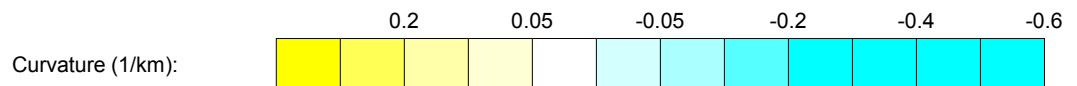
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	Engineer:	S.Ditton	Client:	Boral Cement		
	Drawn:	S.Ditton		BER-003/2		
	Date:	15.09.11	Title:	Predicted Worst-case Tilt Contours for the Proposed SW1 and 406 Pillar Extraction Panels at Berrima Colliery		
	Ditton Geotechnical Services Pty Ltd		Scale:	1:12,500	Figure No:	4b



Key:

—	Curvature (1/km)	—	Water courses (gullies)	—	Fences	—	Unsealed Roads/ Tracks
□	Old Second Workings	▲	Farm Dams	□	Buildings/ Sheds/ Tanks	○	Subsidence Protection Zone Limits
□	Proposed Second Workings Area	---	Faults	○	Power Poles		
		—	Installed Subsidence Lines				

DgS

Engineer: S.Ditton
Drawn: S.Ditton
Date: 15.09.11

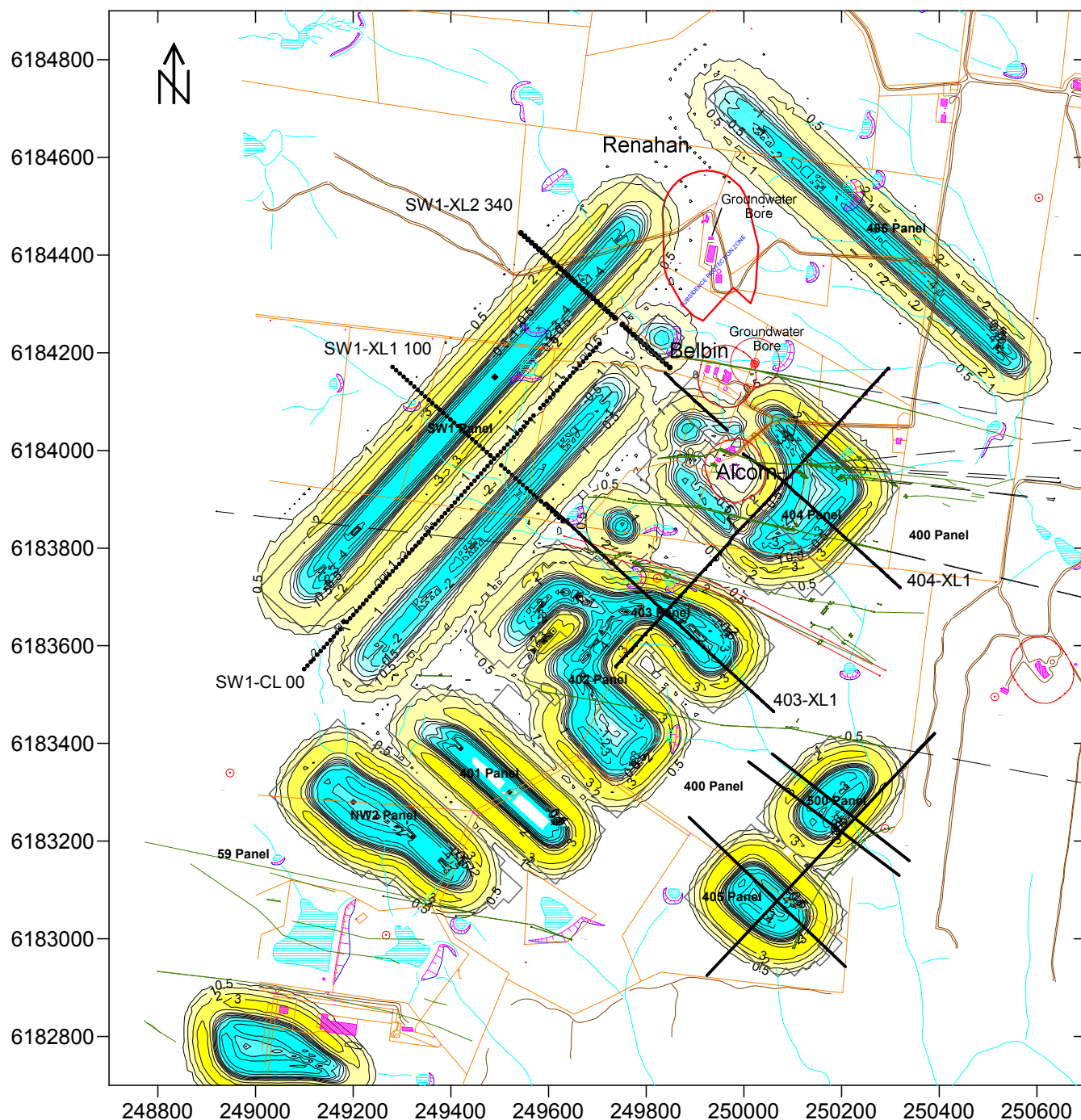
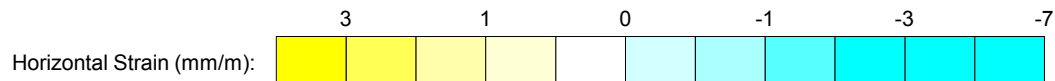
Ditton Geotechnical Services Pty Ltd

Client: Boral Cement
BER-003/2

Title: Predicted Worst-case Curvature Contours for the Proposed SW1 and 406 Pillar Extraction Panels at Berrima Colliery

Scale: 1:12,500

Figure No: 4c



Key:

— Strain (mm/m)	— Water courses (gullies)	— Fences	— Unsealed Roads/ Tracks
□ Old Second Workings	□ Farm Dams	□ Buildings/ Sheds/ Tanks	□ Subsidence Protection Zone Limits
□ Proposed Second Workings Area	— Faults	○ Power Poles	
	— Installed Subsidence Lines		

