Centennial Coal

RESPONSE TO SUBMISSIONS

Western Coal Services Project
State Significant Development 5579
Modification 1

February 2017

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Western Coal Services Project
SSD 5579 – Modification 1

RESPONSE TO SUBMISSIONS

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1.0 INTRODUCTION

This Response to Submissions (RTS) report has been prepared by Centennial Coal Company Pty Limited (Centennial Coal) in response to submissions lodged with the NSW Department of Planning and Environment (DPE) during the public exhibition of the Statement of Environmental Effects (SEE) for the proposed modification to Western Coal Services Project (MOD 1), State Significant Development (SSD) 5579. The SEE (Centennial Coal, 2016) supporting the proposed modification to SSD 5579 was exhibited from 29 November to 13 December 2016.

The RTS report addresses issues raised in submissions received on the SEE. The report builds on information presented in the SEE and is to be read in conjunction with that document.

1.1. Background

1.1.1. Western Coal Services Project

The Western Coal Services Project (the Project) is located in the Blue Mountains area of NSW within the Lithgow Local Government Area. The Project was developed in response to Centennial Coal's long term strategy for its future operations in the Western Coalfields involving both domestic and export coal sales. The key elements of the Project are to:

- Provide infrastructure to enable flexibility of supply of coal to both domestic and export markets from Springvale Mine and Angus Place Colliery and other Centennial operations within the Western Coalfields
- Provide an upgraded coal handling and preparation plant at the Springvale Coal Services Site (SCSS) with the capacity to beneficiate run-of-mine coal at 7 Mtpa
- Integrate into one consent the processing and distribution of coal from Springvale Mine, Angus Place Colliery, SCSS and other Centennial Coal sources.

The Project operates under State Significant Development consent SSD 5579, granted on 04 April 2014 and due to lapse on 30 June 2039.

The main components of the Project are:

- Springvale Coal Services Site
- Kerosene Vale Stockpile Area
- Overland conveyor system
- Mount Piper Haul Road
- Wallerawang Haul Road
- Link Haul Road.

The Project is owned by the Springvale unincorporated joint venture with participants Centennial Springvale Pty Limited (as to 50%) and Springvale SK Kores Pty Limited (as to 50%). Springvale Coal Pty Limited (Springvale Coal) is the operator of the Project on behalf of the joint venture.

1.1.2. Overview of the Proposed Modification

Springvale Coal is seeking a modification (MOD 1) to SSD 5579 to address interactions with the proposed in the Springvale Water Treatment Project (Springvale WTP) to allow for:

- The receipt of residuals material from the water treatment plant proposed in the Springvale WTP and emplacement within the existing reject emplacement area at the SCSS
- Changes to the decommissioning and rehabilitation strategy approved in SSD 5579.

As noted above the proposed modification addresses the operational interactions between the Project and the proposed Springvale WTP. Springvale Coal is seeking State Significant Development consent (SSD 7592) for the Springvale WTP to meet the water quality performance measures specified in Schedule 4 Condition 12 of Springvale Mine's consent SSD 5594. This condition requires the treatment of mine water transferred to the Springvale Delta Water Transfer Scheme from Springvale Mine and Angus Place Colliery prior to discharge to the Coxs River catchment via Springvale Mine's LDP009 on Environment Protection Licence (EPL) 3607.

The Springvale WTP is proposing to construct and operate a raw water transfer pipeline and a water treatment plant to transfer mine water from the existing dewatering facilities on the Newnes Plateau for treatment and reuse within the cooling towers of Mount Piper Power Station (MPPS) as first priority. A number of ancillary pipelines for the transfer of treated water and by-products of the water treatment process will also be installed.

The Springvale WTP is proposing to transfer its residual materials stream, resulting from the pre-treatment phase in the water treatment plant at MPPS, to the SCSS for emplacement within the existing REA at the site. The Western Coal Services Project is not approved to receive residuals material from off-site locations for emplacement within its existing REA. Modification to consent SSD 5579 is being sought to allow receipt of the residuals stream by the Project from the proposed Springvale WTP.

The installation of the raw water and the residuals pipelines within the Project Application Area requires minor changes to the approved decommissioning and rehabilitation strategy in SSD 5579. The modification proposes amendment to the approved decommissioning and rehabilitation strategy.

The SEE assessed the impacts of the proposed residuals transfer to the new REA at the SCSS on the receiving environment. The Springvale WTP is proposing to transfer up to 0.43 ML/day of liquid residuals at a maximum salinity of 2500 µS/cm for emplacement within the REA. The water and salt balance modelling identified minor increases in salinity concentrations in the immediate receiving waters of Wangcol Creek. This is largely a function of the increased volume of water being managed within the SCSS and the existing very high salinity in the shallow groundwater system. However, the environmental consequences of these minor impacts on the geomorphology and aquatic ecology of Wangcol Creek and downstream users in the Coxs River catchment have been assessed as negligible.

It is also important to consider the minor detrimental effect to Wangcol Creek in the context of the overall improvements to catchment water quality achieved by the implementation of the Springvale WTP. The proposed modification to the Western Coal Services Project consent SSD 5579 is only required to facilitate the management of residuals for implementation of the Springvale WTP and therefore should not be considered in isolation from the overall development. The Springvale WTP is effectively removing all mine water discharges to the Cox River catchment from Springvale Mine's LDP009 for reuse within the Mount Piper Power Station. The residuals stream represents less than 0.5% of the total mine water inflows managed within the Springvale Delta Water Transfer Scheme, and is product of a necessary step in the treatment process for the Springvale WTP. The Springvale WTP results in considerable overall benefits in the Coxs River catchment.

Notwithstanding the above, Springvale Coal has commenced investigations of beneficial reuse options for the management of SCSS's high salinity water surplus to the operational requirements of the Western Coal Services Project. This beneficial reuse option, when identified, would comprise the long term solution to the management of the high salinity water at the SCSS and would be implemented concurrently with the grant of development consent for the Angus Place Extension Project (SSD 5602). In the short to medium term, Springvale Coal will continue to progress with investigations to augment the current understanding of the existing surface and groundwater environments at the SCSS. Water management measures are progressively being implemented at the site for improved water quality outcomes in discharges off site. Of noteworthy is the commencement, in mid-2016, of the installation of clean water diversions at the SCSS, described in detail in Section 3.3.9.1 of the SEE and

Section 2.4 and Section 4.3 of Appendix A of the RTS. Construction of the diversion works is proposed to be staged, with the Stage 1 works expected to be completed in 2017 and the second and final Stage 2 works expected to be completed in 2019, prior to the operation of the Springvale WTP.

Consultation with the stakeholders on the proposed water management works program for the SCSS have commenced and will be ongoing.

1.2. Document Preparation

The RTS has been prepared by Nagindar Singh of Centennial Coal Company Limited. The following specialist consultants have provided additional technical advice included in **Appendix A** of the RTS:

- Lachlan Hammersley, Senior Environmental Engineer, GHD Pty Ltd
- Tess Davies, Water Resources Engineer, GHD Pty Ltd
- Peter Eccleston, Principal Water Engineer, GHD Pty Ltd
- Karl Rosen, Principal – Environment, GHD Pty Ltd.

2.0 SUBMISSIONS ON THE PROPOSED MODIFICATION

This section provides an overview of the submissions received on the proposed modification during the exhibition period, and summaries of these submissions.

2.1. Overview of Submissions

Of the 9 total submissions received on the SEE:

- 6 were from government agencies
- 2 were from special interest groups
- 1 was from a community individual.

Government agency submissions were received from:

- Lithgow City Council (LCC)
- NSW Department of Planning and Environment (DPE)
- NSW Department of Primary Industries (DPI)
- NSW Environment Protection Authority (EPA)
- NSW Office of Environment and Heritage (OEH)
- WaterNSW.

Submissions, objecting to the proposed modification, were received from two specialist groups and one community member:

- Blue Mountains Conservation Society (BMCS)
- The Colong Foundation for Wilderness Ltd (Colong Foundation)
- Julie Flavell (ID 177213).

2.2. Summaries of Submissions

2.2.1. Government Agency Submissions

Table 1 provides summaries of issues raised by government agencies listed in **Section 2.1**. **Table 1** also notes sections in the RTS where the issues raised are addressed.

Table 1 – Summary of Comments and Issues in Submissions from Government Agencies

Government Agency	Comment / Issue	Section Reference
DPE	Emplacing the pre-treatment process residual waste could increase the LDP006 daily discharge rate. The increased discharge is modelled on an annual average basis. Please provide details on the maximum increase in discharge, and what effect this maximum would have on the receiving environment.	**Section 3.1.1**
	The pre-treatment residual material would contain a range of metals. It is unclear in the SEE what the sequencing of emplacement would be and how the emplacement would be managed to limit the risks associated with shallow groundwater resources. Please provide further details on how the risks of this impact would be minimised.	
	Clean water diversions are currently being installed at the site, with the most significant works relating to the diversion of clean water overflows from Retention Dam away from LDP006. Please provide details on the proposed	

Government Agency	Comment / Issue	Section Reference
	drainage path of the overflows, detail the timing of installation of all clean water works, and how these works would contribute to improvements to water quality impacts.	
DPI	DPI has reviewed the application and Statement of Environmental Effects and has no further comments at this time.	Noted.
EPA	MOD 1 predicts that the annual disposal of 157 ML (approximately 10 kL at a time) of residuals from the SWTP will result in the annual average discharge increasing from 441 ML to 570 ML; while this is a reduction in the current annual average of 848 ML, and this is dependent on the success of the clean water diversion, the disposal of residuals still results in a predicted discharge of 129 ML (with an estimated EC of 2500 µS/cm) annually from LDP006.	**Section 3.1.2**
	The EPA welcomes the construction of SWTP and the beneficial outcomes to water quality. However, the EPA does not support the transfer and disposal of SWTP water in a liquid state to the SCSS – REA that will result in water with an elevated EC (2500 µS/cm) contributing to an increased daily rate of discharge in the order of 0.3 – 0.5 ML/day from LDP006. Allowing a discharge of up to 0.5 ML/day of mine water back to the Coxs River (via an increased discharge at LDP6 into Neubecks Creek (*sic*), is counter to the intent of the SWTP.	
	The EPA acknowledges that the residuals material will be decanted from the REA and managed in accordance with the current water management practices at SCSS. The EPA requests that options to dewater the residuals on site at MPPS treatment facility or the SCSS prior to disposal at the REA as a solid waste be considered. Following disposal as a solid waste placement, the material could be managed to restrict influx of rainfall and the subsequent generation of leachate.	
	The EPA is seeking clarification on the exact location proposed for disposal of the residuals. Figure 5 of the main report titled '*Springvale Coal Services Site Infrastructure*' shows the Co-disposal REA located near the main entrance on the eastern side of the site. Whereas Figure 11 of the main report titled '*Residuals Transfer Pipeline at Springvale Coal Services Site*' shows the Residuals Transfer Pipeline terminating at the REA located on the southern boundary of the site.	
	In the event that the project is approved, and a decision is made on the most suitable form to dispose the waste as per the EPA guidelines, and apply for a licence variation to permit the receival of waste from off site.	
LCC	Council considers the Environmental Assessment adequately highlights the relevant issues and has no objection to the project subject to Council's original conditions remaining on the consent.	Noted
OEH	OEH understands that the proposed modification will not require changes to surface infrastructure at the Western Coal Services site. As such, there will be no additional ground disturbance or clearing of native vegetation. The proposal will result in some changes to the rehabilitation strategy relating to Domain 2 (Reject Emplacement Area) and Domain 7 (haul roads and overland conveyor system). There will be no changes to the Additional Rehabilitation Initiatives for the Lamberts Gully Creek catchment, which require the establishment and enhancement of locally endemic native vegetation species and improvement of fauna habitat values in the area. The final landform planned for the site is not proposed to change. Based on the information provided, OEH has no specific comments regarding the proposed modification.	Noted.
WaterNSW	WaterNSW has reviewed the SEE and notes that the salt and water balance modelling results predict an adverse environmental impact along Wangcol Creek due to increase in salinity as a result of the proposed residuals material transfer and emplacement at the Springvale Coal Services Site (SCSS). This indicates	**Section 3.1.3**

Government Agency	Comment / Issue	Section Reference
	that the proposed modification would not have a neutral or beneficial effect on water quality in Wangcol Creek.	
	The SEE states that the increased EC is primarily due to increased salt load on Cooks Dam (EC within Cooks Dam - median 3273 µS/cm and can be as high as 4460 µS/cm) which is higher than the assumed of 2500 µS/cm for residuals material stream. WaterNSW notes that water from the Rejects Emplacement Area is pumped to Cooks Dam (see Vol. 1, Page 29, Section 3.3.9.3). WaterNSW considers that this may be the reason for high salinity and water levels in Cooks Dam and appropriate mitigation measures should be adopted to rectify this issue.	
	Appendix D, Page 39, Section 5.1.1 and Figure 5-3 states discharges from LDP006 range from 0-14 ML/day. While salinity loads for average annual discharges have been estimated, salinity loads and consequences for higher end of discharges are not estimated. WaterNSW considers these should be estimated and impacts on Wangcol Creek assessed.	
	Clarification is required on the timeframe when the clean water diversions at the SCSS would be installed, monitoring completed and salt and water modelling results validated for future conditions. WaterNSW requests that the modelling validation results be provided to agencies.	

2.2.2. Submissions from Special Interest Groups

Two Special Interest Groups (SIG), namely BMCS and Colong Foundation, object to the proposed modification. **Table 2** provides a summary of issues raised by these SIGs. **Table 2** also notes sections in the RTS where the issues raised are addressed.

Table 2 – Summary of Comments and Issues in Submissions from Special Interest Groups

Special Interest Group	Issue	Section Reference
BMCS	**1. Aim of WCS Modification 1 and the principal conclusions** Adverse environmental impacts will be experienced along Wangcol Creek, comprising: • Increased volumes of water (~4-5%) in Wangcol Creek down to its confluence with Coxs River • Increased salt loads and EC levels (~16%) if the site and salt water balance results of the future conditions are compared against the proposed conditions.	Noted
	2. BMCS's Assessment Mod 1 considers that the 'face-value' changes are minor (negligible) because the down-river impacts at Lakes Wallace and Burragorang are insignificant. However, this approach is environmentally unsound and is predicated upon the notions that: • provided there is sufficient down-river dilution, upstream pollution is immaterial – yet the up-river tract is still trashed from an environmental viewpoint – the high salinity and contained metallic ions will still have killed macroinvertebrate populations and adversely affected other species; • it is unreasonable to aim for water quality consistent with that in pristine headwaters up-stream from mining-induced impacts – this 'accommodating' approach is embedded in many environmental protection licences and remains a function of the consent conditions relating to the Springvale Extension3; • it is unreasonable to place a high $-value on the environment and thereby	Noted

Special Interest Group	Issue	Section Reference
	require mining companies to include comprehensive treatment of their polluted discharges, lest this detracts from the mine's viability; and, • if a watercourse is partially trashed, the discharge of polluted waters which slightly ameliorate the problem is deemed neutral or beneficial rather than being viewed as an unacceptable cumulative impact. • Much of the above is pertinent to the WCS Mod 1, despite the glowing statements and conclusions in Mod 1, vol 1, Sections 9.5.3, 9.5.4 and 9.6, pp100-102. In simple terms, WCS is already sending highly polluted discharges to Wangcol Ck via LDP006 – it is the elephant in the SWTTP room. WCS Mod 1 is now trying to dress-up the need to take the residuals stream from the Mt Piper treatment plant (in accordance with the SWTTP) as an environmentally sound practice which conforms with the principles of ecologically sustainable development (Mod 1, vol 1, Section 9.5) and assists the SWTTP to achieve *"…environmental benefits by improving the water quality in Coxs River catchment.".* Unfortunately, the Wangcol Ck portion of the Coxs R catchment will continue to be polluted by discharges from LDP006 as clearly indicated (Mod 1, vol 1, Section 7.7, p93): *"The transfer of residuals stream from the Springvale WTP to the SCSS for emplacement within the existing REA results in increases in volume (up to 5%) and salt discharges (up to 16% increase in EC)" through LDP006 to Wangcol Creek."* *"The increased frequency of discharges has the effect of increasing the frequency of exposure of aquatic species to potential toxicants (boron, iron, manganese, nickel and zinc), albeit at decreased concentrations. This is not predicted to impact on the existing instream habitat and macroinvertebrate diversity of Wangcol Creek as the creek in the vicinity of LDP006 has the most degraded habitat and the lowest level of macroinvertebrate diversity of the current four Wangcol Creek aquatic ecology monitoring sites."* Although not stated, this is a classic case of 'some other dude did it'! The old Original Pine Dale open-cut encompassed Wangcol Ck such that the whole tract was intensely disturbed, inadequately rehabilitated, and a substantial source of pollution. More recently, the Yarraboldy Extension of the Pine Dale open-cut mine (currently owned by Energy Australia and under 'care and maintenance') interfered with the groundwater regime and remains an ongoing potential source of contamination. Now, WCS is actively polluting Wangcol Ck through discharges from LDP006; and finally, under the Mod 1 proposal (if approved) WCS will continue to pollute Wangcol Ck, justifying its action on the pre-existing degree of degradation. This above is unacceptable. As Centennial and Energy Australia stand to benefit from the SWTTP, and both companies are involved with the ongoing degradation of Wangcol Ck, it is time to stop the blame-game and acknowledge the role of cumulative impacts. Both companies should be placed on notice to the extent that the discharges associated with Mod 1 must be sent to the RO (reverse osmosis) treatment plant; and any development of the Pine Dale mine must either be a hydrologically closed system, or any released water should have a quality at least matching the up-stream quality of Wangcol Ck.	
	3. Specific Concerns **3.1 Clean and dirty water – requirements, implications and desirable outcomes** The interaction between groundwater and surface-water hydrologic regimes of the region reflects hydraulic connectivity between historical bord and pillar workings, old open-cut operations, numerous surface-water 4 management ponds, REAs (reject emplacement areas), AEAs (ash emplacement areas), and remnants of natural watercourses (e.g., Mod 1, vol 2, Appendix DA, Figs. 2-1 to and 2-4, pp6-9; Appendix DB, Fig 2-2, p11). The	**Section 3.2.1**

Special Interest Group	Issue	Section Reference
	region is a porous mess, not least because many of the surface water features are unsealed. There is clear acceptance of this connectivity (Mod 1, vol 2, Appendix DB, Section 2.3, pp9-10 and Fig. 4-2 p23). Despite the foregoing, the intention is to recognize clean and dirty water divisions (Mod 1, vol 2, Appendix D, Fig 5-2, p38). This is justified as follows (Mod 1, vol 2, Appendix D, Section 5.1.1, p36): *"SCSS is currently undertaking design and construction works relating to the separation and optimisation of clean and dirty surface water flow paths within the Lamberts Gully catchment.* ***These works are expected to reduce the clean water load from LDP006 and improve the quality of water discharged from the site in both daily and rainfall discharge events.*** *Additionally, the volume of clean water that infiltrates into the groundwater and subsequently reports to LDP006 is expected to reduce, in part due to improved flow efficiency through the site and the planned pumping of water from SHG1 to the Main Sediment Pond. The primary objectives of these works are to promote the capture and settlement of runoff from dirty catchments and to bypass cleaner water appropriately through site. As part of these works ongoing stabilisation of some catchments will be undertaken to reduce the risk of sediment laden water contributing to the clean water system."* This may be necessary to meet operational commitments, but because of the vertical connectivity and down-dip connectivity throughout the region, such separation into 'clean' and 'dirty' systems has little environmental merit. Both are saline and contaminated with metallic and non-metallic ions (Mod 1, vol 2, Appendix D, Section 5.3.2, p53). The Society accepts that 'clean' means less polluted than 'dirty'. For example, Table 5-4 (Mod 1, vol 2, Appendix D, p54) shows that the pH differs little, whereas the EC for 'clean' water is 1143 µS/cm by the time it reaches the Retention Pond while the 'dirty' water at Cooks Dam it is 3273 µS/cm. This difference in EC would be important were it not for the facts that both systems are too saline compared with values on Wangcol Ck up-stream from mining (see Mod 1, vol 2, Appendix D, Table 5-3, p50), and the two systems are collectively discharged into Wangcol Ck via LDP006 (Mod 1, vol 2, Appendix DA, Fig. 2.3, p8). The Society strongly believes that, in the context of improving the water quality in Wangcol Ck and thereby lessening its high-salinity contribution to the Coxs R, all the 'clean' and 'dirty' water should be collected and, together with any other discharges envisaged under the SWTTP, be sent to the proposed water treatment system. Discharging through LDP006 to Wangcol Ck will not have acceptable environmental outcomes.	
	3.2 Modelling Deficiencies The Society recognizes that modelling necessarily involves assumptions. However, this does not justify disregarding interactions between surface water and groundwater due to enhanced hydraulic connectivity within this highly-disturbed region of historic mine workings (underground and open-cut), reject and ash emplacement areas, a municipal waste tip, and water-management infrastructure. Yes, the interaction is fully recognized, but the implications of this for enhancing salinities and increasing the content of metallic and non-metallic ions within surface-water and groundwater flows to Wangcol Ck have largely been ignored. Such disregard risks underestimating the environmental toxicity of the polluted waters. Mod 1, vol 2, Appendix D, Section 2.3, Fig. 4-2 p23 conveys part of the concern. However, a modified Figure available from the Colong Foundation includes ash and municipal waste emplacements and more completely conveys the likelihood of the degree of salinity and other toxic components being underestimated.	
Colong Foundation	**1. Modelling omits cumulative impacts located within the project area** The Department of Planning and Environment must require the water and	**Section 3.2.2**

Special Interest Group	Issue	Section Reference
	salinity load modelling to be redone with the cumulative impacts within the project area to be fully accounted for, as the likely consequences of these impacts are likely to greatly magnify the already large salinity problem associated with LDP006. Salinity levels at Cooks Dam discharge, LDP006, already approaches 5,000µS/cm. The modelling analysis for the proposed minor works modification combines the beneficial outcomes from the treatment and power plant reuse of Springvale mine water from LPT009 with the adverse saline discharge from LTP006, to predict favourable cumulative downstream flows and salinity outcomes. While the cumulative assessment for this modification proposal is done for the downstream environment, the cumulative water input flows and salinity assessment is not done *for* the project area. This selective cumulative modelling assessment of the proposed modification creates an unreasonably favourable outcome that cannot eventuate as saline inputs from the ash and REA waste emplacements are omitted from the model. Statement of Environmental Effects (SEE) does not recognise the need to treat the toxic water discharging from LDP006 in any way whatsoever, even though there is recognition of its saline nature this is downplayed. This salinity problem will be magnified by the already approved Reject Emplacement Area and extensions of the ash emplacement on this porous landscape. The SEE does not appropriately respond to or even identify these overlapping environmental problems – as depicted on *Figure 1* on the following page. Groundwater contamination also may be increased by establishment of a municipal waste heap if there is a failure in the heap liner as will be discussed. The modelling assessment admits that mine water from old underground mine workings will find its way to LPT006 through Cooks Dam to Wangcol Creek (see *Figure 3 modelling schematic*) but ignores the large non-point groundwater discharges from the project area (see *additional Figure A* at the end of this submission).	
	2. Deposition of water treatment plant residuals The consent must require selective emplacement of contaminated residual materials from the water treatment plant. There is no evidence in the SEE that the salinity from residuals will be closer to the raw mine water feed than laboratory bench top 'jar test' data of the residual materials. This assertion is based on heavy treatment of these liquid residual materials to render it environmentally inert. The treatment assertion will be swamped by the cumulative leachate contributions to groundwater from the ash and coal reject emplacement that will occur in with the residual emplacement area (see Figure 1, and addition figures B and C at end of this submission). These combined contributions will result in increasingly high contamination levels in Cooks Dam and Wangcol Creek via LDP006. These leachate contributions will also increase salinity of uncontrolled groundwater contamination of Wangcol Creek (see additional figure A). The placement of water treatment residuals in the existing ash emplacement area is restricted. The brine conditioned ash is placed above the water conditioned ash, but this practice does not appear to be a consideration in the proposed modification in relation to combined REA/ash emplacement. The SEE states that 'the water balance modelling predicts an increase in the volume of water discharged through LDP006 as a result of the increased load on the SCSS water management system due the residuals transfer.' The saline load on Wangcol Creek must increase as LPT006 receives discharges from three types of waste. The effect of mixing leachate from coal reject, ash emplacement and the water treatment plant residuals is possibly synergistic but not considered by the SEE. The proposed cancellation of this increase through separation of clean surface water will not eventuate for reasons that will outlined in the following section.	

Special Interest Group	Issue	Section Reference
	3. Clean and dirty water flows from the project area The claim of clean water diversion flows as described on page 23 of SEE is unconvincing. Lamberts Gully is the main feature of the "clean catchment" and it contains an old rehabilitated open cut coal mine. The Retention Pond where the clean area diversion water collects has an EC of 1146 µS/cm (Table 5-4, Appendix D, Vol 2), which is nothing like clean background surface water. It is not clean water and the proposed measures are unlikely to significantly improve the quality of water in the Retention Pond due to the presence of decant water from the Co-disposal Area and runoff from the old Lamberts Gully open cut area. Figure 5-2, Appendix D of Volume 2 shows the clean water diversion includes the main sediment dam (also known as the Conveyor Dam). Figure 5-2 shows the clean/rehabilitated catchment diverted from LDP006 catchment receives water from the main sediment dam that sometimes can be too dirty to discharge. Sediment settling appears to be the only purpose of the "clean water" diversion, as the runoff is saline, but not nearly as saline as Cooks Dam. 4 The lower part of the proposed "clean" catchment surrounds appears to be separated from the Co-disposal REA. This REA is described in the text on page 28 as having six cells. The two eastern cells are described as holding decant water, however *figure 3* shows decant water from these cells going to LDP006. The Co-disposal REA is not separate from the clean area. The decant water discharges/reports to the Retention Dam and mixes with the clean water in the Retention Dam downslope of the two ponds. These flows contaminate and compromise the purpose of the clean catchment separation. Further, as discharge from the "clean" catchment then flows into and mixes with the LDP006 discharge, so the purpose of clean catchment separation is defeated at the discharge point. The minimisation of the moderately contaminated water collected in the Retention Dam must be adequately treated. The proposed water treatment plant could treat this water as it is only moderately contaminated. Without treatment the proposed clean/rehabilitated catchment separation is unable to provide any significant environmental gain in water quality. If the water quality of discharges from the separated clean/rehabilitated catchment markedly declines, then it should be collected with LDP006 discharges and treated in a specific purpose water treatment facility as discussed in the previous section.	
	4. The Approved Municipal Waste Emplacement Area should never be developed Lithgow's approved municipal waste emplacement area overlies shallow mine workings. The coal pillars of these old workings are unlikely to support the additional loads arising from of this large waste heap and movement of heavy machinery over it. Collapse of the pillars or the bord areas is a likely contingency as it regularly happens in areas of shallow mine workings that are not subject to additional loadings. Subsidence events must compromise any liner places under the metropolitan waste heap leading to groundwater contamination. In these circumstances where the approved municipal waste heap cannot be sealed from groundwater when sitting over old and perhaps unstable underground workings, suggests that the site needs to be reconsidered. The toxic mine waters and ash heap leachate may then combine with rubbish heap leachate in a shallow groundwater aquifer that (from the groundwater salinity data above) already reports to Wangcol Creek. Placing municipal waste on land subject to mine subsidence at the head of the Coxs River catchment is highly inappropriate. 7 Municipal waste dump development also will replace a large part of the "Lamberts Gully Rehabilitation offset areas" (see additional figure D). Loss of this	

Special Interest Group	Issue	Section Reference
	offset appears not to be accommodated by further offsets, and is a poor practise, as ecosystems can't be traded as commodities without unexpected ecological outcomes. The municipal waste emplacement must not proceed in such an inappropriate area that risks contaminating Sydney's drinking water supplies with such a potentially nasty toxic cocktail. The EPA and DPE should work with Lithgow Council and the community to identify locations for waste facilities that are not located on highly inappropriate porous ground.	
	5. Rehabilitate Kerosene Vale Stockpile Area The Kerosene Vale Stockpile Area should be outside the mine operations envelope for Centennial Coal's mines now that Wallerawang Power Plant is being rehabilitated. This stockpile site is now unnecessary. The stockpile area is located near the village of Lidsdale and generates contaminated runoff that can be avoided. The use of this stockpile area will require truck haulage, and adversely affect air quality at Lidsdale and also annoy people with truck movements. There is no necessity to create a very large stockpile of coal next to Lidsdale and if the municipal waste emplacement area does not proceed, as the coal stockpile could go there instead. This would avoid expensive and unnecessary double handling and truck movements. The Kerosene Vale Stockpile Area should be rehabilitated and planted with native species of local provenance.	

2.2.3. Submissions from Members of the Community

Only one submission from the community was received. Comments noted in this submission are included in **Table 3.**

Table 3 – Summary of Comments in Submissions from Members of the Community

Submitter & ID	Comment	Section Reference
Julie Flavell (ID 177213)	Whilst finally we have encouraging direction with this initiative with remediation of long standing concern with mining discharge water into Coxs River it will in its present form fail our communities, our waterways with the remaining discharge from LDP006. Whilst I support the concept I cannot support it in its current form. If we are to secure and maintain healthy waterways into the future then it is recommended that the discharge from LDP006 which has a consistent historic reading of over 4000 µS/cm be included to the proposed pipeline to Mt Piper. "The assessment admits that mine water from old underground workings will find its way to LDP006 through Cooks Dam to Wangcol Creek as groundwater, but then does not recognise the need to treat this toxic water in any way whatsoever". All industries with government leading by example with any discharge into any waterway will equal natural background levels. Equally of concern for this entire area regarding leaching from Mt Piper ash repository. The area has been acknowledged for many years as a high cumulative impact zone, with recognised toxic discharge, emissions and pollutants with millions of tonnes of coal in 2 locations, those being Mt Piper and Western Coal Services, noise, disruption to communities, loss of lifestyle, and destruction to highly sensitive natural areas, polluted waterways. Add to the mix displacement of people and loss of a community with the bulldozing of the village of Blackmans Flat. This community has paid a high price and now it is time to have an	Noted.

Submitter & ID	Comment	Section Reference
	inclusive and holistic approach to ensure that not only this rea but the entire Lithgow be respected and given its dues. To date the determinations have not been inclusive and have only considered part of the mix which has been well document on jobs and growth. Having said this one has to look overall at those recommendations of jobs and growth. Historically I acknowledge Lithgow's coal mining has been the backbone for continuity for its survival as a City producing billions upon billions of dollars with distribution local, national and international. But, I look at this beautiful city and it is in decline it cannot be ignored. Many business owners have commented why is Lithgow in decline when other areas are flourishing increasing in population. Add to the mix of insecurity felt by this community with the privatisation of both power and coal industries as common sense tells us that if those industries do not meet their target profits they will walks away. Future planning with diversification will secure this great city as it so deserves from its government given the historic contribution it has made. Secure its entitlement ensuring that if those major industries walk away we have other future viable sustainable options.	

3.0 RESPONSE TO SUBMISSIONS

3.1. Responses to Government Agency Submissions

The majority of responses to submissions are included in **Appendix A**. References to sections where the submissions have been addressed in **Appendix A** are provided below.

3.1.1. Department of Planning and Environment

Issue

Emplacing the pre-treatment process residual waste could increase the LDP006 daily discharge rate. The increased discharge is modelled on an annual average basis. Please provide details on the maximum increase in discharge, and what effect this maximum would have on the receiving environment.

Response

Refer to Section 4.1 of **Appendix A**.

Issue

The pre-treatment residual material would contain a range of metals. It is unclear in the SEE what the sequencing of emplacement would be and how the emplacement would be managed to limit the risks associated with shallow groundwater resources. Please provide further details on how the risks of this impact would be minimised.

Response

Refer to Section 4.2 of **Appendix A**.

Additionally, it is noted that increased groundwater monitoring is to be undertaken on groundwater bores at a number of strategic locations to identify sources of EC and surface to groundwater interactions at the SCSS. Each of the groundwater bores will have monitoring equipment installed that will continuously gauge both level and EC at a time-step less than one day. Monitoring historically is undertaken weekly which does not cover the response speed expected between surface and groundwater. The Statement of Commitments (**Chapter 4.0**) has been updated to include this commitment.

Issue

Clean water diversions are currently being installed at the site, with the most significant works relating to the diversion of clean water overflows from Retention Dam away from LDP006. Please provide details on the proposed drainage path of the overflows, detail the timing of installation of all clean water works, and how these works would contribute to improvements to water quality impacts.

Response

Refer to Section 4.3 of **Appendix A**.

3.1.2. Environment Protection Authority

Issue

The EPA welcomes the construction of SWTP and the beneficial outcomes to water quality. However, the EPA does not support the transfer and disposal of SWTP water in a liquid state to the SCSS – REA that will result in water with an elevated EC (2500 µS/cm) contributing to an increased daily rate of discharge in the order of 0.3 – 0.5 ML/day from LDP006. Allowing a discharge of up to 0.5 ML/day of mine water back to the Coxs River (via an increased discharge at LDP6 into Neubecks Creek (sic), is counter to the intent of the SWTP.

The EPA acknowledges that the residuals material will be decanted from the REA and managed in accordance with the current water management practices at SCSS. The EPA requests that options to dewater the residuals on site at MPPS treatment facility or the SCSS prior to disposal at the REA as a solid waste be considered. Following disposal as a solid waste placement, the material could be managed to restrict influx of rainfall and the subsequent generation of leachate.

Response

Refer to Section 3 of **Appendix A**.

Issue

MOD 1 predicts that the annual disposal of 157 ML (approximately 10 kL at a time) of residuals from the SWTP will result in the annual average discharge increasing from 441 ML to 570 ML; while this is a reduction in the current annual average of 848 ML, and this is dependent on the success of the clean water diversion, the disposal of residuals still results in a predicted discharge of 129 ML (with an estimated EC of 2500 µS/cm) annually from LDP006.

Response

Springvale Coal accepts the emplacement of residuals in the REA at the SCSS will result in predicted discharge of 129 ML annually from LDP006 and a salt load of 337 tonnes/year. Whilst these predictions provide no benefit to the receiving environment, potential impacts will only be realised upstream from the Coxs River and Sawyers Swamp Creek confluence, and in reality will have less potential for impact during the typical operation of the Springvale WTP. It is considered appropriate to assess the impacts of residuals management at the SCSS in the context of the overall SWTP and the associated overall benefits to the Coxs River catchment through cessation of untreated mine water from Springvale Mine's LDP009.

Additionally, it is emphasised the typical volume of residuals transferred from the Springvale WTP is anticipated to be closer to 0.16 - 0.35 ML/day than the maximum 0.43 ML/day transfer rate assessed in the Water Resources Impact Assessment (GHD, 2016) supporting the WCS Modification 1. Therefore, the predicted impacts of the residual transfer on the salt outputs from the SCSS via LDP0006 discharges should be considered as conservative, upper-limit estimates. This is also the case for predicted residuals electrical conductivity (EC) which is anticipated to be closer to the current LDP009 EC (mean EC of 1170 µS/cm) rather than the 2,500 µS/cm EC assessed.

Issue

The EPA is seeking clarification on the exact location proposed for disposal of the residuals. Figure 5 of the main report titled 'Springvale Coal Services Site Infrastructure' shows the Co-disposal REA located near the main entrance on the eastern side of the site. Whereas Figure 11 of the main report titled 'Residuals Transfer Pipeline at Springvale Coal Services Site' shows the Residuals Transfer Pipeline terminating at the REA located on the southern boundary of the site.

Response

The proposed Residuals Transfer Pipeline from the water treatment plant at MPPS will terminate within the new REA at the SCSS, as shown in Figure 10 and Figure 11 of the SEE. The residuals will be emplaced within the new REA, as discussed in Section 4.2.7 of the SEE.

The Co-disposal REA at the SCSS, shown in Figure 5 of the SEE, will not be used for the emplacement of the residuals from the Springvale WTP. As discussed in Section 3.3.7 of the SEE the Co-disposal REA is being progressively rehabilitated.

Issue

In the event that the project is approved, and a decision is made on the most suitable form to dispose the waste into the RE, the licensee will be required to formally classify the waste as per the EPA guidelines, and apply for a licence variation to permit the receival of waste from off site.

Response

Springvale Coal confirms that it will apply for a licence variation to permit receival of residuals (following formal classification of residuals waste as per the EPA guidelines) if the proposed modification is approved. The revised Statement of Commitments (**Chapter 4.0**) has been updated to include this commitment.

3.1.3. WaterNSW

Issue

WaterNSW has reviewed the SEE and notes that the salt and water balance modelling results predict an adverse environmental impact along Wangcol Creek due to increase in salinity as a result of the proposed residuals material transfer and emplacement at the Springvale Coal Services Site (SCSS). This indicates that the proposed modification would not have a neutral or beneficial effect on water quality in Wangcol Creek.

Response

Refer to Section 2.1 of **Appendix A**.

Issue

The SEE states that the increased EC is primarily due to increased salt load on Cooks Dam (EC within Cooks Dam - median 3273 µS/cm and can be as high as 4460 µS/cm) which is higher than the assumed of 2500 µS/cm for residuals material stream. WaterNSW notes that water from the Rejects Emplacement Area is pumped to Cooks Dam (see Vol. 1, Page 29, Section 3.3.9.3). WaterNSW considers that this may be the reason for high salinity and water levels in Cooks Dam and appropriate mitigation measures should be adopted to rectify this issue.

Response

Refer to Section 2.2 of **Appendix A**.

Issue

Appendix D, Page 39, Section 5.1.1 and Figure 5-3 states discharges from LDP006 range from 0-14 ML/day. While salinity loads for average annual discharges have been estimated, salinity loads and consequences for higher end of discharges are not estimated. WaterNSW considers these should be estimated and impacts on Wangcol Creek assessed.

Response

Refer to Section 2.3 of **Appendix A**.

Issue

Clarification is required on the timeframe when the clean water diversions at the SCSS would be installed, monitoring completed and salt and water modelling results validated for future conditions. WaterNSW requests that the modelling validation results be provided to agencies.

Response

Refer to Section 2.4 of **Appendix A**.

Water quality and flow monitoring will be implemented on the proposed clean water diversion works. The monitoring data will be required to monitor the effectiveness of the clean water diversions installed. The Statement of Commitments (**Chapter 4.0**) has been updated to include this commitment.

3.2. Responses to Submissions from Special Interest Groups

3.2.1. Blue Mountains Conservation Society

Issue

Clean and dirty water – requirements, implications and desirable outcomes

Response

Refer to Section 4.4.1 of **Appendix A**.

Issue

Modelling Deficiencies

Response

Refer to Section 4.4.2 of **Appendix A**.

3.2.2. Colong Foundation for Wilderness

Issue

Modelling omits cumulative impacts located within the project area

Response

Refer to Section 4.5.1 of **Appendix A**.

Issue

Treatment of LDP006 discharges

Response

Refer to Section 4.5.2 of **Appendix A**.

Issue

Deposition of water treatment plant residuals

Response

Refer to Section 4.5.3 of **Appendix A**.

Issue

Clean and dirty water flows from the project area

Response

Refer to Section 4.5.4 of **Appendix A**.

Issue

Groundwater environment

Response

Refer to Section 4.5.5 of **Appendix A**.

Issue

The Approved Municipal Waste Emplacement Area should never be developed

Response

The Lithgow City Council's Municipal Waste Emplacement Area approved within the SCSS does not form part of this modification.

Issue

Rehabilitate Kerosene Vale Stockpile Area

Response

No proposed modification elements involve any works within the Kerosene Vale Stockpile Area. This area is approved under SSD 5579 for the storage of 500,000 tonnes of coal, if the coal storage capacity at the SCSS is exceeded. The area will be accessed via the approved Link Haul Road linking the SCSS and Mount Piper Haul Road, once the Link Haul Road is constructed. The air quality impacts for the track haulage of coal from the SCSS and the Kerosene Vale Stockpile Area were assessed and approved in the Western Coal Services *Environmental Impact Assessment* (WCS EIS) (RPS, 2013). Similarly, the potential noise impacts of truck haulage were assessed and approved in the WCS EIS.

4.0 REVISED STATEMENT OF COMMITMENTS

A revised Statement of Commitments for the modification has been provided in **Table 4.** The new commitments that have been included are shown in red.