DgS

Engineer: S.Ditton
Drawn: S.Ditton
Date: 15.09.11

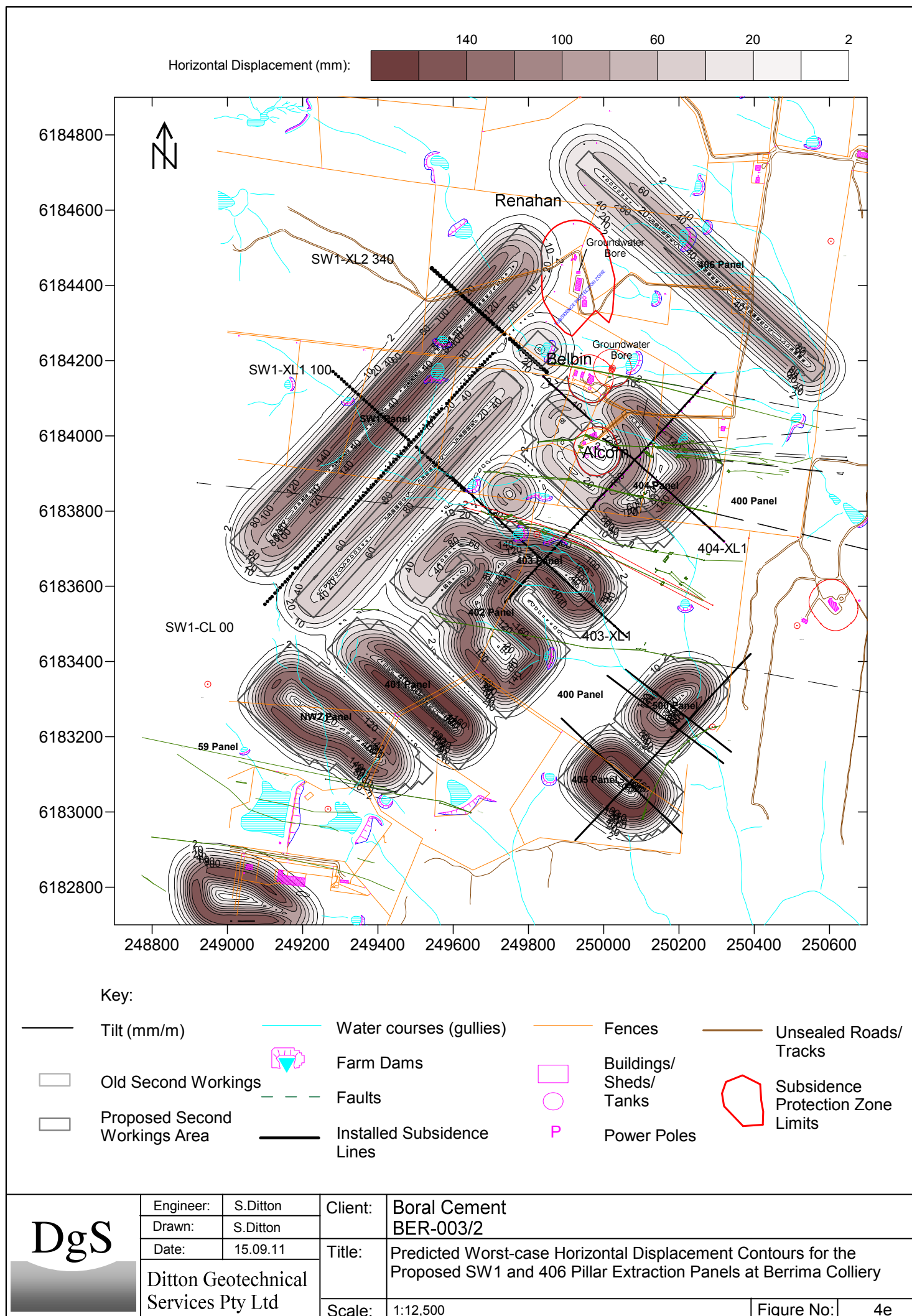
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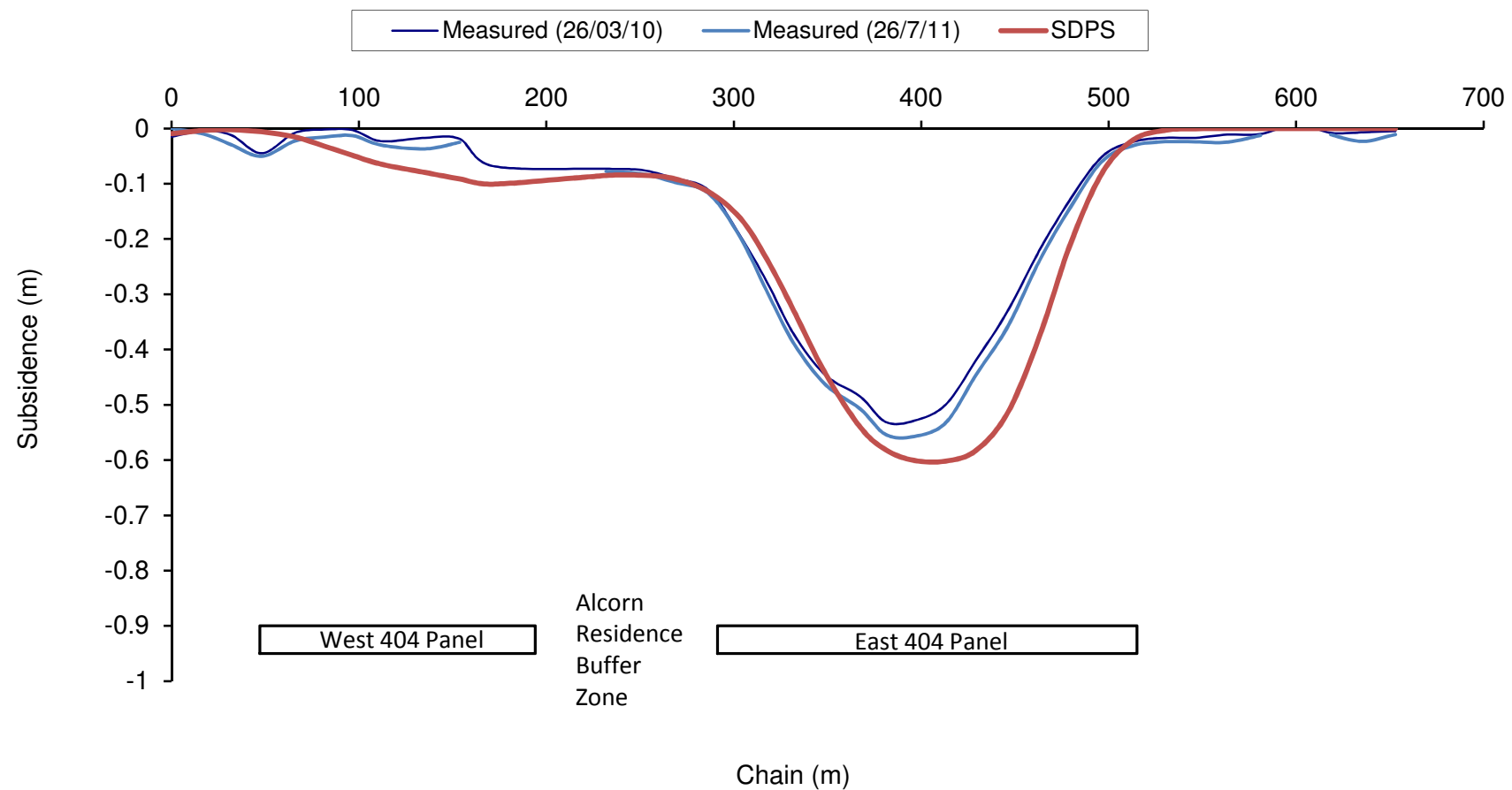
Client: Boral Cement
BER-003/2

Title: Predicted Worst-case Horizontal Strain Contours for the Proposed SW1 and 406 Pillar Extraction Panels at Berrima Colliery

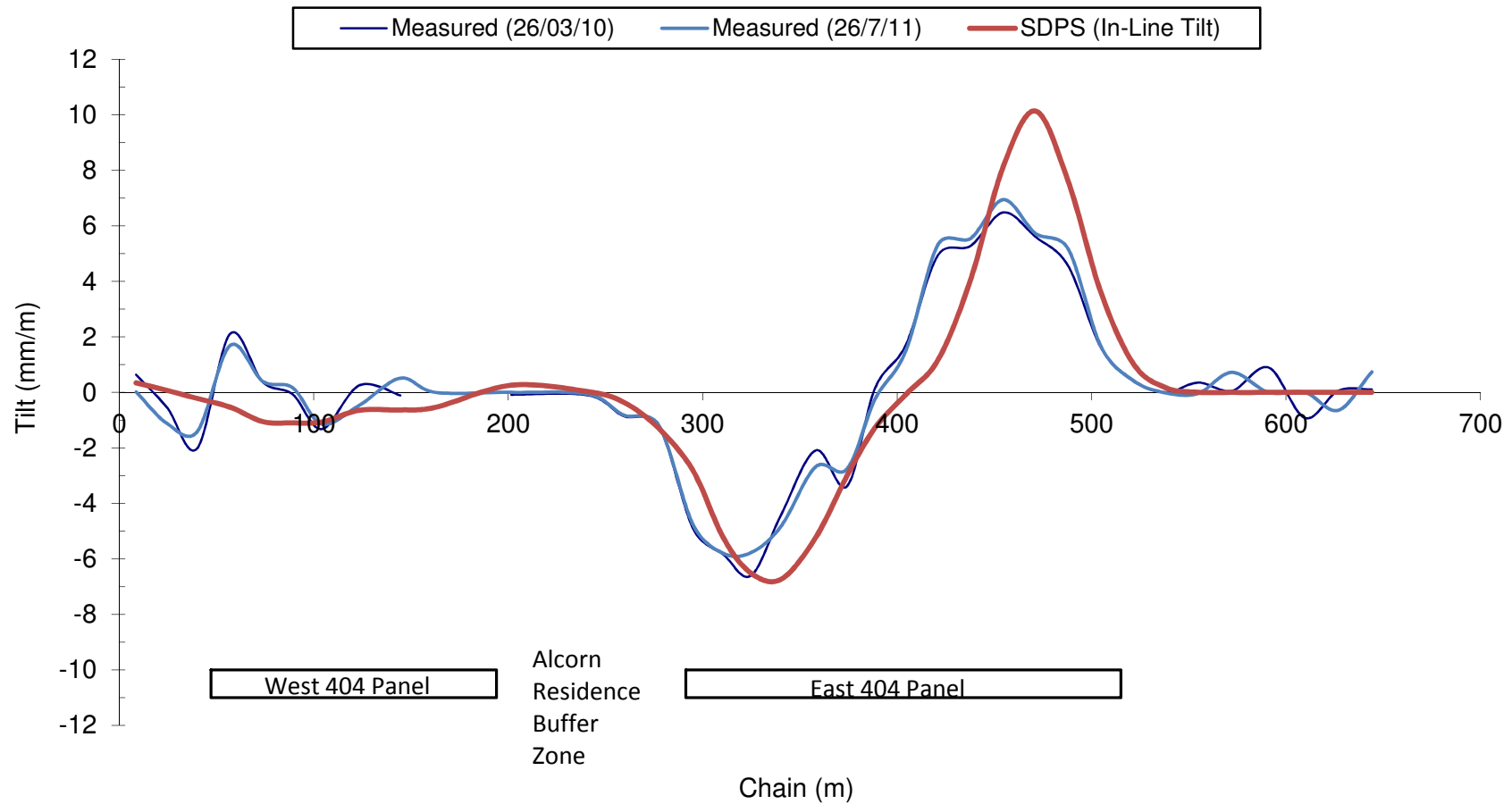
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Figure No: 4d