Table 4 – Revised Statement of Commitments

Desired Outcome	**Action**
1. General	
Undertake all operations in a manner that will minimise the environmental impacts associated with the operation of Springvale Mine.	Operations will be undertaken in accordance with operations approved in the Western Coal Services Project (SSD 5579) as modified, and the Mining Operations Plan. Springvale Coal will apply for a variation to EPL 3607 to permit receival of residuals at the Springvale Coal Services Site.
2. Hours of Operation	
Undertake all operations within the approved operating hours.	Springvale Coal Services Site: 24 hours per day, 7 days per week Kerosene Vale Stockpile Area: Day period only (7 am – 6 pm) Mount Piper Haul Road: No operations during adverse meteorological conditions during the night period (10 pm – 7 am) Wallerawang Haul Road: No operations during the night period (10 pm – 7 am).
3. Groundwater and Surface Water Resources	
All surface water, groundwater and aquatic impacts are minimised to the greatest extent possible.	The surface and groundwater management and monitoring will be managed in accordance with the site's *Water Management Plan*. The *Water Management Plan* will updated to include the following monitoring. • Water quality and flow monitoring will be implemented on the proposed clean water diversions works. • A select number of existing groundwater bores will be retrofitted with monitoring equipment that will continuously gauge both level and electrical conductivity at a time-step less than one day. Springvale Coal will continue to implement measures to optimise the clean and surface water separation at Springvale Coal Services Site, and reduce flows and improve water quality through LDP006 as much as practicable. The establishment of all proposed clean water diversions within the Lamberts Gully catchment within the Springvale Coal Services Site will be completed in 2019 prior to the commencement of the Springvale Water Treatment Project (SSD 7592).
4. Rehabilitation	The *Rehabilitation and Closure Plan* will be updated with the proposed changes to the Project's decommissioning and rehabilitation strategy.

5.0 ADDITIONAL CONSULTATION

A meeting was held with the EPA on 15 February 2017 to discuss the outcomes of the Water Resources Impact Assessment (GHD, 2016) supporting the modification application and EPA's submission on the SEE.

6.0 REFERENCES

Centennial Coal (2016), *Western Coal Services Project: Modification 1*, Centennial Coal Company Limited, November 2016.

GHD (2016), *Water Resources Impact Assessment: Western Coal Services Project Modification 1*, GHD Pty Ltd, November 2016.

RPS (2013), *Western Coal Services Project: Environmental Impact Statement*, RPS Australia East Pty Ltd, July 2013.

APPENDIX A

Additional Responses to Submissions and Technical Advice

Letter Report from GHD Pty Ltd

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27 February 2017

Nagindar Singh
Environmental Projects Coordinator - West
Centennial Coal Company Limited
1384 Castlereagh Highway
LIDSDALE NSW 2790

Our ref:	22/18193 114045
Your ref:	

Dear Nagindar

Western Coal Services Modification 1
Response to submissions

1 Introduction

As part of the public exhibition of the Statement of Environmental Effects for the Western Coal Services Modification 1 Project (the Project), a number of submissions were made by government agencies and the public. This letter provides background on responses to the submissions for consideration by Springvale Coal Pty Limited (Springvale Coal).

It is noted the Project addresses operational interactions of the proposed Springvale Water Treatment Project (SWTP) (SSD 7592) with the Western Coal Services Project (SSD 5579), namely the transfer of residuals from the proposed water treatment plant in the SWTP for emplacement within the new Reject Emplacement Area (REA) at the Springvale Coal Services Site (SCSS).

2 WaterNSW

Three points of clarification are included within the submissions made by WaterNSW which have been discussed in the sections below. WaterNSW indicates that there is unlikely to be any water quality benefit to Wangcol Creek when the Project is compared to neutral or beneficial effect (NorBE) principles. These have been outlined within not only the Project impact assessment information but also all permutations of the SWTP impact assessments. These assessments considered a number of options to discharge surplus treated mine water to:

- Mount Piper Power Station (MPPS) as cooling water.
- Wangcol Creek.
- Thompsons Creek Reservoir for storage and subsequent reuse at MPPS.

These assessments are available at the Department of Planning and Environment’s website.

2.1 Neutral or beneficial effect

The SWTP is proposed to be developed to improve the quality of mine water discharges in the upper Coxs River catchment. The SWTP is achieving a benefit to the catchment through provision of a high level of treatment and eliminating discharges from Springvale Mine's LDP009, as required by Schedule 4 Condition 12 of Springvale Mine's development consent (SSD 5594).

The residuals management process is an essential component of the treatment process adopted as part of the SWTP and is required to realise the overall environmental benefits for the catchment.

The Water Resources Impact Assessment (GHD 2016a) supporting the SEE for the Project details modelling to predict the impact of residuals on the operation of the existing SCSS's water management system and has assessed the potential impacts upon the immediate receiving waters in Wangcol Creek and on a regional scale within the Coxs River catchment. The modelling used conservative assumptions in terms of both the residuals salinity concentration (2,500 µS/cm) and residuals volume (maximum 0.43 ML/day) and concluded that the environmental consequences (i.e. geomorphology and aquatic ecology/macroinvertebrate ecology) on receiving waters is considered negligible (i.e. not measurable).

The assumed residuals salinity in the water and salt balance modelling (GHD 2016b) was based on limited jar testing results reported by Hunter Water Australia (now Hunter H2O). As noted in Section 6.3.2 of GHD (2016a), it is unlikely that the raw mine water from LDP009 discharges will result in residuals with an electrical conductivity (EC) as high as 2,500 µS/cm. It is more likely, based on the results from the Newstan Colliery Water Treatment Plant case study, discussed in detail in Section 6.2 of GHD (2016a), that the EC of the residuals to be emplaced at the SCSS REA will be closer to the raw mine water feed to the water treatment plant in the SWTP. The raw mine water discharges from LDP009 has a median EC of 1,170 µS/cm. As a comparison, the EC of the raw mine water feed at the Newstan Colliery Water Treatment Plant was measured at 2,400 µS/cm on 23 September 2016 and the EC of the resulting residuals material from that water treatment plant was 2,500 µS/cm. This represents a variation of less than 5% increase in salinity of the raw mine water feed that was found to be due to the pre-treatment or the clarification process. The EC of the residuals transferred from the SWTP is more likely to fall within the range 1,100 to 1,200 µS/cm. Furthermore, the typical volume of residuals transferred from the SWTP is anticipated to be closer to 0.16 – 0.35 ML/day (refer Section 3.2) than the maximum 0.43 ML/day transfer rate assessed in GHD (2016a). Therefore, the predicted impacts of the residual transfer on the salt outputs from the SCSS via LDP0006 discharges should be considered as conservative, upper-limit estimates.

The methodology adopted for the water and salt balance (using GoldSim version 11.1), as discussed in Section 4.2.1 of the Water Resources Impact Assessment (GHD, 2016a), used 127 years of historical rainfall data between January 1889 to December 2015. The GoldSim model simulated conditions for the SCSS from current conditions in 2016 to 2020 (inclusive) using daily time steps. Daily time steps were used for the modelling because daily rainfall data was the shortest period of data available and changes in operational conditions are typically made on a daily (or shorter) basis.

To assess the impact of rainfall on SCSS, the water and salt balance modelling was undertaken by applying 127 different rainfall patterns over the simulation timeline. To complete this, the simulation timeline was modelled for 127 'realisations', where each realisation represented a single model run from 2016 to 2020. The only variation between realisations was that each realisation modelled a different continuous historical rainfall pattern.

The use of realisations allows for cumulative probability distributions to be prepared to indicate the spread of results against likelihoods for existing, future and proposed scenarios.

For salt balance components, the use of EC inputs for various water cycle components was required as an initial condition. This was then updated as a result of the model iterations resulting in the predictions presented. For example, the underground EC for the site was an input as a starting 6,000 µS/cm, which was determined from the review of groundwater monitoring information.

Predicted salt loads from the water and salt balance are presented in Figure 2-1 for each scenario considered by GHD (2016a). Figure 2-1 presents salt loads as a cumulative probability distribution, where the probability of not exceeding certain salt loads is presented.

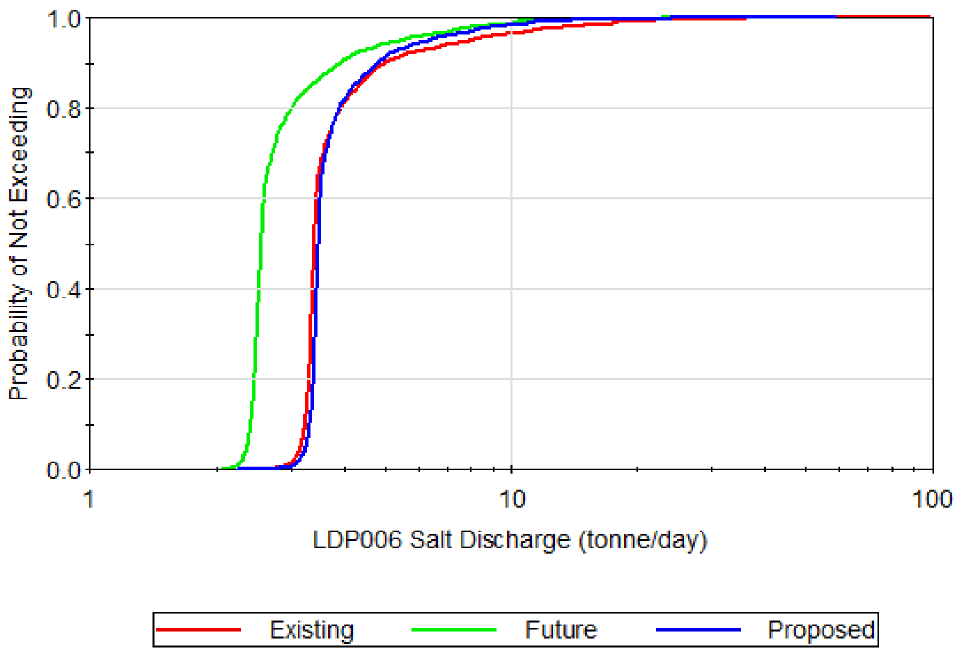

Figure 2-1 Cumulative probability distribution – LDP006 salt load

Figure 2-1 indicates that the salt load between the existing and proposed modelled scenario to be comparable, specifically in the rarest of occasions, with the proposed scenario likely to result in a salt load slightly less than the existing case. In terms of the numeric results at specific percentiles, these are provided in Table 2-1 below.

Table 2-1 Cumulative probability distribution – LDP006 salt load

Probability of not exceeding	Existing scenario	Future scenario	Proposed scenario
10%	2.7 t/day	2.1 t/day	2.6 t/day
50%	3.4 t/day	2.6 t/day	3.5 t/day
95%	7.9 t/day	5.4 t/day	6.3 t/day

Whilst predicted salt loads by GHD (2016a) have indicated no benefit to the receiving environment, potential impacts will only be realised upstream from the Coxs River and Sawyers Swamp Creek confluence and in reality will have less potential for impact during the typical operation of the SWTP. It is considered appropriate to assess the impacts of residuals management at the SCSS in the context of the overall SWTP and the associated overall benefits to the Coxs River catchment.

2.2 Reject emplacement area water management

The management of water captured within the new REA is undertaken primarily through dewatering to A-Pit REA. However losses also occur through evaporation or infiltration. In addition to volumes transferred to A-Pit REA, water is further managed with dewatering pumps to Cooks Dam where water again can also evaporate or infiltrate (GHD, 2016b).

The REA facilities at SCSS have been developed as unlined storages and hence are likely each to have some connectivity to the shallow groundwater environment. To mitigate the connectivity between the REAs and the shallow groundwater environment the use of coarse coal rejects around the emplacement area perimeters and the deposition of fine coal rejects in the centre has been undertaken historically. This emplacement methodology continues to be utilised in the new REA. Adopting this approach seeks to form a reduced hydraulic conductivity of the emplacement area with the shallow groundwater, as over time the coarse coal reject material voids are filled with fine coal slurry and material consolidation occurs.

REA infiltration will inevitably migrate to Cooks Dam, as Cooks Dam is the lowest point above the Lithgow Seam. The submission’s conclusion that the water quality within Cooks Dam is likely influenced by the REA is correct. Further assessment of groundwater pathways have been undertaken and are ongoing. These pathways are to be validated by continuous groundwater monitoring discussed further below.

There is a cyclic relationship behind water sourced for washing from Cooks Dam and the disposing of reject material within the REA, with pathways of water back to Cooks Dam. This cycle is likely to result in some concentrating effects; however, groundwater quality data indicates other areas of high EC water are influencing water quality in the locality. Figure 2-2 presents the EC from the groundwater environment presented by GHD in the impact assessment for the SWTP (GHD 2016c).

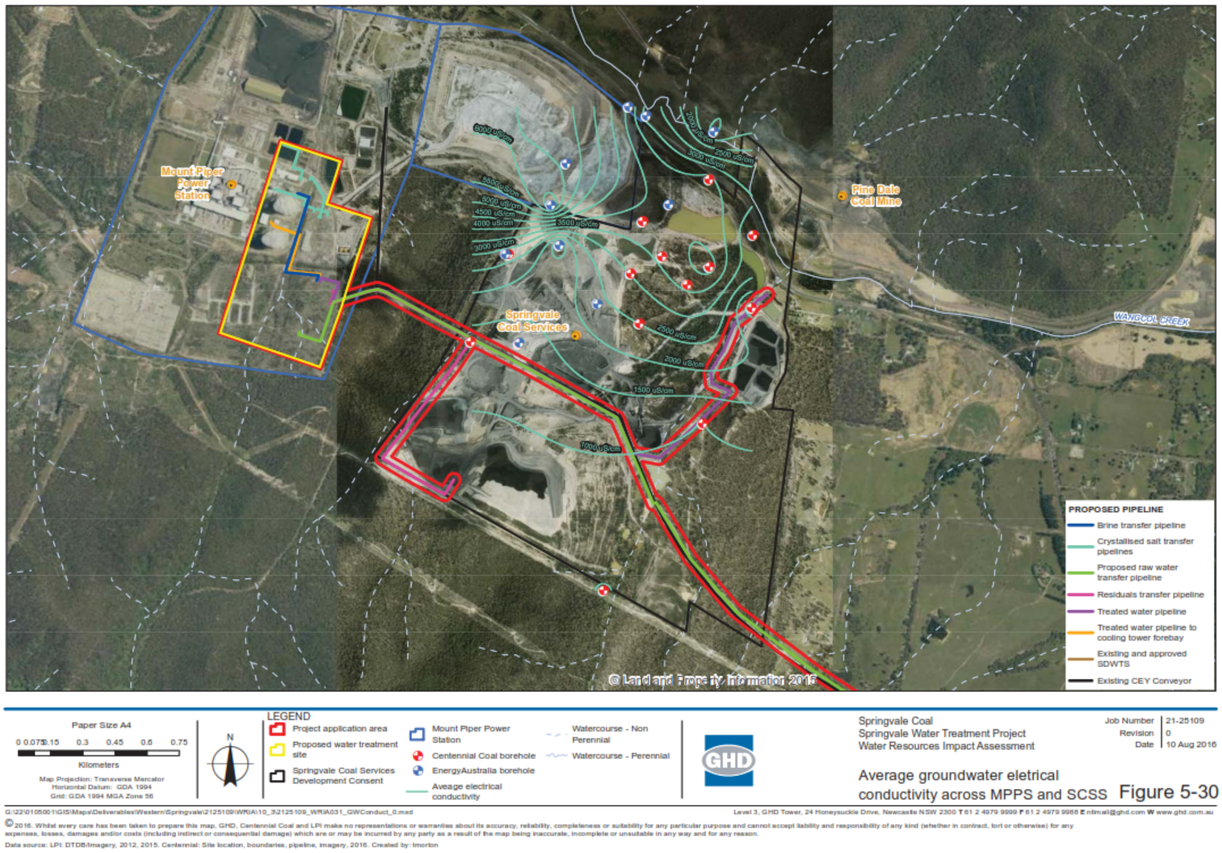

Figure 2-2 Baseline monitoring of EC in shallow groundwater environment (GHDa 2016)

A potential mitigation measure to cease infiltration function from occurring would include lining of surface infrastructure at the SCSS, including the new REA and A-Pit REA. However, the majority of the surface infrastructure at the SCSS are already operational and retrospectively lining would be impractical and inefficient considering the extent of surface to groundwater connectivity known to exist.

In order to understand the dynamic nature of the shallow groundwater environment across SCSS, the installation of continuous logging level and EC monitoring is to be implemented at a number of existing groundwater bores in 2017. These locations are strategic such that pathways and assumptions can be confirmed. This is following on from geophysical survey works undertaken by specialist contractors to further understand the primary pathways and quality of groundwater present within the shallow groundwater environment.

2.3 Loads and consequences for higher end discharges

Figure 5-3 in GHD (2016a) appended as Appendix D to the Project Statement of Environmental Effects, presented the historical daily discharge volumes from LDP006. This indicated a number of peaks over the previous two years where discharges from LDP006 at the SCSS have been close to 14 ML/day. These discharge volumes are for the existing conditions which consider a large portion of catchment from Lamberts Gully which is proposed to be diverted away from LDP006 as part of the future and proposed conditions.

The discharge predictions from the water balance model indicate a clear separation of discharge volumes from events of 95% probability of not exceeding. Beyond 95% probability of not exceeding the effects of catchment contribution to LDP006 become more significant with results at probabilities of 99% indicating an existing discharge of 28.7 ML/day compared with a future and proposed conditions indicating a 4.6 and 4.9 ML/day results respectively. For the purposes of this discussion, high end discharges will be defined for probabilities of not exceeding greater than 95%.

In response to requests to assess the salt loads in the most extreme (rare) of discharge events, probability of daily salt loads have been provided in Figure 2-1 and numerically in Table 2-1 within Section 2.1, modelled as part of the water and salt balance assessment (GHD, 2016a). The predictions indicate that in rare events, the daily salt loads reduce for proposed conditions compared to existing conditions. Considering a daily salt load of 10 tonnes/day the probability of not exceeding this load for the proposed conditions were predicted to be 99% of days compared to the existing conditions, which were predicted not to occur within 97% of days.

The relationship for predictions of daily salt loads through LDP006, generally followed similar results to that of the cumulative probability distribution for predicted daily flows (refer Figure 4-1 in Section 4.1) with an increase in salt load corresponding with increased discharge from LDP006.

As discussed in Section 6.7.1 of GHD (2016a) the Water Resources Impact Assessment assessed salt concentrations in the receiving environment rather than loads as the environmental harm thresholds are well defined.

With the diversion of clean water away from LDP006 (the future scenario), modelling results indicate that salt load will reduce between probabilities of 0% and 90% as flow volume through LDP006 is typically less. The proposed scenario indicates similarities with the existing conditions with the introduction of residuals, whilst not being as significant in volume, the proposed scenario does result in an increased EC being discharged from Cooks Dam. This occurs as a result of the higher EC (median EC of 3,273 µS/cm) already being present within Cooks Dam compared to the residual flow EC (2,500 µS/cm) This was noted and discussed in Section 6.7.2 of GHD (2016a).

Slight separation between the existing and proposed scenario are observed in results greater than 90% probability, where proposed scenario has a higher salt load than the existing scenario due to the constant residual flow.

It should be noted that the implementation of the clean water diversions proposed as part of the future conditions will improve water management and in turn water quality from events that historically would have created discharges in the order of 14 ML/day.

In the review of recent LDP006 discharge data, EC since July 2016 has reduced from a high of approximately 5,000 µS/cm.

2.4 Timeframes for clean-water diversions and validation monitoring

Springvale Coal committed in the Western Coal Services Project to complete the separation of clean and dirty water at the SCSS within five years from the date the development consent SSD 5579 (04 April 2019) was granted. The separation works were commenced in mid-2016 during the establishment of the new REA described in Section 5.1.3 of GHD (2016a). The separation works completed at that time included:

- Diversion of upstream catchment of Huon Gully around the new REA to enable clean water flows down Huon Gully
- Modifications to the A-Pit REA to serve as the sediment pond for the new REA by receiving tailings return water
- Establishing a pumping system for the transfer of tailings water from the A-Pit REA to Cooks Dam.

The existing surface water catchments and diversions are shown in Figure 5-2 of GHD (2016a). As described in Section 5.1.1 of GHD (2016a) (and Section 3.3.9.1 of the Statement of Environmental Effects) Springvale Coal are currently undertaking additional diversion works at SCSS, this time relating to the separation and optimisation of clean and dirty surface water flow paths within the Lamberts Gully catchment. The clean water from Huon Gully catchment will be pumped away from SHG1 to the Lamberts Gully catchment to the west to minimise infiltration into the groundwater system. The concept designs of the diversions works have been completed and are attached (Attachment A). Detailed design works are currently being undertaken using survey and LIDAR data from the site. It is anticipated that these current design works will result in minor alignment changes to the diversions structures for improved dirty and clean water flow paths at the site.

Construction of the diversion works is proposed to be staged, with the Stage 1 works expected to be completed in 2017 and the second and final Stage 2 works to be completed in 2019.

As part of revisions to the water management plan to be undertaken following approval of the proposed modification and as required by Schedule 5 Condition 5 of SSD 5579, water quality and flow monitoring will be implemented on the proposed clean water diversion works. The monitoring data will be required to monitor the effectiveness of the clean water diversions installed.

3 EPA NSW

3.1 Options assessment

EPA NSW provided a submission on the Project requiring options to be considered for the management of residuals within SCSS and at MPPS. A number of options were considered in the development of the SWTP, and the liquid residuals transfer scheme was considered the optimum solution resulting in minimal environmental and operational constraints. Mine water inflows to the water treatment plant at MPPS have variable levels of total suspended solids (TSS) and are typically around 30 mg/L, however TSS can spike towards 615 mg/L (sample taken from Bore 8, 5 May 2015) following long wall moves or seismic events.

Alternatives for management of residuals were considered during the development of the SWTP. Each alternative involved transfer and disposal to the REA at the Springvale Coal Services Site (SCSS) located approximately 1.5 km from the proposed water treatment plant at MPPS. The sub-sections below provide justifications on why these options were considered unfeasible, and hence rejected, when compared to the base case, being the transfer of liquid residuals to the new REA at SCSS.

3.1.1 Overview

The residuals stream arises from the removal of solids from the raw mine water as part of the pre-treatment process at the water treatment plant and is required to allow the effective operation of the reverse osmosis desalination units. The residuals will have a dry solids content of around 1.5% to 2% so will mostly be water with high levels of suspended solids that requires management outside the desalination process at the new water treatment plant.

The REA currently receives both coarse and fine rejects (tailings) from the coal washery with an approved capacity of 12.5 million m^3 representing 25 years operations in accordance with the Western Coal Services Project consent SSD 5579. The new REA at the SCSS is currently being used for the management of both the coarse and fine reject materials. The coarse rejects material is used to construct the emplacement area perimeters/batter slopes and the fine rejects, as a slurry, is sub-aerially deposited in the centre. The A-Pit REA is used as a sediment pond for the new REA. Water losses arise through evaporation and infiltration through the REAs to the shallow groundwater system. The shallow groundwater system migrates towards Cooks Dam and is either reused within the washery or released to Wangcol Creek via LDP006.

The current REAs (new REA and A-Pit) at SCSS are unlined and retrofitting with a liner may not be feasible as new REA is partially filled and the A-Pit is filled to capacity. The new REA is designed to allow the fine reject slurry to fill the void space in the ground and this will result in a progressive reduction in the hydraulic connection between the REA and the shallow groundwater environment and associated transfer volumes to Cooks Dam and LDP006.

Alternatives for residuals management included a liquid transfer system as currently proposed as part of the SWTP, dedicated sludge lagoons/drying beds, or use of mechanical dewatering systems to reduce the liquid content in the residuals stream in conjunction with the use of a polymer to produce a dewatered sludge prior to disposal to the new REA. A description of each alternative with the associated environmental and operational constraints is included below and summarised in Table 3-1.

Table 3-1 Residuals management alternatives

	Liquid transfer	Sludge lagoons/drying beds	Mechanical dewatering
Solids content by weight	1.5 to 2%	30 to 40%	10 to 25%
Infrastructure requirements	As proposed in Springvale Water Treatment Project EIS	Sludge lagoons and drying beds, supernatant return pipeline, transfer of dewatered sludge to REA.	Mechanical dewatering system, chemical storage and dosing facilities, residuals storage, centrate return pipeline, transfer of dewatered sludge to REA.
Transfer system	Residuals transfer pipeline as proposed in the Springvale Water Treatment Project EIS	Supernatant return pipeline, vehicle haulage or conveyor system for dewatered sludge	Centrate return pipeline, vehicle haulage or conveyor system for dewatered sludge
Environmental consequences	Base case	Slight reduction in discharge from LDP006 compared to base case Vegetation clearance, noise and dust impacts for sludge transfer system or additional heavy vehicle movements on public road.	Slight reduction in discharge from LDP006 compared to base case. Potential release of polymer to receiving waters; Vegetation clearance, noise and dust impacts for sludge transfer system or additional heavy vehicle movement on public road.
Site constraints	No significant site constraints	Significant site constraints due to available land and ground subsidence due to old mine workings	No significant site constraints
Capital estimate	Base case	Potential addition of $8 to $12 million capital cost	
Operational cost / GHG	Base case	Similar to base case	Higher energy consumption = higher operational cost and GHG

3.1.2 Liquid transfer to Springvale Coal Services Site

The base case adopted as part of the SWTP involves a liquid transfer scheme to the SCSS. The Project involves installation of a clarifier within the pre-treatment process at the water treatment plant for removal of suspended solids in the raw mine water feed, thickening the solids via a thickener process and discharge the solids to the residuals pipeline.

The residuals will have a dry solids content of around 1.5% to 2% which can be pumped as a liquid via the transfer pipeline for disposal at the SCSS REA. The 1,800 m pipeline will be predominantly located in disturbed areas following the alignment of the existing conveyor and boundary of the REA resulting in minimal environmental impacts during construction or operation of the residuals management system.

The residuals stream would be managed in accordance with the existing practices for fine rejects at the SCSS. Water quality for the residuals stream will be representative of raw mine water quality with the addition of ferric chloride dosing during the clarification process which was conservatively assessed to be up to 0.43 ML/day at EC of 2,500 µS/cm.

The level of treatment required for the raw mine water as part of the pre-treatment process is a function of the highly variable levels of suspended solid within the raw mine water. As noted above the TSS in raw mine water is typically around 30 mg/L, but is known to spike towards 615 mg/L following long wall moves or seismic events. The residuals stream will have a maximum volume of 0.43 ML/day during periods corresponding to treatment of peak mine water flows and high turbidity in the mine inflows. However, for the vast majority of the year (approximately 90%) the TSS of the mine inflows will be low, resulting in a considerably lower volume of residuals being transferred at an estimated 0.16 to 0.35 ML/day.

A maximum EC of 2,500 µS/cm was used in the assessment of the impact of the residuals transfer on the receiving environment in the Water Resources Impact Assessments for SWTP (GHD, 2016c) and the Project (GHD, 2016a). However, this EC result was based on a conservative jar testing result and the typically lower suspended solids in mine water inflows will result in a smaller incremental increase in salinity as part of the clarification process with a typical EC of 1,100 to 1,200 µS/cm predicted for the residuals stream.

The majority of the year the residuals transfer system will therefore fall well within the parameters of 0.43 ML/day at EC of 2,500 µS/cm included in the modelling to provide a conservative assessment of the potential impacts from the disposal of residuals.

The water and salt balance identified minor increases in salinity concentrations in the immediate receiving waters of Wangcol Creek. This is largely a function of the increased volume of water being managed within the SCSS and the existing very high salinity (~5,000 µS/cm) in the shallow groundwater system. The increase in salinity was only identified to occur in Wangcol Creek and Coxs River upstream of its inflow to Lake Wallace. In practice, the additional volume of water discharged through LDP006 will be considerably less than predicted in the modelling with a corresponding reduction in potential impacts to Wangcol Creek as shown in the supplementary modelling included in Attachment B and Section 3.3, which used the typical and lower operating volumes (0.15 to 0.35 ML/day) and EC (1,100 to 1,200 µS/cm) noted above.

It is also important to consider the minor detrimental effect to Wangcol Creek in the context of the overall improvements to catchment water quality achieved by the implementation of the SWTP. The modification to the Western Coal Services Project consent is only required to facilitate the management of residuals for implementation of the SWTP and therefore should not be considered in isolation from the overall development. The SWTP is effectively removing all mine water discharges to the Cox River catchment from Springvale Mine’s LDP009 for reuse within the MPPS. The residuals stream represents less than 0.5% of the total mine water inflows and is a necessary step in the treatment process for the SWTP which results in considerable overall benefits for the catchment.

3.1.3 Sludge lagoons/drying beds

A dedicated system of lined sludge lagoons/drying beds is a possible alternative for the management of the residuals from the SWTP. Such a system would consist of two sludge lagoons (to allow one to be taken offline for maintenance) for consolidation of the thickened sludge, followed by four drying beds (each sized for three months of consolidated sludge) to spread the thickened sludge for solar drying. The sludge lagoons/drying beds would be lined to minimise the risk of liquid migrating to the groundwater; and given favourable climate, is able to produce dried sludge of up to 30% to 40% solids by weight. During prolonged unfavourable climate condition, disposal of a more liquid sludge at 10% to 25% dried solids may be necessary.

The supernatant from the sludge lagoons would need to be returned to the new water treatment plant for treatment requiring additional pipeline infrastructure not already proposed. This will also result in additional treatment volume and brine production requiring management within the existing MPPS blowdown systems. The existing brine concentrators at MPPS are currently at capacity at peak treatment volumes and any additional load may require further refinement of the existing blowdown management processes.

The dewatered cake would be too thick to enable transfer to the REA within the proposed residuals pipeline and would require an alternate transport system to be developed utilising either a vehicle haulage or conveyor system. Removal of dewatered sludge from the drying beds is typically done manually with an excavator.

Establishing a direct haulage route or conveyor route would require considerable ground disturbance and clearance of native vegetation between the water treatment plant and the REA. A new haulage or conveyor system would also introduce the potential for further noise and dust impacts requiring active management and mitigation. Alternatively, the dewatered cake would require haulage via the public road network involving an additional two to four heavy vehicle movements per day.

Disadvantages of the sludge lagoons / drying beds approach are as follows.

- Considerable area is required for the additional sludge lagoons/drying beds (preliminary estimate indicates approximately 2 ha of additional land would be required for two lagoons and four drying beds).
- Land available at the new water treatment plant site is limited and is affected by old underground mine workings in the area (GHD, 2016d) resulting in the potential for subsidence impacting upon the suitability of the site for the establishment of new infrastructure.

- Removal of dewatered sludge and conveyance to the REA can be labour intensive compared to the liquid transfer option.
- High additional capital cost involved (preliminary estimate $8 to $12 million) based on the area and number of lagoons / drying beds involved.

3.1.4 ***Mechanical dewatering system***

A range of mechanical dewatering systems were considered for management of the residuals at the water treatment plant site prior to disposal to the SCSS REA.

Different types of mechanical equipment can be used for dewatering residuals and include filter presses, belt presses and centrifuges. The alternate dewatering systems have their own advantages at an operational level and centrifuges would generally be preferable as a result of the ability to operate continuously and require less operator and maintenance interface than the alternate systems. Such mechanical dewatering equipment is typically sized to operate for an eight hour shift during average solids loading condition, which allows the operations to increase up to three eight hour shifts during peak solids loading. A 20 m^3/hr mechanical dewatering system is therefore necessary to meet peak loading condition.

Any mechanical dewatering systems would require additional infrastructure to be provided at the water treatment plant site. This will include a building to house the dewatering equipment, a crane for maintenance, a storage pond (minimum one day storage) to hold residuals prior to dewatering, a storage area for dewatered residuals, a centrate return system and a means for transporting dewatered residuals off site to the REA.

For the majority of the year, it will be difficult to achieve effective dewatering of the residuals stream through mechanical dewatering systems alone due to the typically low TSS of the mine inflows. Dosing of a polymer coagulant aid would be required in conjunction with the mechanical process to achieve a high level of dewatering typically targeted by mechanical dewatering processes.

Polymers are synthesised from organic based long chain chemicals and are used frequently in water treatment processes to aid flocculation. There is a wide range of commercially available polymers on the market used in the water treatment industry.

Dosing of polymers in conjunction with mechanical processes would potentially achieve a dewatered residuals cake or paste in the range of 10% to 25% solids by weight. Dosing with polymers would require additional chemical storage and dosing facilities in addition to the mechanical dewatering equipment at the water treatment plant site.

The liquid or centrate from the dewatered product would need to returned to the water treatment plants requiring additional pipeline infrastructure not previously proposed. This will also result in an additional treatment volume and brine production requiring management within the existing MPPS blowdown systems. The existing brine concentrators at MPPS are currently at capacity at peak treatment volumes and any additional load may require further refinement of the existing blowdown management processes.

The dewatered cake would be too thick to enable transfer to the REA within the proposed residuals pipeline and would require an alternate transport system to be developed utilising either a vehicle haulage or conveyor system. Establishing a direct haulage route or conveyor system would require considerable ground disturbance and clearance of native vegetation and potential noise and dust impacts between the water treatment plant and the REA. Alternatively, the dewatered cake would require haulage via the public road network involving an additional four to six heavy vehicle movements per day.

The addition of a polymer will also introduce an additional chemical into the REA with potential for transfer to receiving waters. Increasing the solids content in the residuals is expected to reduce the excess volume of water discharged from LDP006, however will include the potential for introduction of new chemical pollutants.

The classification of this slurry waste would be required and may lead also to the need to implement a lining solution for the area of disposal due to the polymers being used.

Disadvantages of the mechanical dewatering approach are:

- High additional capital cost involved (preliminary estimate $8 to $12 million) based on the size of dewatering facility involved.
- Additional energy consumption compared to the liquid transfer option and therefore additional greenhouse gas impact.
- Additional chemical (polymer) dosing is required with greater risk of the chemical finding its way to Wangcol Creek via the REA.

3.1.5 Summary

The use of sludge lagoons/drying beds may reduce slightly the impact of the residuals on Wangcol Creek, but the severe site constraints and high capital and operating cost are not considered justified given the minimal additional benefits for the catchment.

The introduction of mechanical dewatering will significantly increase the cost and operational complexity of the residuals management system for minimal environmental benefit in comparison to a liquid transfer scheme. The need for polymer in a mechanical dewatering solution will introduce the risk of polymer finding its way to Wangcol Creek via the REA.

Dewatering the residuals prior to sending it to the REA would also require additional infrastructure with associated environmental constraints which would require further consideration prior to implementation.

The liquid transfer scheme as currently proposed is considered the preferred alternative from a capital and operational perspective resulting in minimal environmental impacts to the immediate receiving waters of Wangcol Creek.

3.2 Sensitivity on water and salt balance modelling

To assess the likely sensitivity of the water and salt balance modelling undertaken for the Project, the modelling undertaken was reviewed considering the more likely parameters which included a reduced EC and reduced daily flow of residual.

Outcomes from the sensitivity exercise are provided in Attachment B.

The results of sensitivity testing are presented in Table 3-2 for Wangcol Creek at the confluence with LDP006 discharge (location 2) defined as the receiving environment.

Table 3-2 Summary of results

Predictions	Change from impact assessment results – Proposed conditions	
Flow	-25 ML/year	-1%
Salt load	-67 tonnes/year	-4%
EC	-30 µS/cm	-3%

The results of the sensitivity assessment indicate that the change in residual flow and conductivity at Wangcol Creek indicates a change between existing and proposed of -2% however salt load indicates a change between existing and proposed of +1%. Refer to Attachment B for further results of the sensitivity analysis.

3.3 Review of basic mixing model

A review of the mixing model (with respect to EC) was undertaken in association with the sensitivity assessment on the water and salt balance modelling. For EC this indicated that the dilution effects predicted as part of the assessment remain with the dilution effect slightly increased by 4.5%.

4 Department of Planning and Environment

Three main points were raised by the DPE which are discussed in the sections below.

4.1 Impact on discharge volumes from emplacing residuals into REA

Figure 4-1 and Figure 4-2 below provide cumulative probability distribution plots for daily discharge volume and daily discharge EC for each scenario considered in the Modification 1 assessment at LDP006. These figures enable the consideration of the relationship between scenarios for both discharge and EC and the predicted frequency of specific discharge volumes or EC of occurring.

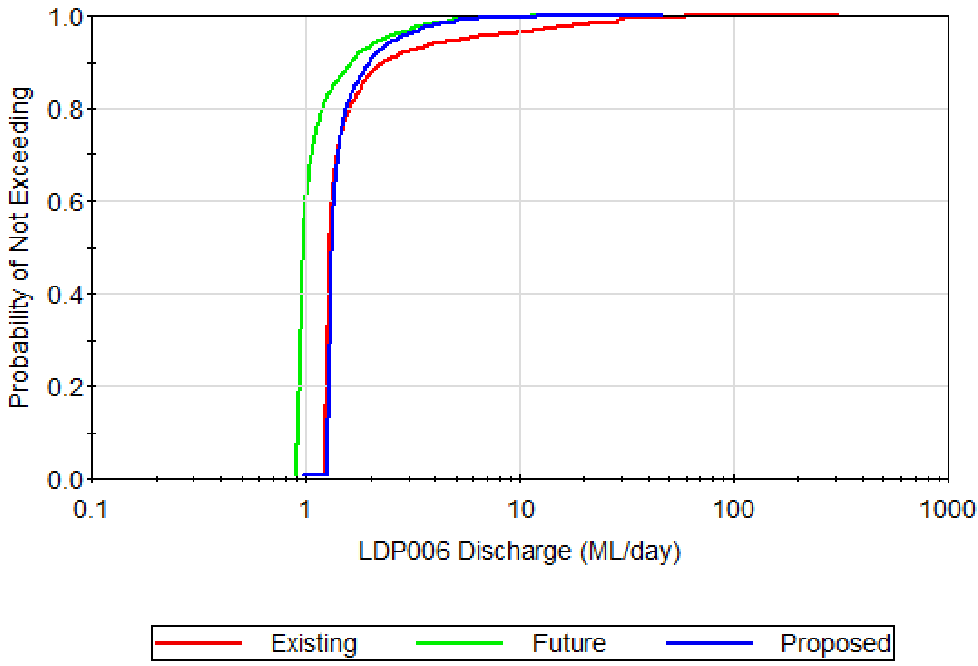

Figure 4-1 Cumulative probability distribution of discharges via LDP006

From Figure 4-1, it is clear that the maximum flow at LDP006 is greatest for the existing conditions modelled, due to the fact that all catchment area is contributing to this discharge point. The results indicate flow rates between 4 ML/day (90th percentile) to 59 ML/day (100th percentile) from the model for the existing conditions. In comparison, the future and proposed scenarios indicated a reduced discharge volume due to the diversion of catchment away from LDP006. This indicated a potential 100th percentile result of less than 12 ML/day for both scenarios. These events would most likely occur when significant rainfall is occurring and the dirty water management system at the SCSS has its capacity exceeded resulting in water surcharging to LDP006. It is estimated that the dirty water management system (of the future and proposed condition scenarios) will operate to criteria of conveying a 20 to 50 year average recurrence interval (ARI) event, after which the dirty water system would overflow into the clean water network.

A comparison of the results of the future and proposed condition illustrate the effect that the residual load has on daily flow rates. Figure 4-1 shows that residual influence occurs up to approximately an 80th percentile, of which greater than this rainfall becomes a greater influence on the effect of discharges at LDP006.

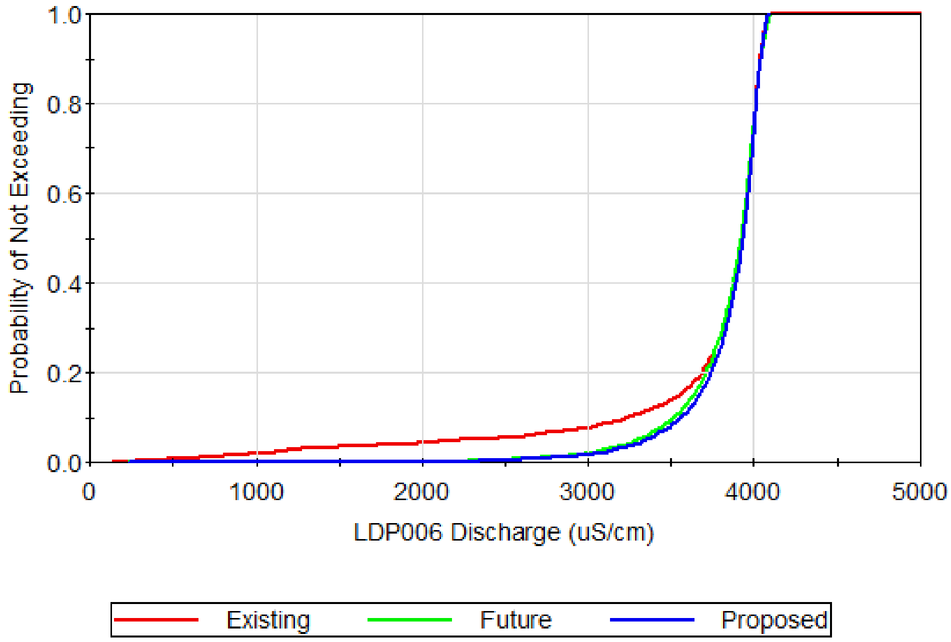

Figure 4-2 Cumulative probability distribution of EC at LDP006

From Figure 4-2, the probability of not exceeding should be viewed inverse to that of the flow, that is, lower EC values are likely to be as a result of higher flows and higher EC values should be considered as a result of very low flows. This relationship is due to the diluting effect of low EC rainfall; however, this may not apply in all scenarios but is expected in the majority of cases at SCSS.