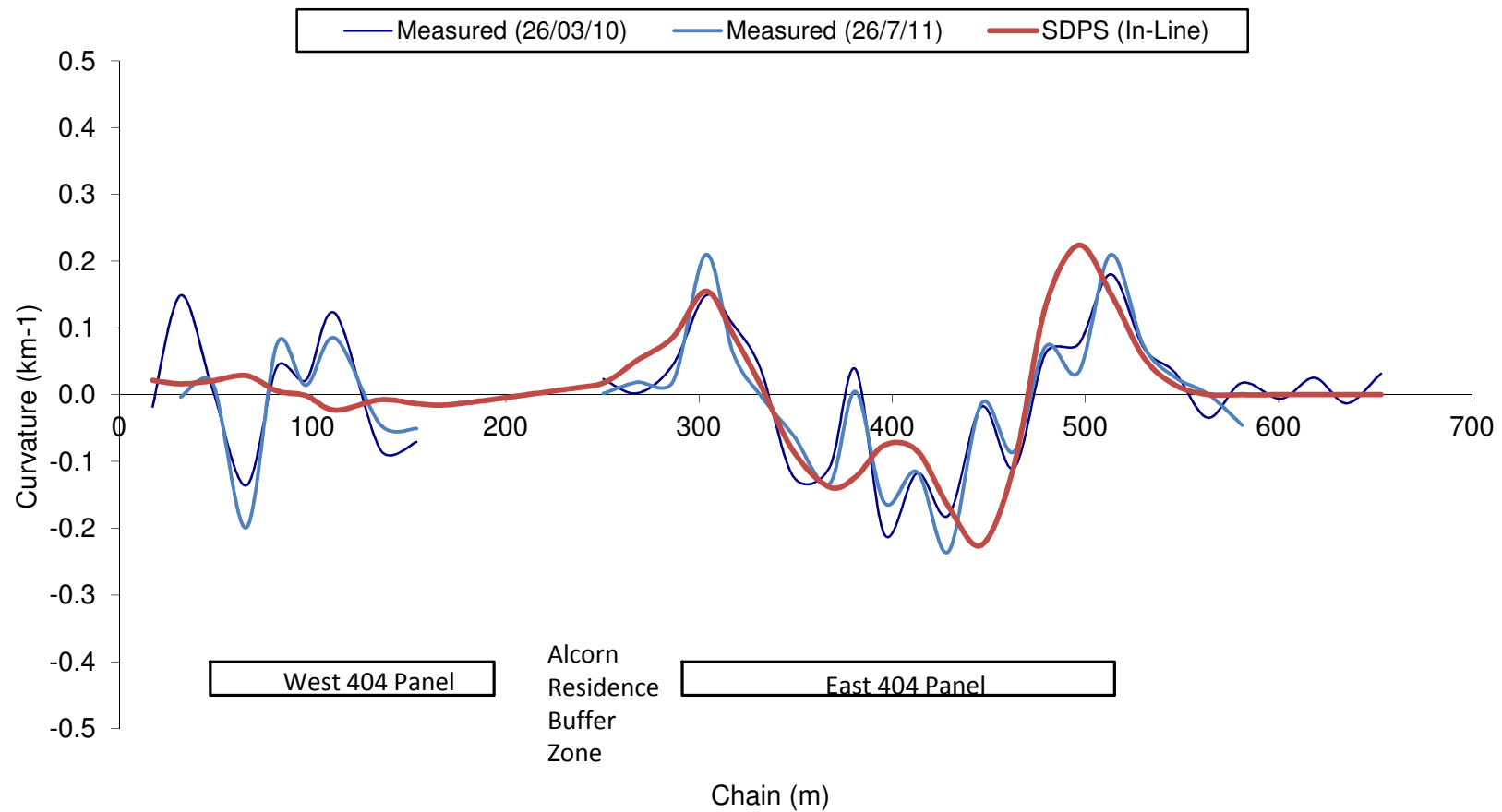




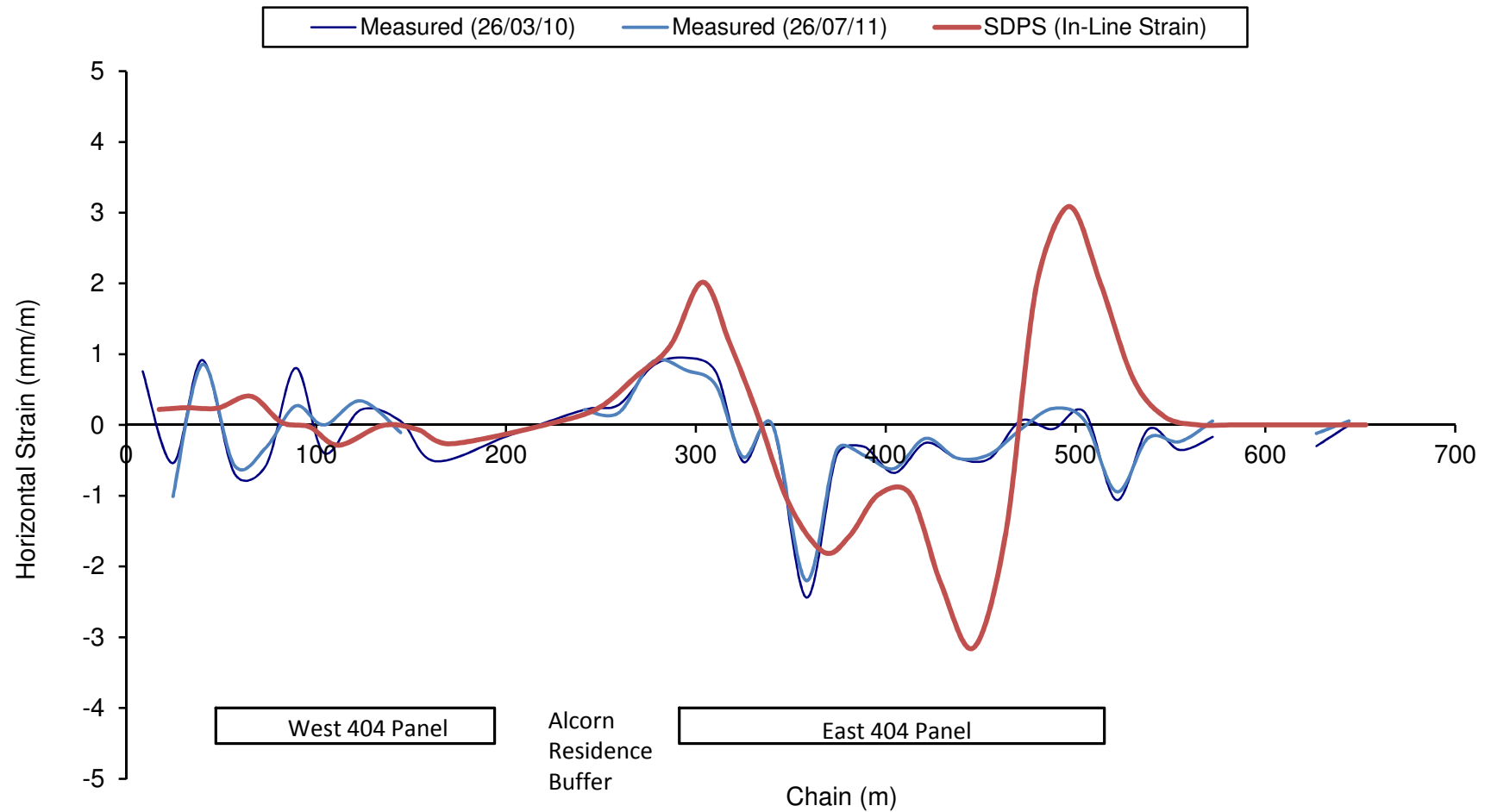
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	Services Pty Ltd		Scale:	NTS		Figure No:	5a



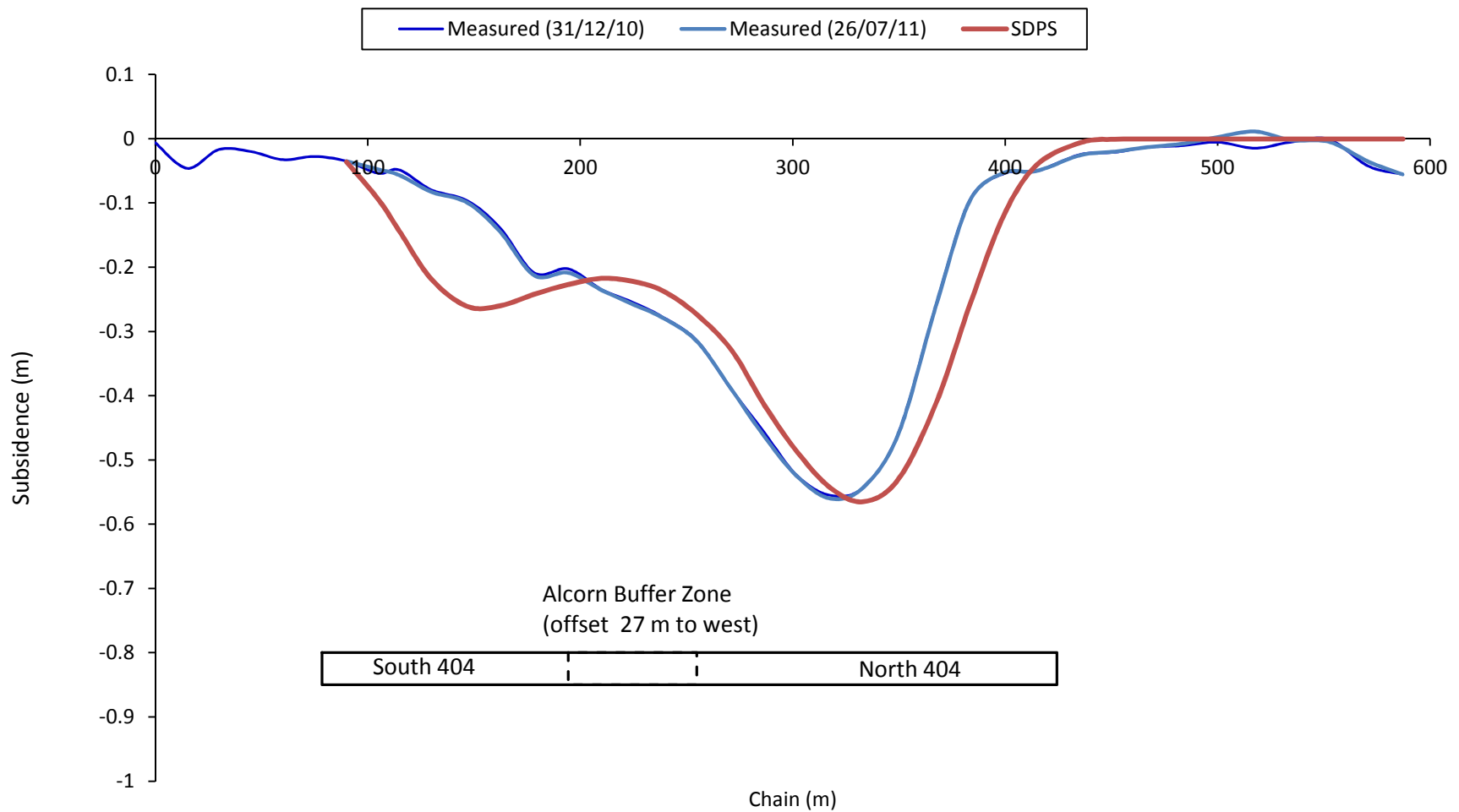
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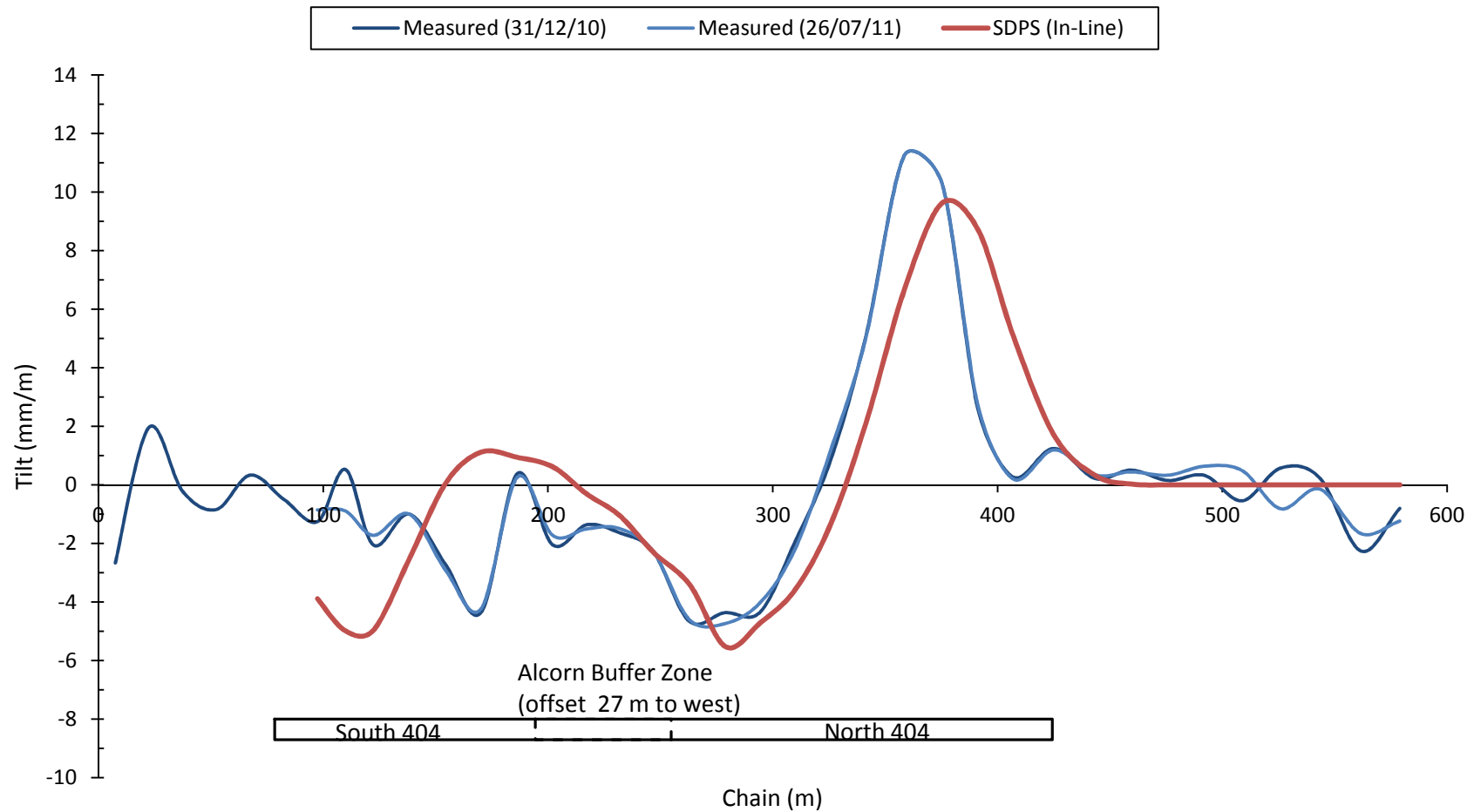
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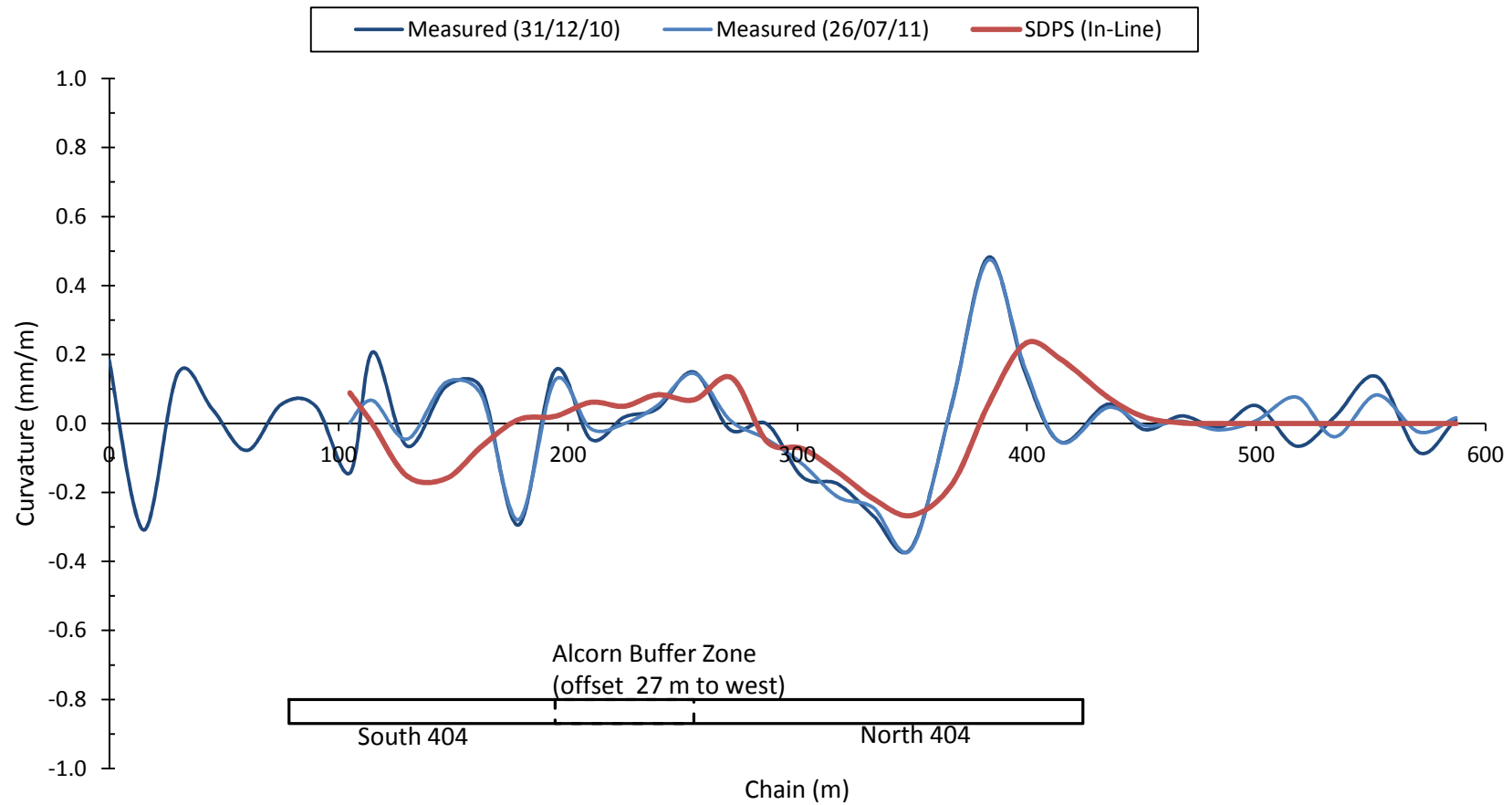