It is clear that the increase in EC of LDP006 discharges occurs in future and proposed scenarios as a result of the diversion of clean water away from LDP006 which has historically had a diluting effect. But within the proposed scenario a lower limit on EC is predicted at LDP006, by the introduction of the residuals (at an EC of 2,500 µS/cm) which is less than the current EC of Cooks Dam (median of 3,273 µS/cm). When proposed conditions are compared with existing conditions, EC has historically been more diluted from clean catchment runoff contributing to LDP006 under existing conditions.

Very minor differences are noticed in the future and proposed conditions. The common point between the two conditions are that the EC is predicted to become concentrated on a daily basis due to the diversion of diluting surface water.

4.2 Contamination risk of shallow groundwater

There is no specific sequence proposed for the emplacement of the residuals in the new REA at the SCSS. The emplacement of the residuals within the REA will occur concurrently with the emplacement of the fine rejects materials slurry from SCSS's coal handling and preparation plant (washery). The residuals emplacement will use sub-aerial deposition techniques similar to that currently used at the site for the coal fines slurry (refer Section 3.3.7 and Section 4.2.7 of the Statement of Environmental Effects) and will be transferred from the SWTP to the REA regularly but not necessarily on a daily basis. It is noted the water resources impact assessment (GHD, 2016a) has assessed the impact of the transfer of the maximum 0.43 ML/day whereas in reality the transfer rates will be in the range 0.16 -0.35 ML/day.

The assessment of risk to the shallow groundwater considered:

- Groundwater environment water quality.
- Jar testing undertaken for the SWTP.
- Case study of Newstan Colliery Water Treatment Plant.
- Mixing model of residual water quality and LDP006 water quality.

As supported by the outcomes of the water and salt balance (GHD, 2016b), groundwater forms a majority of the discharge at LDP006 under the future and proposed scenarios (i.e. catchment diverted away from LDP006). The mixing model for residuals water quality and LDP006 water quality, provided in Section 6.4.1 and 6.4.2 (GHD, 2016a) assessed the potential risks to water quality at LDP006 by identifying any introduced water quality parameters that may be present within the Springvale Mine feed water that may not be prevalent in LDP006 discharges or shallow groundwater. The result of this assessment found that the addition of residuals to the REA would have a diluting effect on most metals present in LDP006 discharges.

The assessment of re-mobilisation of metals stored within the REA and residual mix, whilst not specifically assessed as a risk, is outlined in Section 6.5.1 and considers that metal contamination of shallow groundwater is unlikely given the function of the co-precipitation with ferric chloride. To mitigate re-mobilisation of metals disposed of within the REA, the management of pH will be required to ensure that water stored is within the bounds of 6.5 to 8.5 pH units.

To mitigate the connectivity between the REA and the shallow groundwater environment the use of coarse coal rejects around the emplacement area perimeters and the deposition of fine coal rejects in the centre of the REA has been undertaken historically. This emplacement methodology continues to be utilised. Adopting this approach seeks to form a reduced hydraulic conductivity of the emplacement area with the shallow groundwater as over time the coarse coal reject material voids are filled with fine coal slurry and material consolidation occurs. The re-mobilisation risk should further reduce over time.

Increased groundwater monitoring is to be undertaken on groundwater bores at a number of strategic locations to identify sources of EC and surface to groundwater interactions. Each of the groundwater bores will have monitoring equipment installed that will continuously gauge both level and EC at a timestep less than one day. Monitoring historically is undertaken weekly which does not cover the response speed expected between surface and groundwater.

The residual operation and concentration of the material being transferred from the SWTP to the REA is proposed to be monitored and assessed within the commissioning phase of the water treatment plant.

4.3 Proposed clean water diversions

As noted in Section 2.4 the concept designs of the diversions works relating to the separation of the clean and dirty water within the Lambert Gully catchment within the SCSS have been completed (refer Attachment A), and Springvale Coal are now progressing with the detailed design works using the survey and LIDAR data from the site for the optimisation of the clean and dirty water flowpaths.

Construction of the diversion works is proposed to be staged, with the Stage 1 works expected to be completed in 2017 and the second and final Stage 2 works are expected to be completed in 2019, prior to the operation of the SWTP.

Water quality and flow monitoring are to be implemented on the proposed clean water diversion works prior to completion of diversions and will continue after the works have been completed until a statistically robust baseline data have been obtained to validate the future conditions modelled in the site water and salt balance included in GHD (2016a).

The diversion of upstream clean water away from Retention Dam (refer to Drawing number 21-24377-C323 in Attachment A) represents the most significant diversion works that will be constructed in the future. The site water and salt balance modelling results for the existing (existing diversion structures), future (diversion structures within Lamberts Gully installed) and proposed (transfer of residuals from the SWTP to the REA) are presented in Section 6.3 of GHD (2016a). The results show that the implementation of the clean water diversions modelled under future conditions will likely improve the water quality of discharges through LDP006.

The proposed drainage paths of the overflows from the retention pond are to be through existing SCSS property to contribute to the Lamberts Gully waterway, downstream of the LDP006 infrastructure. The ability of the Lamberts Gully to manage these overflows will remain the same as existing (or pre-clean water diversion) conditions as the overall catchment contributing to Lamberts Gully is relatively similar.

The implementation of the clean water diversion will enable improved clarity around water volumes at LDP006, which will be confirmed from the flow and water quality data from monitoring proposed to be undertaken in the future, noted in Section 2.4.

The catchment that will be diverted away from LDP006 contains land uses typical of both clean catchment and catchment with construction disturbances. The catchment however currently does not contain coal works or coal handling activities (the activities defined within the EPL). The water quality risks associated with these diverted catchments are likely to be that of a disturbed catchment, including, at times, the potential for elevated total suspended solids, turbidity and elevated salinity.

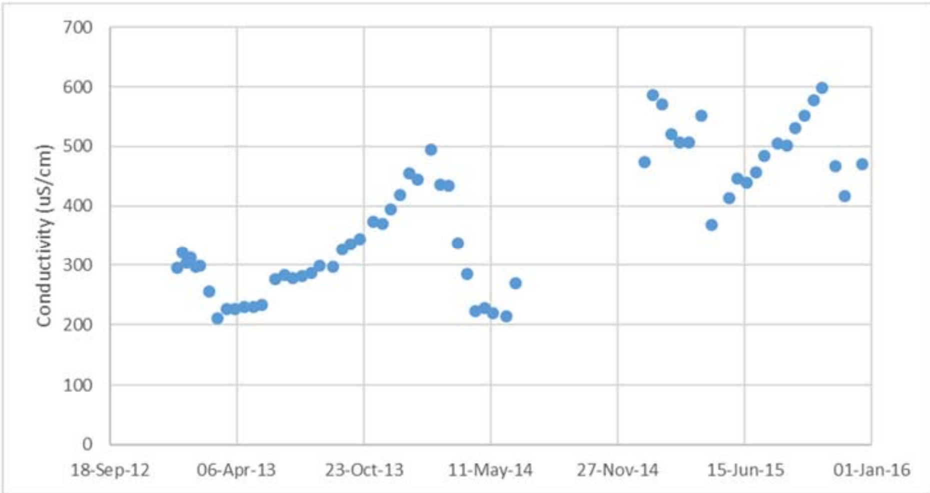

Figure 4-3 Main Sediment Dam – EC levels from 2013 to 2015

Figure 4-3 shows the elevated salinity present within Main Sediment Dam, a clean water dam over the last two years. The data indicates that the salinity levels for potentially disturbed catchments are not related to coal works or handling.

The diversion works will improve the management of dirty and clean water as part of the operations into the future, coupled with ongoing rehabilitation of disturbed catchments. With the redirection of all dirty water catchments to designated dirty water storages (Washery Dam, SLG06, and Cooks Dam), this allows for the opportunity for the water to be reused by the site operations rather than being discharged.

The existing conditions represent the site operating as one system with dirty and clean systems mixed. The proposed works will delineate the two categories of water and allow for improved management. Some concentrating effects may be observed at LDP006 following the diversion, however, annual discharge volume and salt loads are likely to be reduced on average.

4.4 Blue Mountains Conservation Society

4.4.1 Clean and dirty water – requirements, implications and desirable outcomes

The suggestion of gathering all clean and dirty water from SCSS and redirecting to a treatment system is not a sustainable solution nor is it practical. The appropriate rehabilitation of catchments should be sought by operations with catchment runoff allowed to re-contribute to its appropriate outlet. The impact of removal of water from a waterway can be close to, if not similar, the impact of degraded water quality. The runoff water quality of rehabilitated catchments may not be reflective of natural catchments however with time and the maintenance of a stable landform runoff will begin to return to an improved state.

The proposal to collect clean and dirty water from the SCSS and the residuals from the SWTP and transferred to the proposed reverse osmosis / water treatment plant in the SWTP is neither sound nor pragmatic. The residuals waste stream results from the water treatment process and require to be disposed of as a waste product, not further treated through the water treatment plant.

The SCSS water has a much higher salinity than the mine water salinity (median EC of 1,170 µS/cm) that the proposed water treatment plant is designed to treat to specified EC criteria specified in Schedule 4, Condition 12 of Springvale Mine's consent (SSD 5594).

The SWTP will make a major contribution to improving water quality in the Coxs River catchment, but cannot be seen as providing a single standalone solution for management of all water quality issues in the Western Coalfield, including water from SCSS. Moreover, the SWTP has been designed to operate within the existing operating parameters at the MPPS. This includes variable power generation requirements and associated cooling water system make up requirements and the capacity of the existing brine management facilities at MPPS. The design parameters of the proposed water treatment plant cannot be significantly increased without a major overhaul to the existing MPPS operations and development of further solutions for brine and residuals management.

Management of water from sources other than the Springvale and Angus Place mine dewatering facilities does not currently form part of the SWTP.

4.4.2 Modelling deficiencies

The Project's water and salt balance considered salt as a component of the water balance (considered an indicator parameter for potential mining impact) and incorporates a basic mixing model for how residuals and the current groundwater quality would interact. Cumulative assessments undertaken within the regional water and salt balance considered information available at the time for all industries down to Lake Burragorang.

4.5 Colong Foundation for Wilderness

4.5.1 Modelling omits cumulative impacts

A regional water and salt balance undertaken as part of this Project and the SWTP was referenced and assessed as part of the impact assessment. This regional assessment considered all aspects of the catchment contributing down to Lake Burragorang.

Regional modelling undertaken has not considered the Lithgow City Council Blackmans Flat Project as will install an impermeable liner and leachate management system, and groundwater infiltration is unlikely. In regards to the MPPS ash emplacements, these have been assessed to have limited connectivity to the shallow groundwater environment and Wangcol Creek (SKM, 2010) although this is subject to further groundwater monitoring investigations currently being undertaken.

4.5.2 Treatment of LDP006 discharges

Existing LDP006 discharges comprise of overflows from Cooks Dam and overflows from Retention Pond (which includes catchment runoff from Lamberts Gully). The proportion of flow from Cooks Dam overflows makes up the majority of annual contribution to LDP006 discharges. Water balance results presented for LDP006 indicate a predicted 90th percentile volume of water to be 1,348 ML/year (average of ~3.7 ML/day). The clean water diversion works are designed to improve the water management of the site and provide clarity around discharge quality and quantity via LDP006, unaffected by catchment contributions. This requirement addresses a statement of commitment proposed in the Western Coal Services Project.

4.5.3 Deposition of water treatment plant residuals

The Project outcomes have been supported by jar testing as well as the evaluation of other operating treatment plants considered as case studies. The assessment outcomes indicated that residuals contribution to the water management at the site, and indirectly to the shallow groundwater system will effectively dilute the constituents already present underground at SCSS, based on the comparison of concentrations of residuals (2,500 µS/cm) and the existing groundwater environment with EC as high as approximately 4,500 µS/cm.

4.5.4 Clean and dirty water flows

The future water management scenario considered as part of the Project's water and salt balance (2016b) considered that catchments to be diverted away from LDP006 will progressively be rehabilitated to an appropriate condition such that they can be considered clean. Whilst catchments are being rehabilitated, the Main Sediment Dam, and Retention Pond will operate as sediment control structures. Elevated salinity from rehabilitated catchments when compared to natural catchment is inevitable but as Colong Foundation indicate, this is much lower than the water being discharged at LDP006.

Runoff and water captured by the Co-disposal REA (no longer in use) is managed within the dirty water system currently and into the future. This water will not report to any component of the clean water diversion works proposed into the future. This REA is being progressively rehabilitated.

4.5.5 Groundwater environment

The groundwater environment is understood to be a well-mixed body of water that cannot be distinguished between clean, dirty or contaminated. The water quality of the groundwater indicates that it is not representative of any other water type hence it has been classified as groundwater. A few key points should be considered to clarify the statements made:

- Cooks Dam is located in the lowest part of the Lithgow Seam, within which shallow groundwater environment accumulates and flows.
- Water levels maintained within both Cooks and DML Dam are reflective of the groundwater table. To maintain these storages lower, an overall lowering of the groundwater table is required. Springvale Coal seek to reduce the opportunities for surface water infiltration (where practicable and within their operational extent) to the underground in attempt to reduce this relationship.
- The groundwater system is broad in shape and large in volume and grout cut-off walls would do little to address the concerns made by Colong Foundation. Investigations into the groundwater environment have resulted in findings that suggest the large majority of site is subject to both infiltration and seepage effects driven by groundwater level.
- There is likely connectivity between Wangcol Creek and the shallow groundwater for the upper catchment of Wangcol Creek as water levels within the creek are maintained more consistently through dry periods as observed by the gauge located upstream of the SCCS site.

5 References

GHD (2016a) *Western Coal Services Modification 1, Water Resources Impact Assessment*, prepared for Centennial Coal.

GHD (2016b) *Springvale Coal Services, Site Water and Salt Balance Assessment*, prepared for Centennial Coal.

GHD (2016c) *Springvale Coal/EnergyAustralia, Springvale Water Treatment Project, Water Resources Impact Assessment*, prepared for Centennial Coal and EnergyAustralia

GHD (2016d) *Springvale Coal/EnergyAustralia, Springvale Water Treatment Project, Mine Subsidence Assessment*, prepared for Centennial Coal and EnergyAustralia

SKM (2010) *Mt Piper Power Station, Ash Placement Project, Appendix D, Hydrology and Water Quality,* prepared for Delta Energy

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Attachments

A Springvale Coal, Dirty and Clean Water Separation Plans (21-24377-C300 to C370)

B Water and Salt Balance Model Sensitivity

SPRINGVALE COAL
DIRTY AND CLEAN WATER SEPARATION PLANS

DRAWING LIST

21-24377-C300	TITLE SHEET LOCALITY PLAN & DRAWING LIST
21-24377-C301	SITE OVERVIEW
21-24377-C302	GENERAL NOTES
21-24377-C305	GENERAL ARRANGEMENT SHEET 1 OF 2
21-24377-C306	GENERAL ARRANGEMENT SHEET 2 OF 2
21-24377-C310	TYPICAL SECTIONS - SHEET 1
21-24377-C311	TYPICAL SECTIONS - SHEET 2
21-24377-C312	TYPICAL SECTIONS - SHEET 3
21-24377-C313	TYPICAL SECTIONS - SHEET 4
21-24377-C314	CULVERT SCOUR PROTECTION
21-24377-C320	CLEAN WATER DRAIN CW01 PLAN AND LONGITUDINAL SECTION - SHEET 1
21-24377-C321	CLEAN WATER DRAIN CW01 PLAN AND LONGITUDINAL SECTION - SHEET 2
21-24377-C322	CLEAN WATER DRAIN CW02 PLAN AND LONGITUDINAL SECTION
21-24377-C323	CLEAN WATER DRAIN CW03 PLAN AND LONGITUDINAL SECTION
21-24377-C324	DIRTY WATER DRAIN DW01 PLAN AND LONGITUDINAL SECTION
21-24377-C325	DIRTY WATER DRAIN DW02 PLAN AND LONGITUDINAL SECTION
21-24377-C330	HAUL ROAD HR01 PLAN AND LONGITUDINAL SECTION - SHEET 1
21-24377-C331	HAUL ROAD HR01 PLAN AND LONGITUDINAL SECTION - SHEET 2
21-24377-C332	ACCESS ROAD HR02 PLAN AND LONGITUDINAL SECTION - SHEET 1
21-24377-C340	HAUL ROAD HR01 - CROSS SECTIONS SHEET 1 OF 10
21-24377-C341	HAUL ROAD HR01 - CROSS SECTIONS SHEET 2 OF 10
21-24377-C342	HAUL ROAD HR01 - CROSS SECTIONS SHEET 3 OF 10
21-24377-C343	HAUL ROAD HR01 - CROSS SECTIONS SHEET 4 OF 10
21-24377-C344	HAUL ROAD HR01 - CROSS SECTIONS SHEET 5 OF 10
21-24377-C345	HAUL ROAD HR01 - CROSS SECTIONS SHEET 6 OF 10
21-24377-C346	HAUL ROAD HR01 - CROSS SECTIONS SHEET 7 OF 10
21-24377-C347	HAUL ROAD HR01 - CROSS SECTIONS SHEET 8 OF 10
21-24377-C348	HAUL ROAD HR01 - CROSS SECTIONS SHEET 9 OF 10
21-24377-C349	HAUL ROAD HR01 - CROSS SECTIONS SHEET 10 OF 10
21-24377-C350	ACCESS ROAD HR02 - CROSS SECTIONS SHEET 1 OF 2
21-24377-C351	ACCESS ROAD HR02 - CROSS SECTIONS SHEET 2 OF 2
21-24377-C360	CLEAN WATER CULVERT CW01-A - PLAN & ELEVATION
21-24377-C361	CLEAN WATER CULVERT CW01-B - PLAN & ELEVATION
21-24377-C362	DIRTY WATER CULVERT DW01-A - PLAN & ELEVATION
21-24377-C363	DIRTY WATER CULVERT DW02-A - PLAN & ELEVATION
21-24377-C364	HAUL ROAD CULVERT HR01 - PLAN & ELEVATION
21-24377-C370	CAUSEWAY AU03 - PLAN & ELEVATION

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATE	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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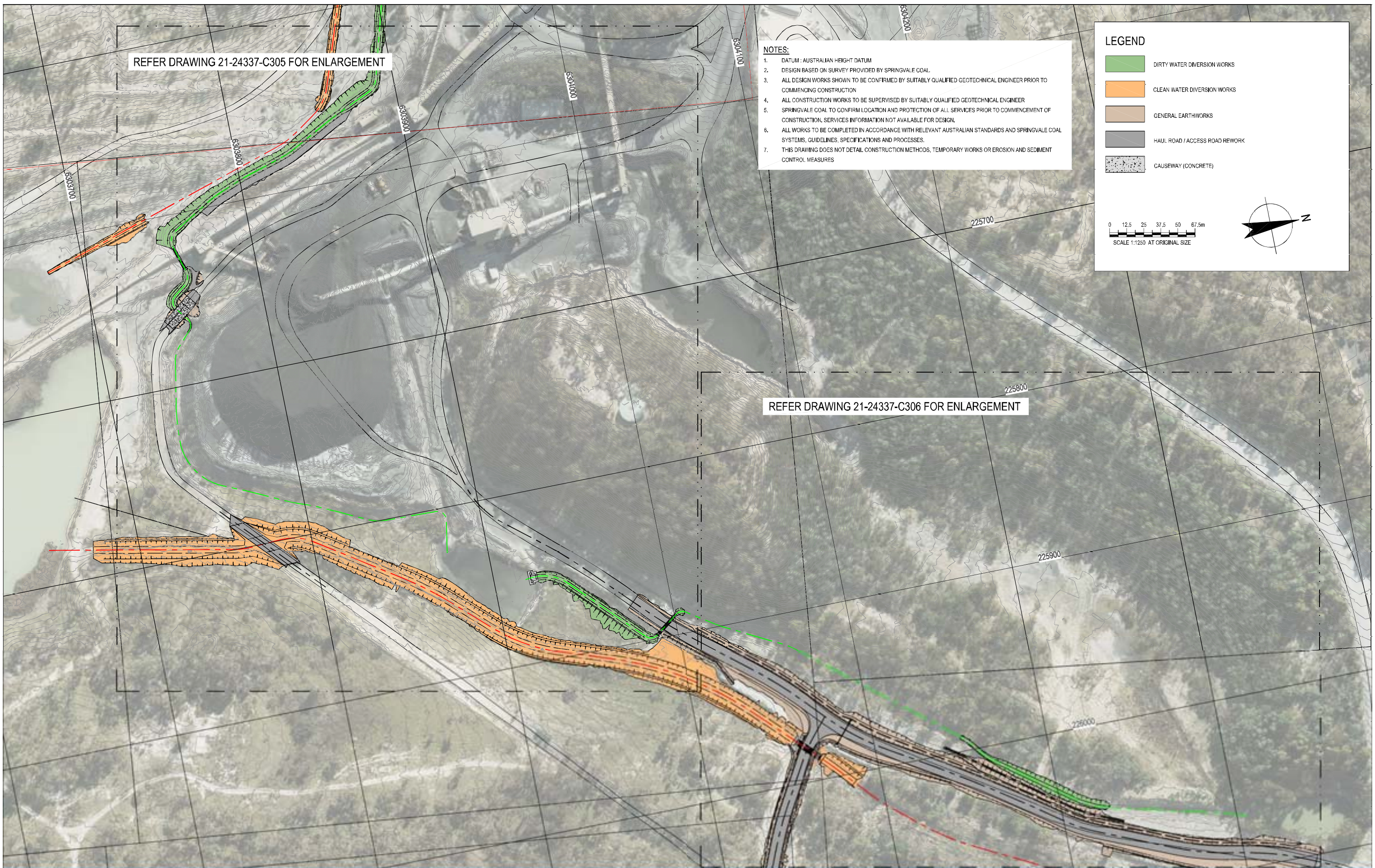
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **TITLE SHEET, DRAWING LIST AND LOCALITY PLAN**
Original Size A1 **Drawing No: 21-24377-C300** Rev: B

Plot Date: 30 January 2017 - 4:45 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C300 COVER.dwg



NOTES:
1. DATUM : AUSTRALIAN HEIGHT DATUM
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3. ALL DESIGN WORKS SHOWN TO BE CONFIRMED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO COMMENCING CONSTRUCTION
4. ALL CONSTRUCTION WORKS TO BE SUPERVISED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER
5. SPRINGVALE COAL TO CONFIRM LOCATION AND PROTECTION OF ALL SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION. SERVICES INFORMATION NOT AVAILABLE FOR DESIGN.
6. ALL WORKS TO BE COMPLETED IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARDS AND SPRINGVALE COAL SYSTEMS, GUIDELINES, SPECIFICATIONS AND PROCESSES.
7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

LEGEND
- DIRTY WATER DIVERSION WORKS
- CLEAN WATER DIVERSION WORKS
- GENERAL EARTHWORKS
- HAUL ROAD / ACCESS ROAD REWORK
- CAUSEWAY (CONCRETE)

0 12.5 25 37.5 50 67.5m
SCALE 1:1250 AT ORIGINAL SIZE

N

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATE	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **SITE OVERVIEW**
Original Size A1 **Drawing No: 21-24377-C301** Rev: B

Plot Date: 30 January 2017 - 4:44 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C301 SITE PLAN.dwg

GENERAL NOTES

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE TECHNICAL SPECIFICATIONS AND GUIDELINES. WHEN DISCREPANCIES ARISE THE CONTRACTOR SHALL ADVISE THE SUPERINTENDENT IMMEDIATELY FOR CLARIFICATION.
2. THE CONTRACTOR SHALL GIVE NOTICE TO THE SUPERINTENDENT IN ACCORDANCE WITH THE SPECIFICATION WHEN INSPECTIONS ARE REQUIRED.
3. THE CONTRACTOR SHALL DEMOLISH AND REMOVE FROM SITE ALL STRUCTURES, CONCRETE, FENCES, ETC. AS REQUIRED.
4. SERVICES HAVE NOT BEEN LOCATED PRIOR TO COMPLETION OF DESIGN. THE CONTRACTOR IS RESPONSIBLE TFOR LOCATING ALL SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR IS TO GIVE NOTICE TO THE SUPERINTENDENT IF ANY CLASHES EXIST BETWEEN THE DESIGN AND EXISTING SERVICE LOCATIONS.
5. UNLESS NOTED OTHERWISE, ALL LEVELS AND DIMENSIONS ARE IN METRES.
6. PRIOR TO COMMENCEMENT OF WORKS THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING SERVICES AND STRUCTURES WHETHER OR NOT SHOWN ON THE DRAWINGS. ANY DAMAGE TO EXISTING SERVICES AND STRUCTURES SHALL BE RECTIFIED AT THE CONTRACTOR'S EXPENSE. 10mm COMPRESSIBLE FILLER MATERIAL SHALL BE PLACED AROUND EXPOSED SERVICES AND STRUCTURES. ALL SERVICE COVERS SHALL BE ADJUSTED TO SUIT FINISHED SURFACE LEVELS.
7. THE CONTRACTOR SHALL ENSURE THAT EXISTING SERVICES SUPPLY IS MAINTAINED AT ALL TIMES. WHERE SERVICES ARE AFFECTED BY NEW WORKS, THE CONTRACTOR SHALL INSTALL ALTERNATIVE/NEW SUPPLIES, UNLESS OTHERWISE AGREED WITH THE SUPERINTENDENT
8. TO MINIMISE DISRUPTION THE CONTRACTOR SHALL STAGE THE WORKS TO THE SATISFACTION OF THE SUPERINTENDENT.
9. PRIOR TO THE REMOVAL OF ANY TREES THE CONTRACTOR SHALL OBTAIN THE SUPERINTENDENT'S APPROVAL. GRUB HOLES SHALL BE BACKFILLED WITH APPROVED MATERIAL PLACED AND COMPACTED TO 98% STANDARD COMPACTION AS REQUIRED BY THE SUPERINTENDENT ONSITE.
10. TEMPORARY DRAINAGE MEASURES SHALL BE INSTALLED TO DIVERT/COLLECT SURFACE AND SUB-SURFACE WATER DURING CONSTRUCTION.
11. THE CONTRACTOR SHALL PROVIDE SUITABLE EROSION AND SEDIMENT CONTROL MEASURES TO ENSURE THAT NO SILT OR BUILDING MATERIALS ENTER THE EXISTING DRAINAGE SYSTEM. ALL EROSION AND SEDIMENT CONTROL WORKS ARE TO COMPLY WITH THE SPRINGVALE COAL WATER MANAGEMENT AND REHABILITATION AND LANDSCAPE MANAGEMENT PLANS.
12. WHEN OTHER CONTRACT WORK IS IN PROGRESS THAT REQUIRES ACCESS AND CO-ORDINATION WITH THIS CONTRACT, THIS CO-ORDINATION WILL BE THE CONTRACTOR'S RESPONSIBILITY.
13. ALL NEW WORKS SHALL BE SMOOTHLY TRANSITIONED INTO EXISTING WORKS.
14. DIMENSIONS OF ANY DETAIL SHALL NOT BE SCALED. DIMENSIONS, IF IN DOUBT, SHALL BE VERIFIED BY THE SUPERINTENDENT.
15. THE CONTRACTOR SHALL PROVIDE ADEQUATE TRAFFIC MANAGEMENT MEASURES WHICH ARE TO BE IMPLEMENTED AND MAINTAINED DURING CONSTRUCTION.
16. THESE DRAWINGS ARE BASED ON LIDAR SURVEY SUPPLIED TO GHD. THE CONTRACTOR SHALL CARRY OUT DETAIL SURVEY TO CHECK FOR VARIATIONS IN LEVEL AND ADVISE THE SUPERINTENDENT OF ANY DISCREPANCY THAT MAY AFFECT THE WORKS.

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Approved (Project Director)
Date
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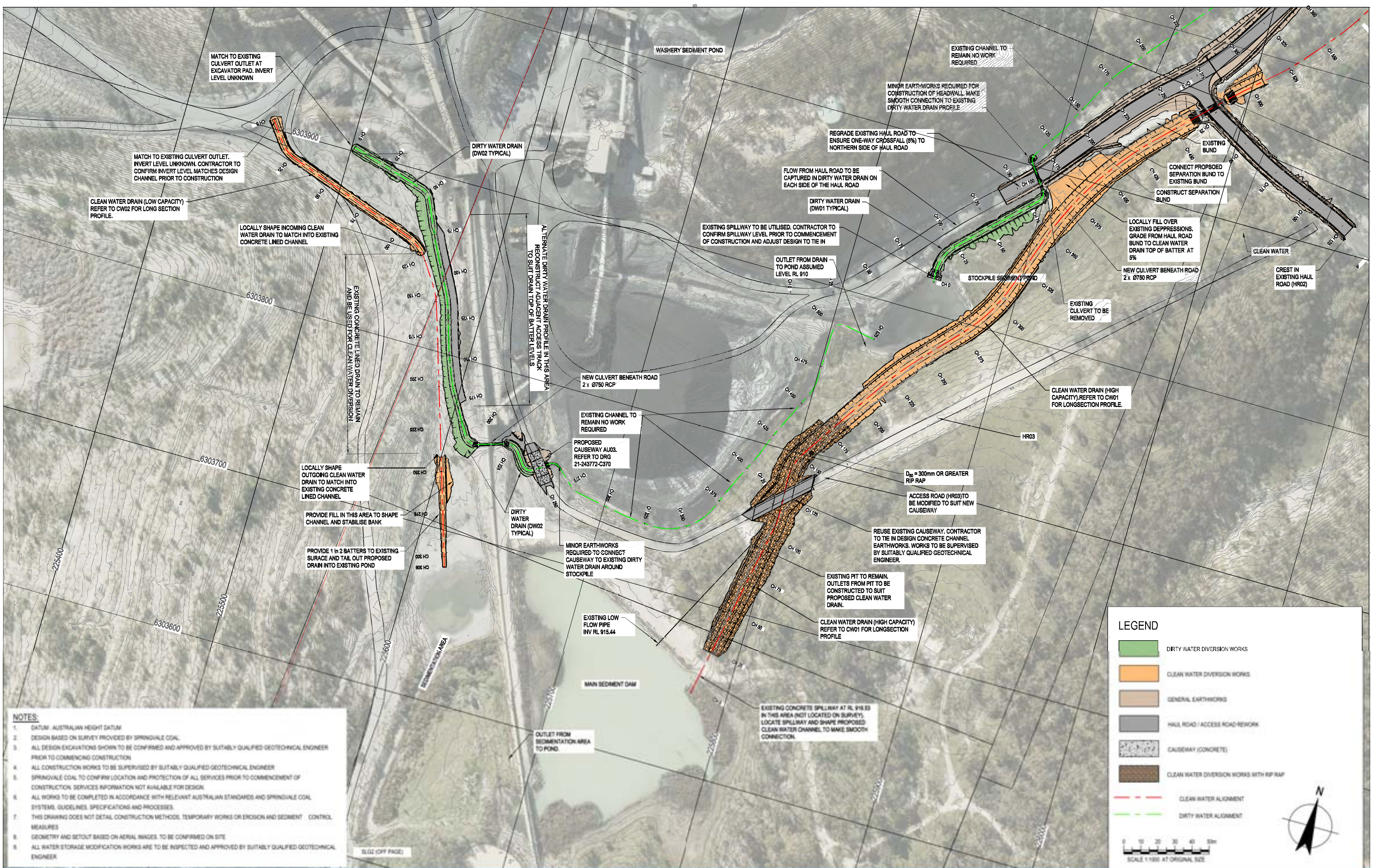
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title GENERAL NOTES

Original Size A1 Drawing No: 21-24377-C302 Rev: B

Plot Date: 30 January 2017 - 4:43 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C302.dwg



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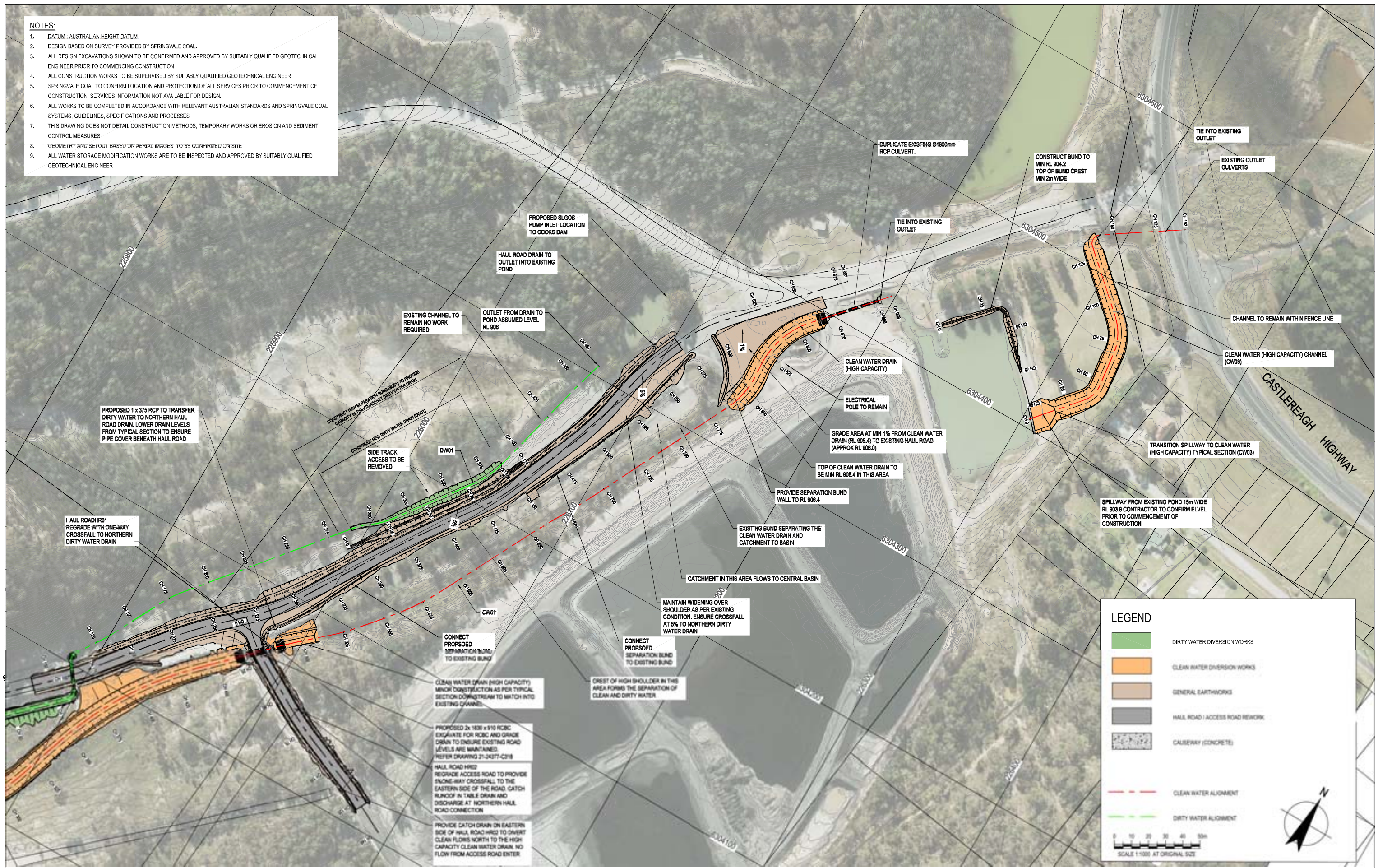
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title GENERAL ARRANGEMENT SHEET 1 OF 2

Original Size A1 Drawing No: 21-24377-C305 Rev: B

Plot Date: 30 January 2017 - 4:43 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C305 GA PLANS.dwg



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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES
8. GEOMETRY AND SETOUT BASED ON AERIAL IMAGES. TO BE CONFIRMED ON SITE
9. ALL WATER STORAGE MODIFICATION WORKS ARE TO BE INSPECTED AND APPROVED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER

No	Revision	Drawn	Job Manager	Project Director	Date
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A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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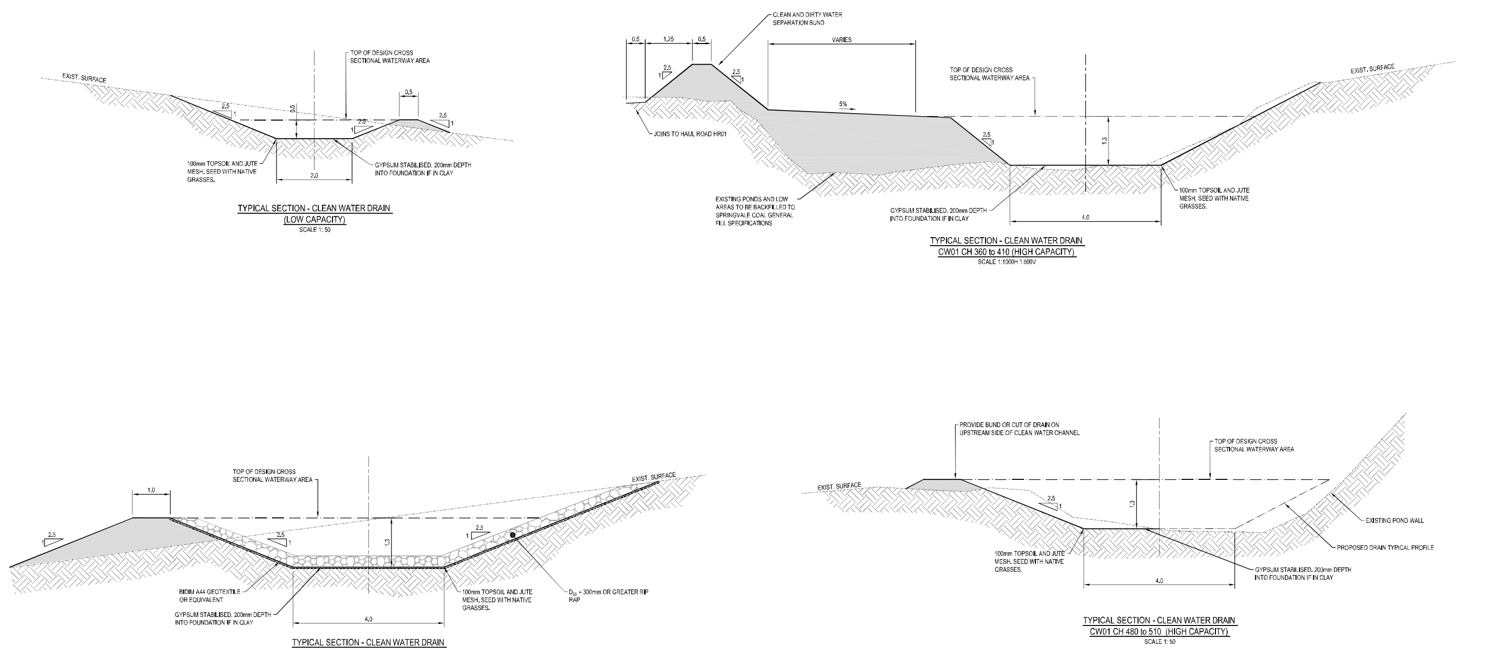
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title GENERAL ARRANGEMENT
SHEET 2 OF 2
Original Size A1
Drawing No: 21-24377-C306
Rev: B

Plot Date: 30 January 2017 - 4:42 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C306 GA PLANS.dwg