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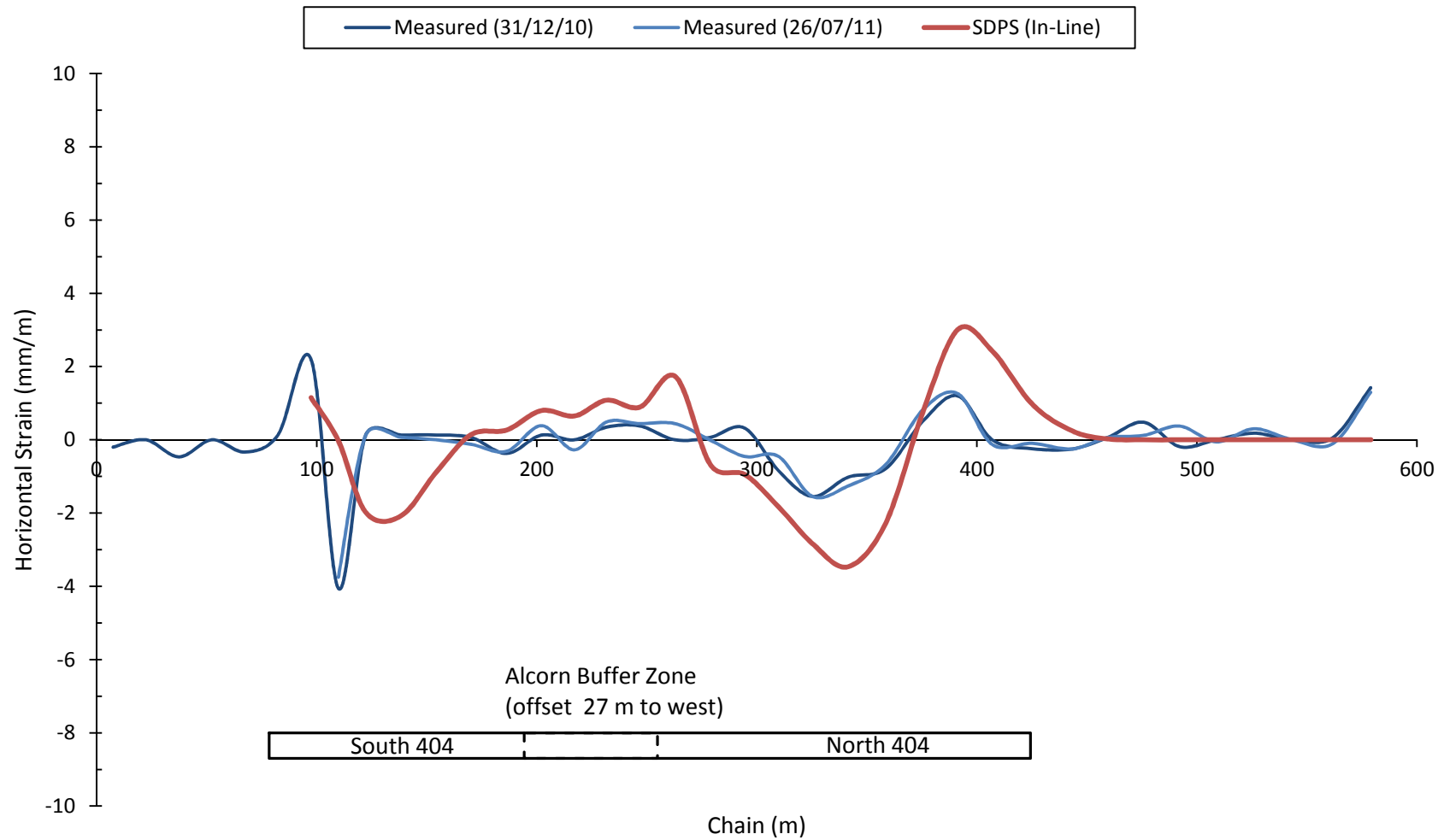
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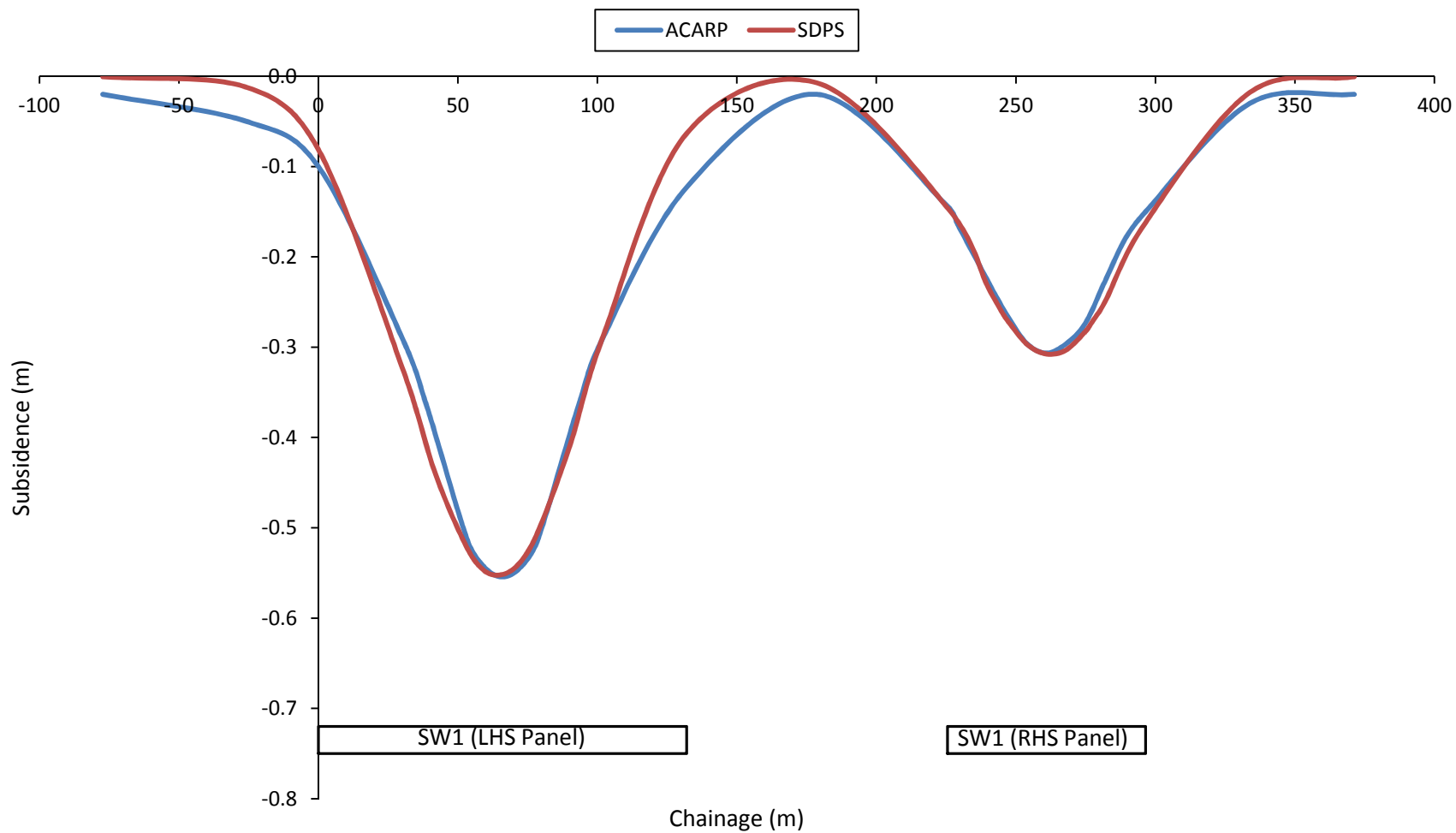
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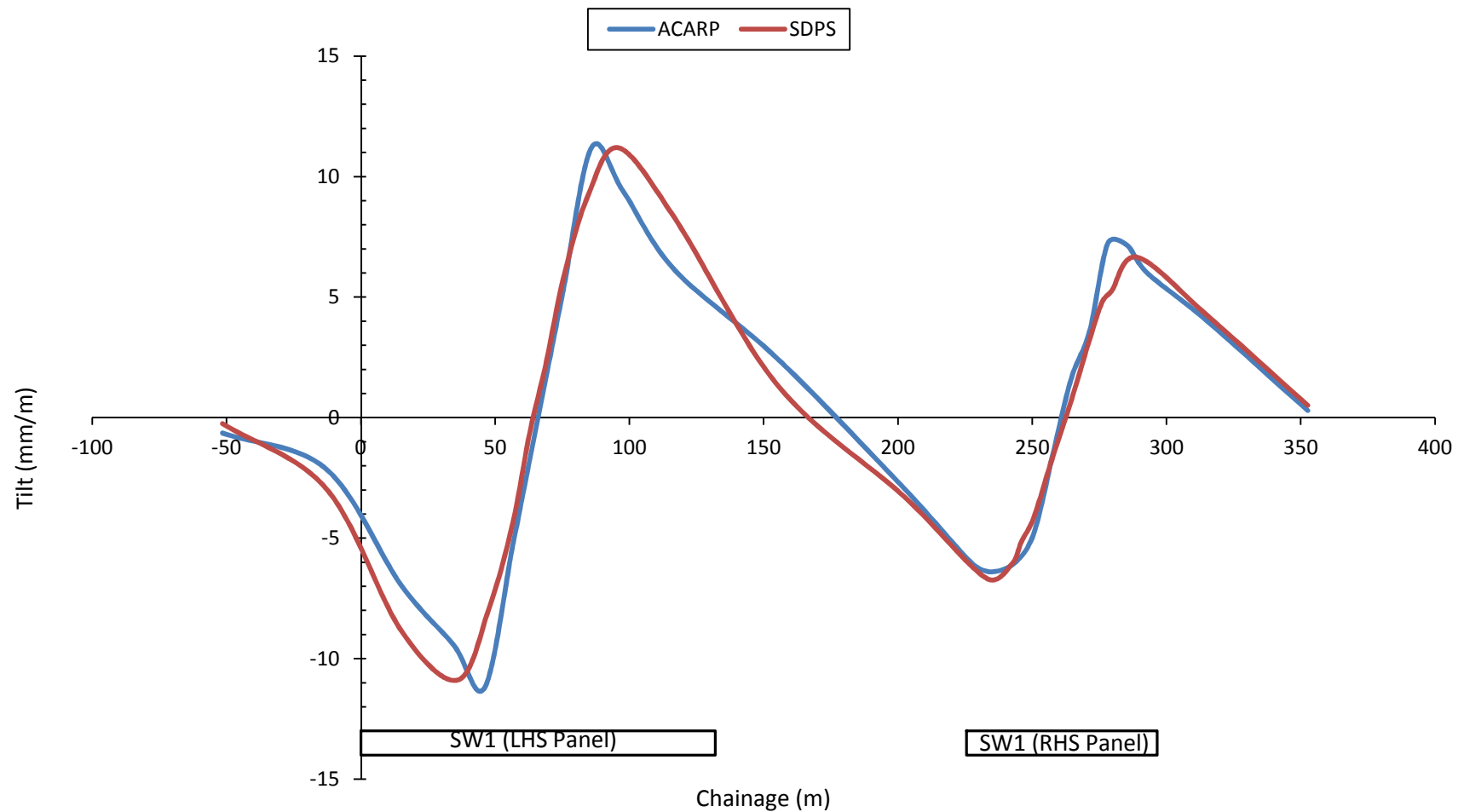