TYPICAL SECTION - CLEAN WATER DRAIN
(LOW CAPACITY)
SCALE 1: 50

TYPICAL SECTION - CLEAN WATER DRAIN
CW01 CH 360 to 410 (HIGH CAPACITY)
SCALE 1:100H 1:50V

TYPICAL SECTION - CLEAN WATER DRAIN
(HIGH CAPACITY)
SCALE 1: 50

TYPICAL SECTION - CLEAN WATER DRAIN
CW01 CH 480 to 510 (HIGH CAPACITY)
SCALE 1: 50

NOTES:
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SCALE 1:50 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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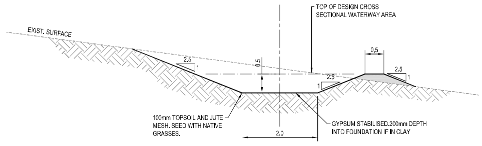
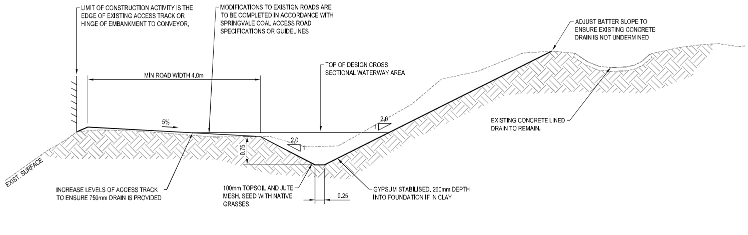
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title TYPICAL SECTIONS - CLEAN WATER
SHEET 1
Original Size A1
Drawing No: 21-24377-C310
Rev: A

Plot Date: 30 January 2017 - 4:41 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C310 TYPICAL SECTIONS.dwg



TYPICAL SECTION - DIRTY WATER DRAIN
SCALE 1:50



TYPICAL SECTION
DIRTY WATER DW02 CH 75 to CH 185
SCALE 1:50

NOTES:

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0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check	D.GREEN
Design Check	B. BATCHELDER
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Date	
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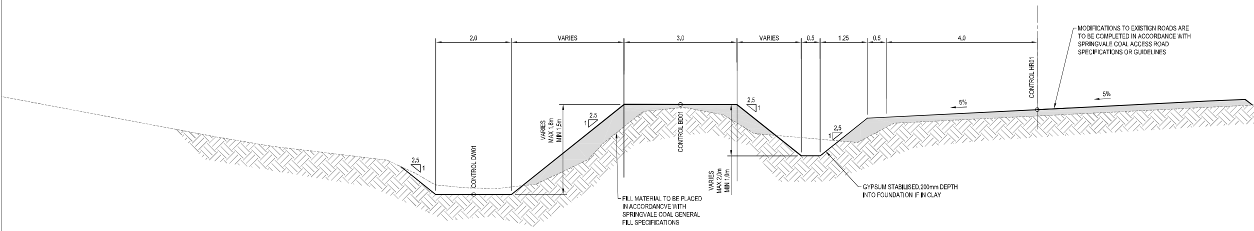
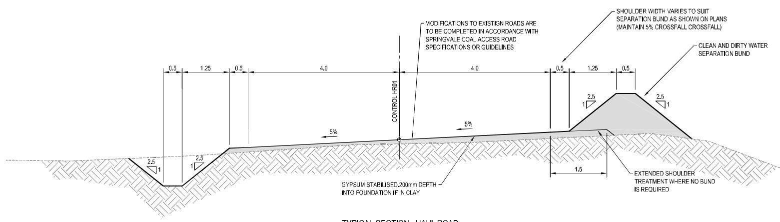
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **TYPICAL SECTIONS - DIRTY WATER SHEET 2**

Original Size **A1** **Drawing No: 21-24377-C311** **Rev: A**

Plot Date: 30 January 2017 - 4:41 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C310 TYPICAL SECTIONS.dwg



TYPICAL SECTION - HAUL ROAD CH 350 to CH 450
SCALE 1:1000H 1:500V



TYPICAL SECTION - HAUL ROAD
SCALE 1:1000H 1:500V

NOTES:

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0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check	D.GREEN
Design Check	B. BATCHELDER
Approved (Project Director)	
Date	
Scale	AS SHOWN

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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **TYPICAL SECTIONS - HAUL ROAD SHEET 3**

Original Size **A1** **Drawing No: 21-24377-C312** **Rev: A**

Plot Date: 30 January 2017 - 4:41 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C310 TYPICAL SECTIONS.dwg

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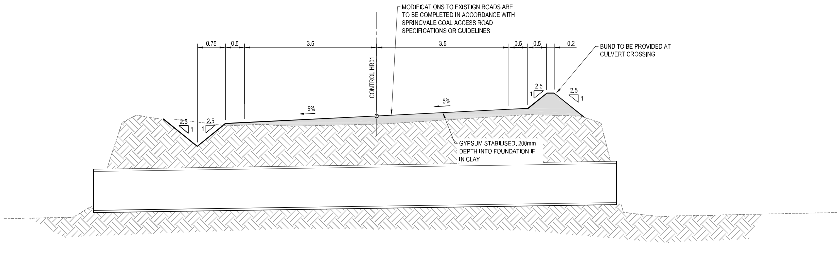
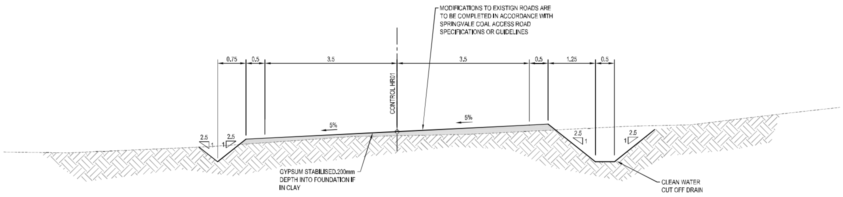
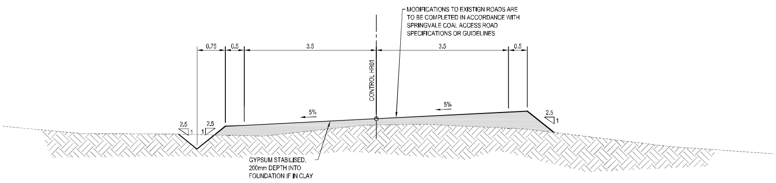


TYPICAL SECTION - HR02 ACCESS ROAD AT CULVERT CROSSING
SCALE 1:1000H 1:500V



TYPICAL SECTION - HR02 ACCESS ROAD
SCALE 1 : 50



TYPICAL SECTION - ACCESS ROAD
SCALE 1:1000H 1:500V

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **TYPICAL SECTIONS - ACCESS ROADS SHEET 4**

Original Size A1 **Drawing No: 21-24377-C313** Rev: A

Plot Date: 30 January 2017 - 4:41 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C310 TYPICAL SECTIONS.dwg

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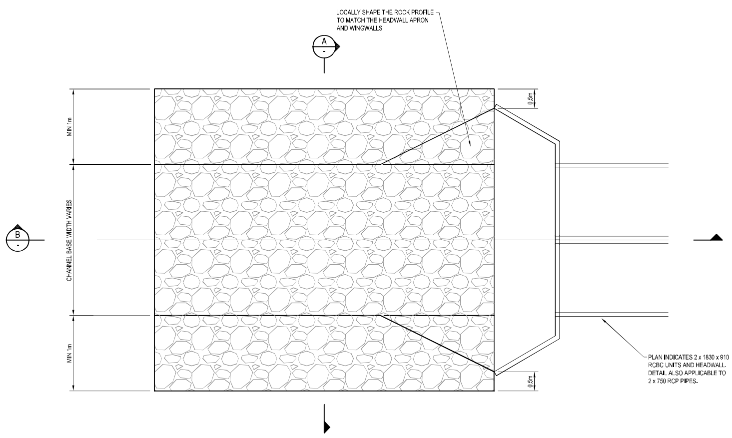
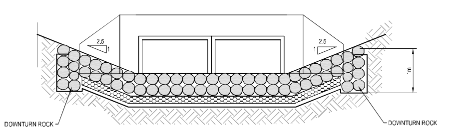
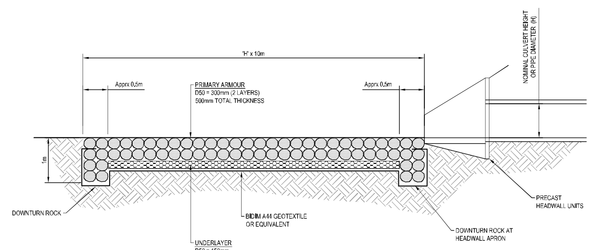


CULVERT INLT / OUTLET SCOUR PROTECTINO PLAN
SCALE 1 : 50



A SECTION
SCALE 1 : 50



B SECTION
SCALE 1 : 50

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drawn | Designer
Drafting Check | Design Check
Approved (Project Director)
Date
Scale AS SHOWN
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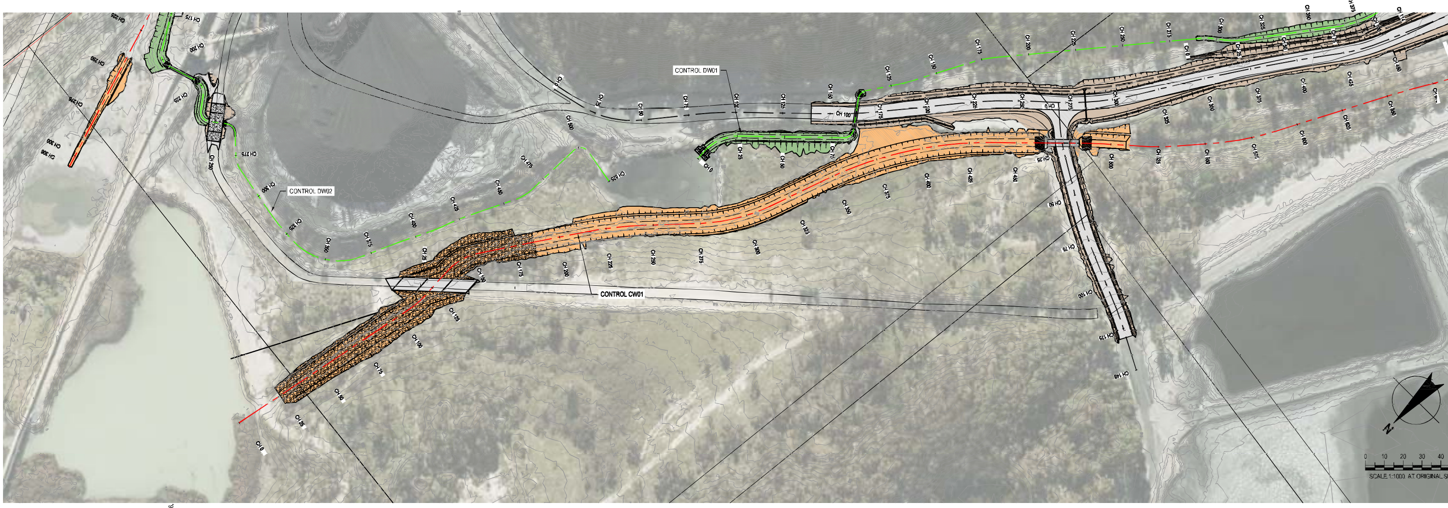
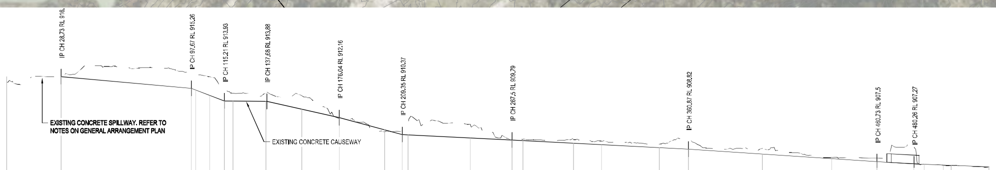
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CULVERT SCOUR PROTECTION**

Original Size A1 **Drawing No: 21-24377-C314** Rev: A

Plot Date: 30 January 2017 - 4:41 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C310 TYPICAL SECTIONS.dwg





DATUM RL. 903.00

VERTICAL ALIGNMENT: L=28.73m G=0% | L=68.94m G=-1.79% | L=17.54m G=-7.59% | L=22.47m G=-0.22% | L=38.36m G=-4.5% | L=33.31m G=-5.36% | L=58.15m G=-1% | L=93.37m G=-1.04% | L=99.86m G=-1.32% | L=19.53m G=-1.18% | L=78.32m G=-0.75%

HORIZONTAL ALIGNMENT: L=107.53m | L=12.22m R=-50.00m | L=17.42m | L=19.04m R=30.00m | L=56.25m | L=32.94m R=200.00m | L=27.85m | L=41.60m R=-100.00m | L=30.68m | L=91.20m R=200.00m | L=48.95m | L=10.21m R=200.00m | L=24.34m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00			915.91
28.73	-0.10	916.500	916.60
97.67	-1.59	915.263	916.85
100.00	-1.74	915.086	916.82
107.53	-1.97	914.514	916.48
115.21	-1.45	913.931	915.39
119.75	-0.83	913.921	914.75
137.17	-0.89	913.883	914.78
156.21	-1.44	913.048	914.49
176.04	0.08	912.156	912.07
200.00	0.21	910.872	910.66
209.35	-0.39	910.371	910.76
212.46	-1.37	910.340	911.71
245.41	-1.42	910.011	911.43
267.50	-0.11	909.790	909.90
273.26	-0.14	909.730	909.87
300.00	-0.40	909.453	909.86
314.86	-0.38	909.299	909.68
345.54	-0.38	908.981	909.36
360.87	-1.08	908.822	909.90
400.00	-0.60	908.304	908.91
436.74	-0.12	907.818	907.94
460.73	-0.37	907.500	907.87
480.26	-1.85	907.269	909.12
485.68	-0.06	907.229	907.29
495.89	0.04	907.152	907.11
500.00	0.04	907.121	907.09
520.00	0.06	906.971	906.91

LONGITUDINAL SECTION - CONTROL CW01
SCALE 1:1000H 1:200V

NOTES:
1. DATUM : AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
3. ALL DESIGN WORKS SHOWN TO BE CONFIRMED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO COMMENCING CONSTRUCTION
4. ALL CONSTRUCTION WORKS TO BE SUPERVISED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER
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VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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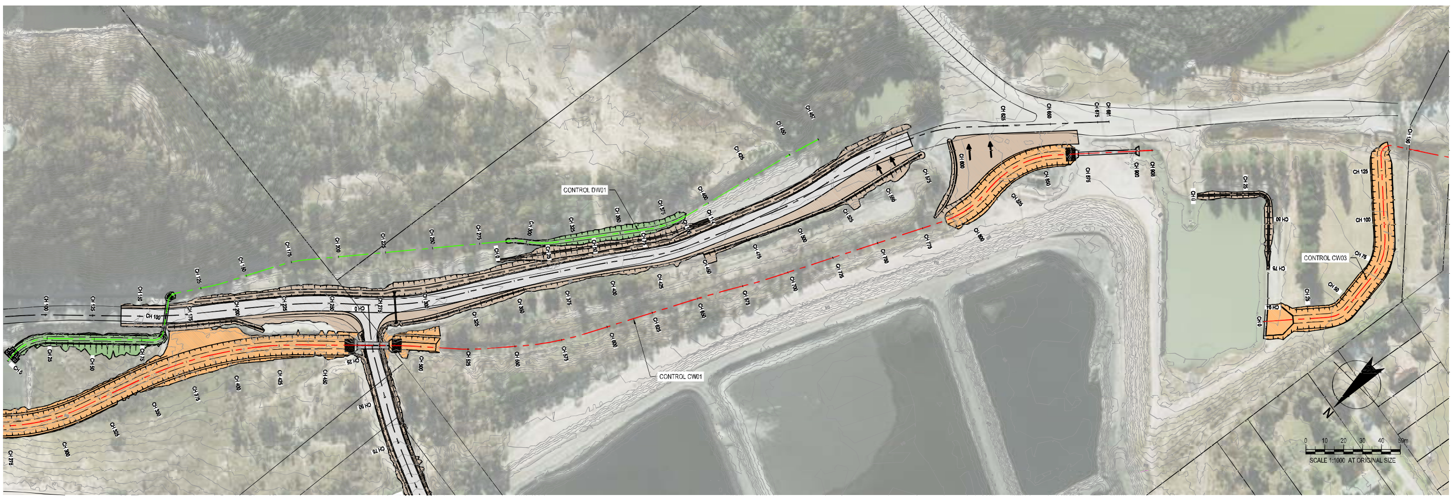
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CLEAN WATER DRAIN CW01**
PLAN AND LONGITUDINAL SECTION SHEET 1

Original Size A1 Drawing No: **21-24377-C320** Rev: B

Plot Date: 30 January 2017 - 4:40 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg



DATUM RL. 901.00

VERTICAL ALIGNMENT: L=99.86m G=-1.32% | L=19.53m G=-1.18% | L=75.32m G=-0.75% | L=99.14m G=-0.7% | L=71.42m G=-0.71% | L=57.26m G=-1.93% | L=73.83m G=-0.32% | L=9.96m G=-12.32% | L=38.47m G=-0.32%

HORIZONTAL ALIGNMENT: L=91.20m R=200.00m | L=48.95m | L=10.21m R=200.00m | L=24.34m | L=13.69m R=-100.00m | L=20.33m | L=35.81m R=150.00m | L=63.29m | L=11.77m R=250.00m | L=14.42m | L=15.18m R=-250.00m | L=93.81m | L=27.51m R=-50.00m | L=3.29m | L=41.00m R=50.00m | L=53.17m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
420.00	-0.36	908.030	908.40
436.74	-0.12	907.818	907.94
460.73	-0.37	907.500	907.87
480.26	-1.85	907.269	909.12
485.68	-0.06	907.229	907.29
495.89	0.04	907.152	907.11
500.00	0.04	907.121	907.09
520.23	0.05	906.970	906.92
533.92	0.13	906.867	906.73
554.26	0.10	906.714	906.62
558.58	0.03	906.682	906.65
598.07	0.06	906.476	906.42
600.00	-0.07	906.391	906.46
651.33	-0.02	906.030	906.05
657.72	-0.07	905.985	906.06
663.10	0.04	905.947	906.00
677.52	0.12	905.845	905.72
692.70	0.03	905.737	905.65
700.00	0.01	905.685	905.68
729.14	-0.03	905.479	905.51
786.21	-0.53	904.334	904.86
800.00	-1.51	904.300	905.80
814.03	-1.71	904.318	906.06
817.31	-1.75	904.336	906.09
858.31	-1.48	904.206	905.69
860.04	-1.32	904.201	905.52
870.00	-2.44	902.968	905.41
900.00	-1.57	902.871	904.44
908.48	-1.48	902.840	904.32

LONGITUDINAL SECTION - CONTROL CW01
SCALE 1:1000H 1:200V

NOTES:
1. DATUM : AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
3. ALL DESIGN WORKS SHOWN TO BE CONFIRMED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO COMMENCING CONSTRUCTION
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VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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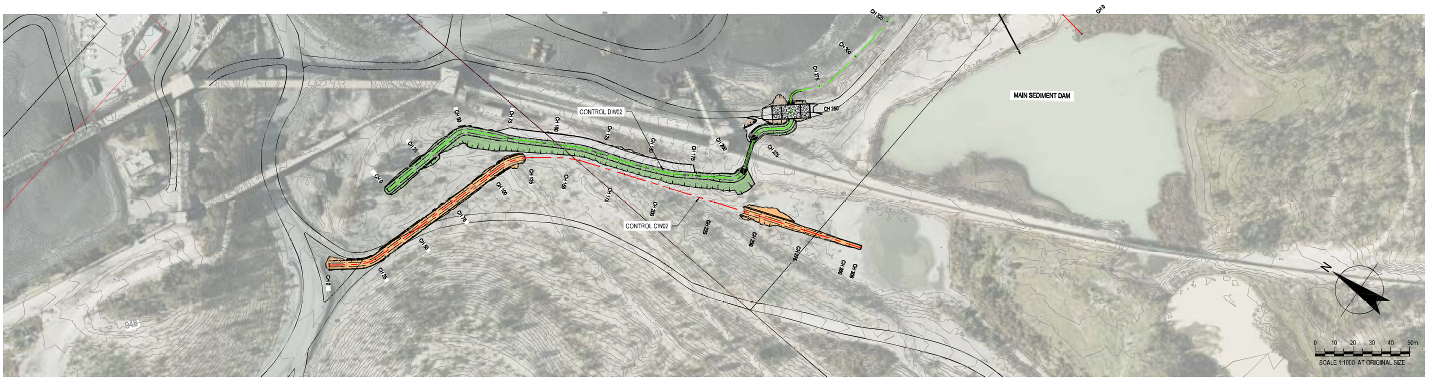
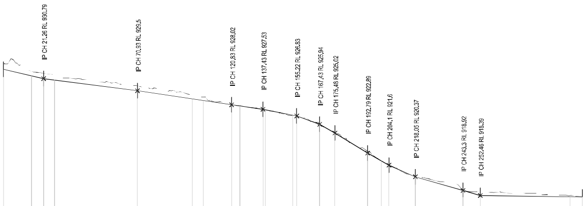
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CLEAN WATER DRAIN CW01**
PLAN AND LONGITUDINAL SECTION SHEET 2