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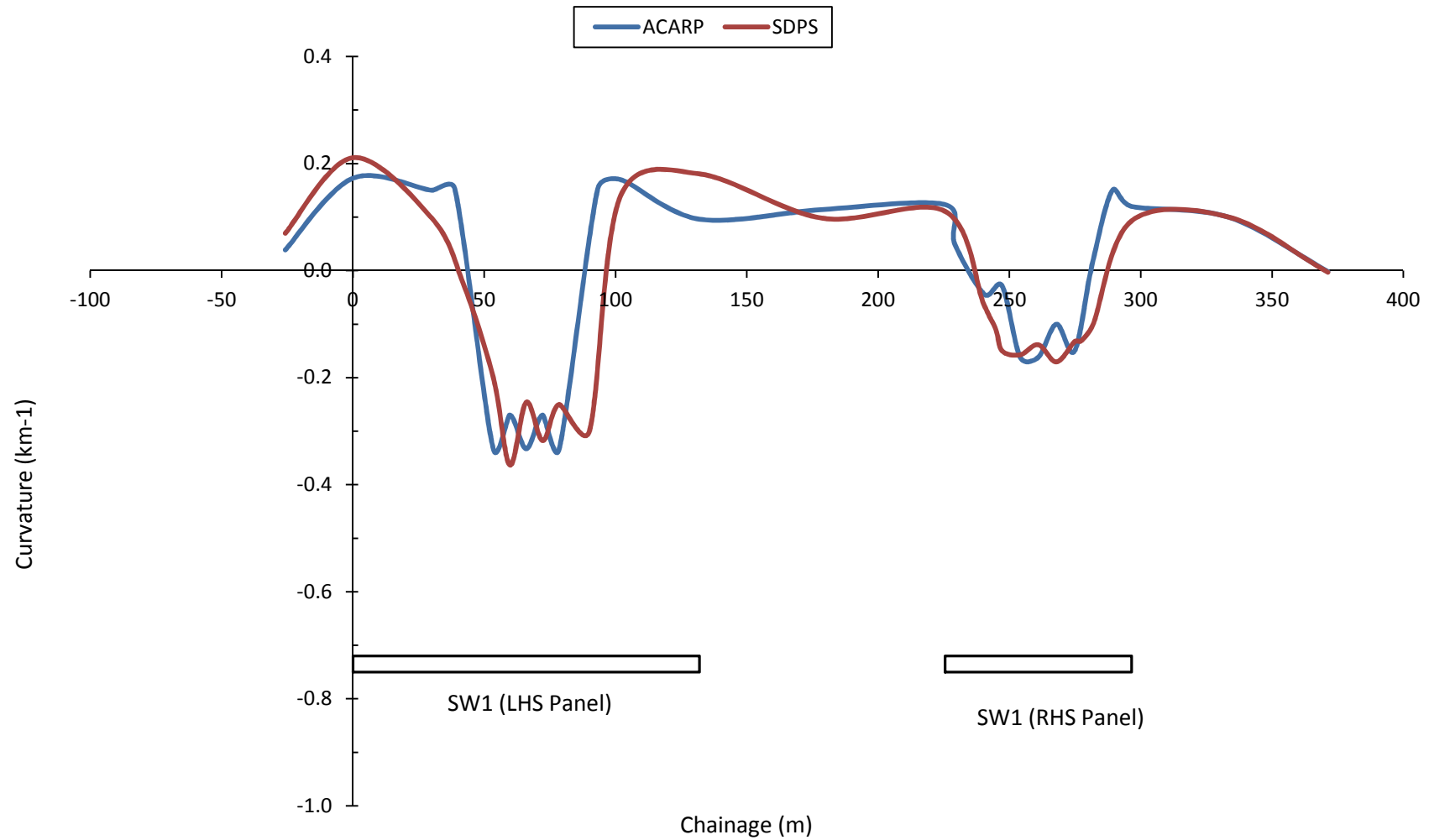
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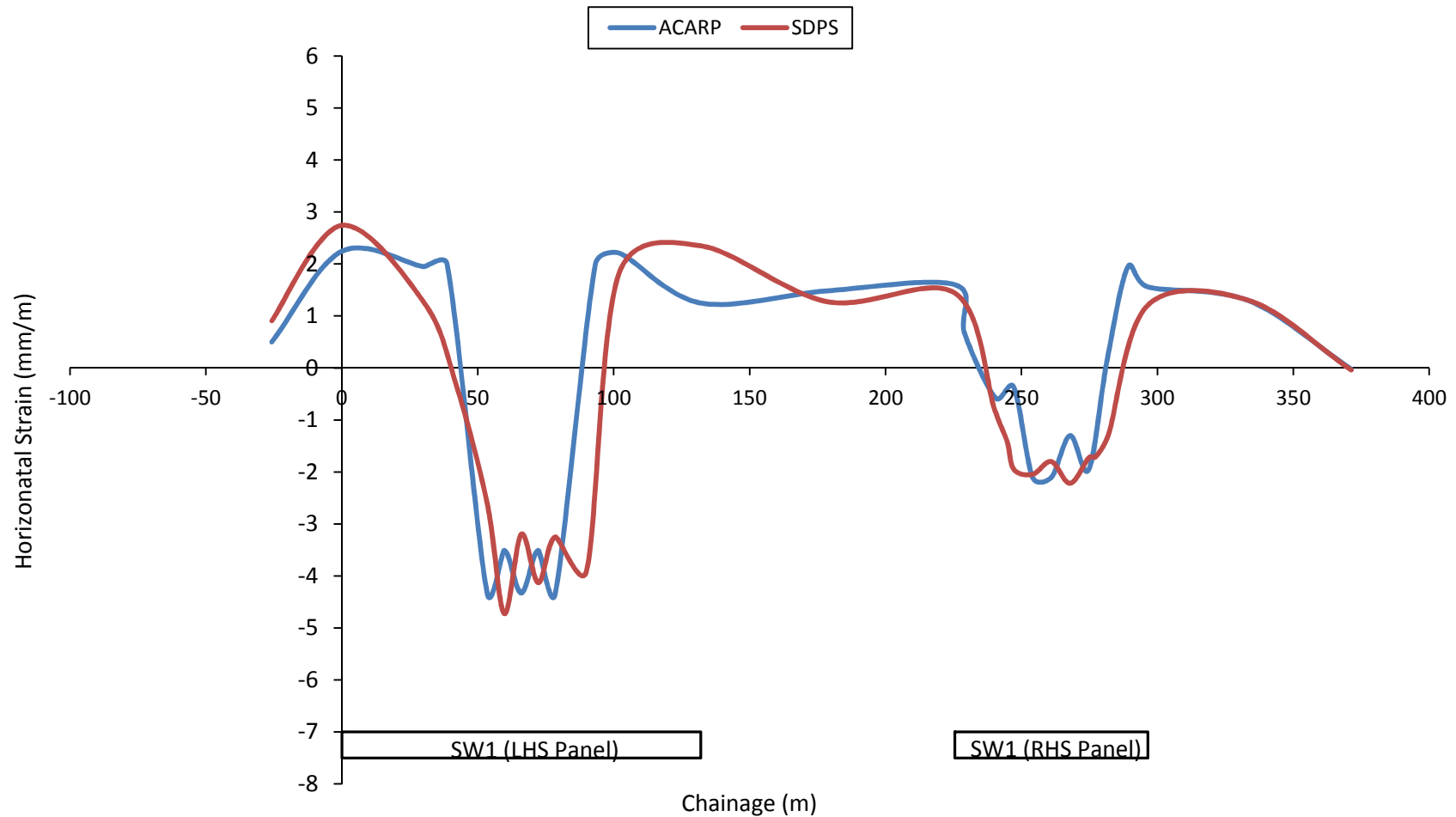
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	Services Pty Ltd			Scale:	NTS		Figure No:



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	Services Pty Ltd		Scale:	NTS			Figure No:



Engineer: S.Ditton

Drawn: S.Ditton

Date: 15.09.11

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Services Pty Ltd

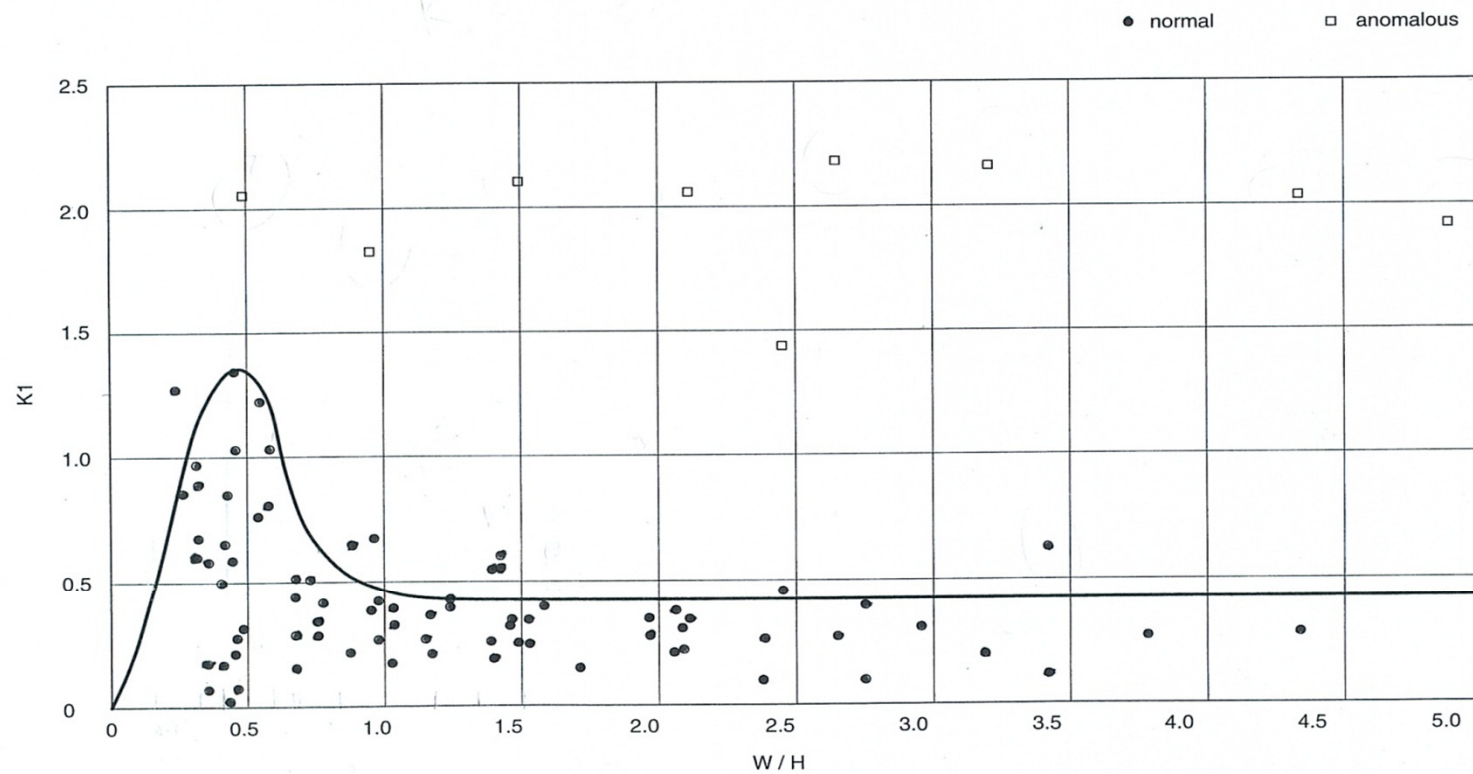
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Title: Calibrated SDPS v. ACARP, 2003 Model Outcomes for XL1 Horizontal Strain for
SW1 Panel Total Extraction Panel at Berrima Colliery

Scale: NTS

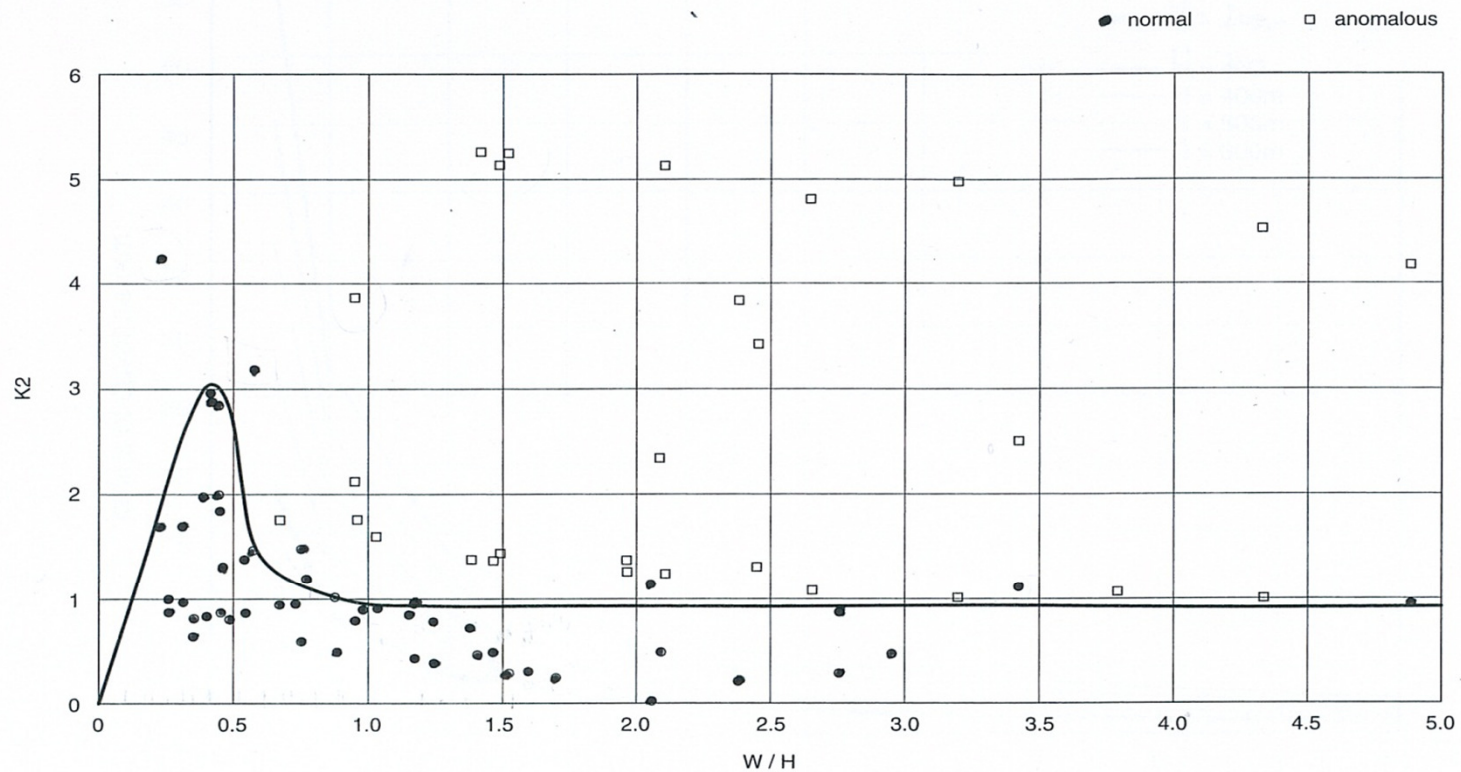
Figure No: 7d



23537-b

Figure 4.6 – Relationship between W/H ratio and K1

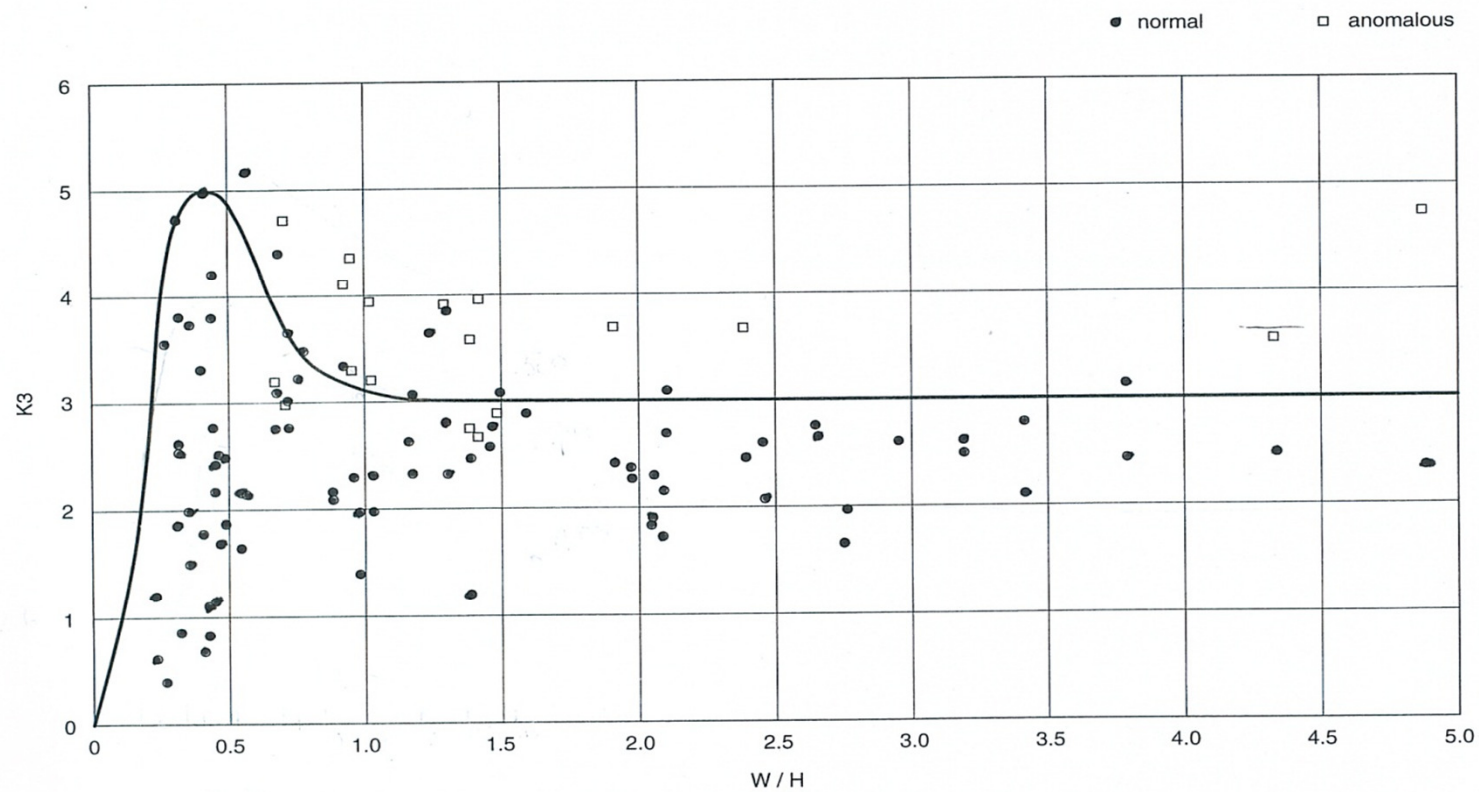
	Engineer:	S.Ditton	Client:	Boral Cement		
	Drawn:	S.Ditton		BER-003/2		
	Date:	15.09.11	Title:	Measured Tensile Strain Data and K1 Factor Design Curve		
	Ditton Geotechnical			(ref: Holla & Barclay, 2000)		
	Services Pty Ltd		Scale:	NTS		Figure No:



23536-1

Figure 4.7 – Relationship between W/H ratio and K2

	Engineer:	S.Ditton	Client:	Boral Cement			
	Drawn:	S.Ditton		BER-003/2			
	Date:	15.09.11	Title:	Measured Compressive Strain Data and K2 Factor Design Curve			
	Ditton Geotechnical			(ref: Holla & Barclay, 2000)			
	Services Pty Ltd		Scale:	NTS		Figure No:	8b



23538-b

Figure 4.10 – Relationship between W/H ratio and K3

	Engineer:	S.Ditton	Client:	Boral Cement		
	Drawn:	S.Ditton		BER-003/2		
	Date:	15.09.11	Title:	Measured Tilt Data and K3 Factor Design Curve		
	Ditton Geotechnical			(ref: Holla & Barclay, 2000)		
	Services Pty Ltd		Scale:	NTS	Figure No:	8c

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