Original Size A1 Drawing No: **21-24377-C321** Rev: UR

Plot Date: 30 January 2017 - 4:40 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg





DATUM RL. 915.00

VERTICAL ALIGNMENT: L=21.26m G=-4.63% | L=49.67m G=-2.58% | L=49.91m G=-2.98% | L=16.6m G=-2.92% | L=17.79m G=-3.93% | L=12.21m G=-7.27% | L=8.05m G=-11.46% | L=17.32m G=-12.33% | L=11.3m G=-11.34% | L=13.96m G=-8.84% | L=25.24m G=-5.73% | L=9.17m G=-5.82% | L=53.98m G=-0.3%

HORIZONTAL ALIGNMENT: L=14.84m | L=12.17m R=-20.00m | L=78.80m | L=19.37m R=30.00m | L=13.41m | L=14.55m R=50.00m | L=153.30m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	-0.63	931.772	932.40
14.84	-0.48	931.085	931.57
21.26	-0.55	930.788	931.34
27.01	-0.57	930.639	931.21
70.93	-0.50	929.504	930.01
100.00	-0.36	928.638	929.00
105.81	-0.37	928.464	928.84
120.83	-0.00	928.016	928.02
125.18	-0.03	927.889	927.92
137.43	0.00	927.531	927.53
138.59	-0.03	927.486	927.52
153.15	0.06	926.913	926.85
155.22	0.00	926.831	926.83
167.43	0.09	925.944	925.85
175.48	0.00	925.022	925.02
192.79	-0.20	922.886	923.09
200.00	0.02	922.069	922.05
204.10	-0.02	921.605	921.62
218.05	0.00	920.371	920.37
243.30	0.00	918.924	918.92
252.46	-0.42	918.390	918.81
300.00	-0.14	918.247	918.39
306.45	-0.04	918.228	918.26

LONGITUDINAL SECTION - CONTROL CW02
SCALE 1:1000H 1:200V

NOTES:
1. DATUM: AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
3. ALL DESIGN WORKS SHOWN TO BE CONFIRMED BY SUITABLY QUALIFIED ENGINEER PRIOR TO COMMENCING CONSTRUCTION
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VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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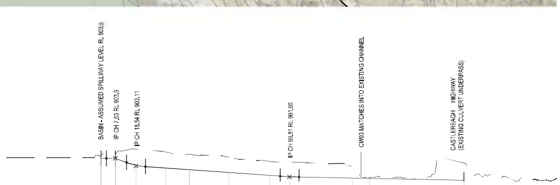
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title CLEAN WATER DRAIN CW02
PLAN AND LONGITUDINAL SECTION
Original Size A1
Drawing No: 21-24377-C322 Rev: B

Plot Date: 30 January 2017 - 4:38 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Technical\Drawings\Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg



DATUM RL. 898.00

VERTICAL ALIGNMENT: L=7.63m | L=5.91m | K=1.7 L=10m | G=0.0% | G=-7.29% | L=71.27m G=-1.42% | K=9.7 L=10m | L=87.38m G=-0.38%

HORIZONTAL ALIGNMENT: L=34.35m | L=12.43m R=-15.00m | L=20.87m | L=21.69m R=-30.00m | L=43.75m | L=9.11m R=5.00m | L=49.98m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	-0.31	903.900	904.21
7.63	-0.56	903.900	904.46
18.54	-1.71	903.178	904.88
34.35	-1.70	902.881	904.58
46.78	-1.62	902.705	904.33
67.65	-1.61	902.410	904.02
89.34	-1.48	902.103	903.59
99.81	-1.57	901.967	903.54
133.09	-1.17	901.826	903.00
142.20	-0.05	901.791	901.84
192.18	-1.82	901.599	903.42

LONGITUDINAL SECTION - CONTROL CW03

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

NOTES:
1. DATUM: AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
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4. ALL CONSTRUCTION WORKS TO BE SUPERVISED BY SUITABLY QUALIFIED ENGINEER
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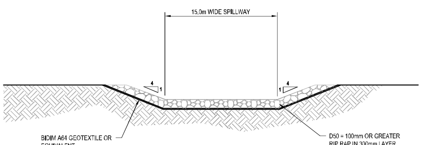
7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES
8. ALL DAM MODIFICATION WORKS ARE TO BE SUPERVISED BY SUITABLY QUALIFIED DAM ENGINEER



SPILLWAY DETAIL

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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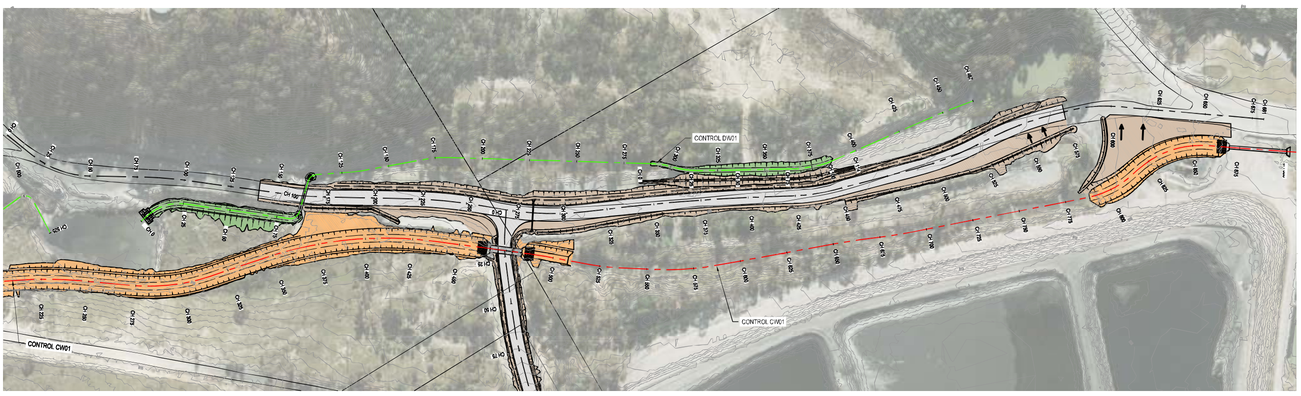
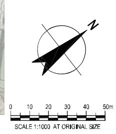
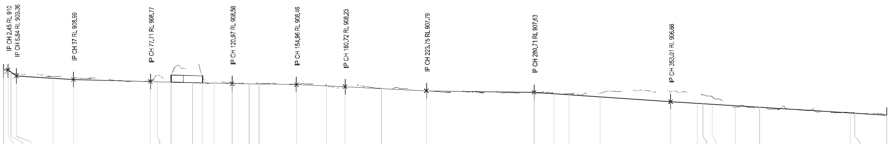
Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
This Drawing must not be used for Construction unless signed as Approved

Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title CLEAN WATER DRAIN CW03
PLAN AND LONGITUDINAL SECTION
Original Size A1
Drawing No: 21-24377-C323 Rev: B

Plot Date: 30 January 2017 - 4:38 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Technical\Drawings\Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg







DATUM RL. 902.00

VERTICAL ALIGNMENT: L=2.45m G=0% | L=4.39m G=-14.56% | L=30.16m G=-1.23% | L=40.71m G=-0.53% | L=43.26m G=-0.49% | L=33.99m G=-0.28% | L=25.76m G=-0.9% | L=43.03m G=-1.02% | L=56.95m G=-0.29% | L=72.31m G=-1.34% | L=114.3m G=-1.25%

HORIZONTAL ALIGNMENT: L=3.93m | L=22.27m R=25.00m | L=55.28m | L=7.16m R=-5.00m | L=16.73m | L=6.10m R=5.00m | L=18.49m | L=5.27m R=-50.00m | L=35.68m | L=10.40m R=50.00m | L=109.98m | L=7.92m R=30.00m | L=2.32m | L=15.62m R=-50.00m | L=51.42m | L=3.04m R=-20.00m | L=4.99m | L=12.14m R=-50.00m | L=60.88m | L=2.30m R=50.00m | L=16.90m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	0.31	910.000	909.69
2.45	0.35	910.000	909.65
3.93	0.16	909.784	909.63
6.84	-0.28	909.360	909.64
26.19	-0.20	909.123	909.32
37.00	-0.23	908.990	909.22
77.71	-0.07	908.774	908.84
81.47	-0.64	908.755	909.40
88.63	-0.91	908.720	909.63
100.00	-1.53	908.663	910.19
105.36	-0.73	908.637	909.37
111.45	0.00	908.607	908.60
120.97	-0.07	908.560	908.62
129.94	-0.03	908.534	908.56
135.22	-0.09	908.519	908.61
154.96	0.00	908.463	908.46
170.90	-0.08	908.320	908.40
180.72	0.15	908.232	908.08
200.00	-0.07	908.036	908.11
223.75	0.08	907.795	907.71
280.71	0.00	907.629	907.63
291.28	-0.10	907.487	907.59
299.19	-0.14	907.381	907.52
315.64	-0.39	907.161	907.55
353.01	-1.05	906.660	907.71
367.06	-1.03	906.484	907.51
370.10	-0.93	906.446	907.37
375.09	-0.76	906.384	907.14
387.23	0.14	906.232	906.09
400.00	0.07	906.072	906.00
448.11	-0.02	905.469	905.49
450.41	-0.08	905.440	905.52
467.31	-0.00	905.229	905.23

LONGITUDINAL SECTION - CONTROL DW01
SCALE 1:1000H 1:200V

NOTES:
1. DATUM : AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **DIRTY WATER DRAIN DW01 PLAN AND LONGITUDINAL SECTION**
Original Size A1 Drawing No: **21-24377-C324** Rev: **B**

Plot Date: 30 January 2017 - 4:38 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg

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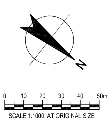
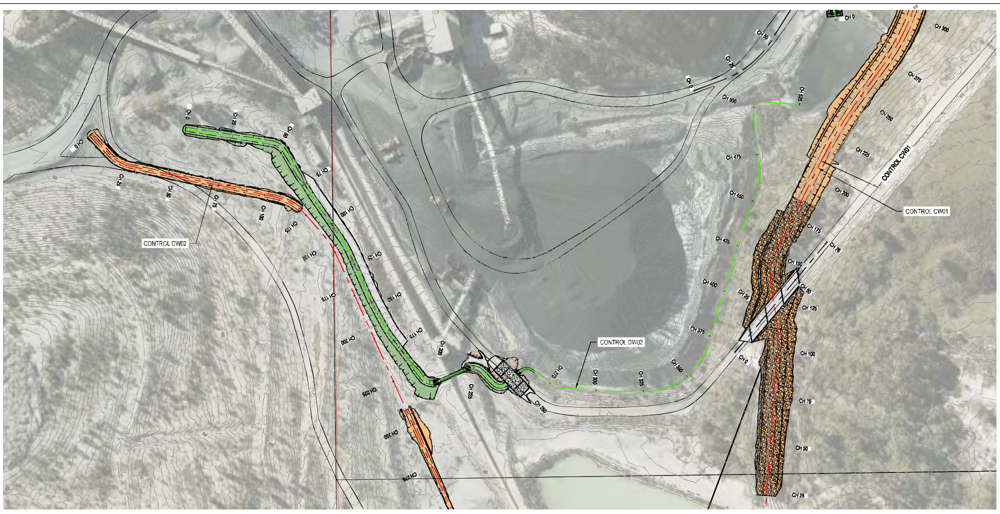
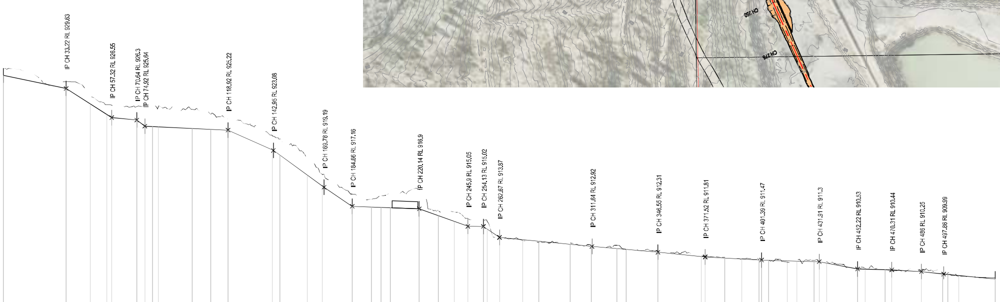
7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES







DATUM RL. 906.00

VERTICAL ALIGNMENT: L=33.22m G=-4.2% | L=24.1m G=-12.79% | L=13.32m G=-1.8% | L=4.28m G=-15.4% | L=44m G=-0.95% | L=24.04m G=-8.93% | L=26.82m G=-14.51% | L=14.88m G=-13.6% | L=35.48m G=-0.75% | L=25.77m G=-7.17% | L=8.23m G=-0.3% | L=8.54m G=-13.49% | L=48.96m G=-1.95% | L=34.92m G=-1.75% | L=24.96m G=-2% | L=29.87m G=-1.12% | L=30.52m G=-0.55% | L=20.31m G=-3.81% | L=18.09m G=-0.49% | L=15.69m G=-1.18% | L=11.86m G=-2.24% | L=27.23m G=-1.87%

HORIZONTAL ALIGNMENT: L=46.02m | L=8.74m R=10.00m | L=24.25m | L=3.13m R=-50.00m | L=27.71m | L=9.53m R=50.00m | L=23.06m | L=3.95m R=-50.00m | L=14.48m | L=7.93m R=-50.00m | L=26.05m | L=10.08m R=-7.50m | L=16.16m | L=9.23m R=7.50m | L=8.35m | L=7.93m R=-5.00m | L=9.51m | L=7.03m R=5.00m | L=11.73m | L=8.54m R=-15.00m | L=27.79m | L=13.67m R=-100.00m | L=4.86m | L=39.73m R=-33.00m | L=12.48m | L=9.04m R=200.00m | L=14.09m | L=9.96m R=-100.00m | L=5.06m | L=9.02m R=100.00m | L=6.73m | L=2.40m R=50.00m | L=20.02m | L=10.58m R=-25.00m | L=30.43m | L=8.57m R=5.00m | L=19.25m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	-0.71	931.030	931.74
33.22	-0.73	929.635	930.37
46.02	-0.80	927.998	928.79
54.76	-1.05	926.879	927.93
57.32	-1.31	926.551	927.87
70.64	-1.42	926.302	927.72
74.92	-2.24	925.643	927.89
79.01	-2.23	925.604	927.83
82.14	-2.16	925.574	927.73
100.00	-2.03	925.403	927.43
109.84	-1.59	925.310	926.90
118.92	-1.18	925.223	926.40
142.43	-1.52	923.124	924.64
146.38	-1.76	922.581	924.34
160.86	-1.82	920.479	922.30
168.79	-1.22	919.329	920.55
184.66	-1.30	917.163	918.46
194.85	-0.84	917.086	917.93
200.00	-1.21	917.048	918.26
204.92	-1.54	917.011	918.55
220.14	-2.05	916.896	918.95
230.32	-0.53	916.167	916.69
238.67	-1.00	915.568	916.57
245.90	-0.85	915.050	915.90
254.13	-0.64	915.025	915.66
256.11	-0.85	914.758	915.60
262.67	-0.01	913.872	913.88
274.87	0.07	913.635	913.56
283.41	0.11	913.468	913.36
300.00	-0.15	913.145	913.29
311.19	-0.15	912.927	913.07
324.86	-0.35	912.687	913.04
329.72	0.01	912.601	912.59
346.55	-0.14	912.306	912.45
369.45	-0.09	911.848	911.93
371.52	-0.07	911.806	911.88
381.93	-0.06	911.690	911.75
390.97	-0.04	911.588	911.63
400.00	-0.00	911.487	911.49
401.39	0.09	911.472	911.39
405.06	0.01	911.452	911.44
415.02	0.15	911.396	911.25
420.09	-0.18	911.368	911.55
429.11	-0.12	911.319	911.43
431.91	-0.18	911.303	911.48
435.84	-0.15	911.153	911.30
452.22	-0.11	910.529	910.64
456.26	-0.08	910.509	910.59
466.84	0.08	910.456	910.38
470.31	0.12	910.439	910.32
486.00	-0.13	910.253	910.38
497.27	-0.01	910.001	910.01
500.00	-0.16	909.947	910.11
505.84	0.03	909.838	909.80
525.09	-0.13	909.478	909.61

LONGITUDINAL SECTION - CONTROL DW02
SCALE 1:1000H 1:200V

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**

Title **DIRTY WATER DRAIN DW02 PLAN AND LONGITUDINAL SECTION**
Original Size A1 Drawing No: **21-24377-C325** Rev: **B**

Plot Date: 30 January 2017 - 4:38 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C320 DRAIN LSECT.dwg

NOTES:
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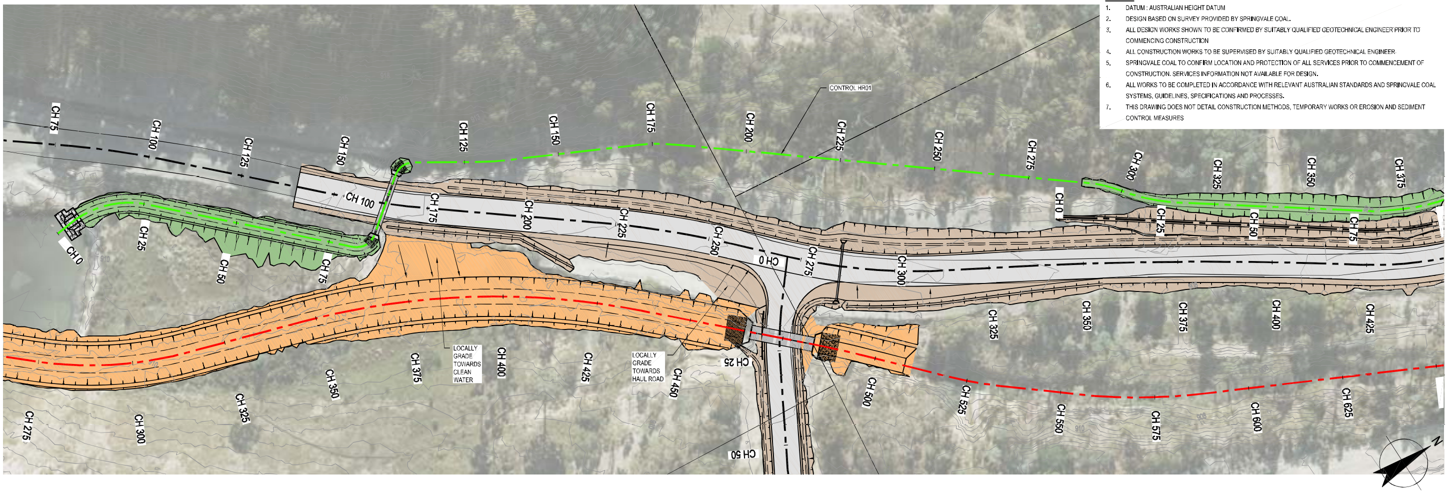
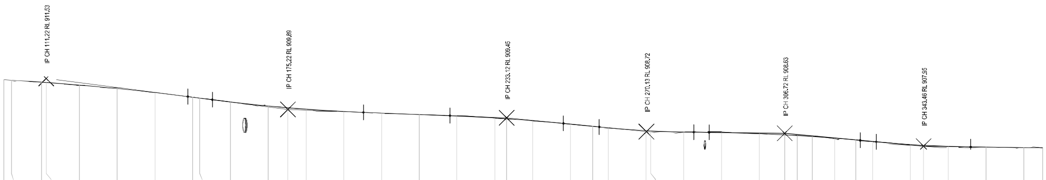


SCALE 1:500 AT ORIGINAL SIZE



DATUM RL. 906.00

VERTICAL ALIGNMENT: K=33.16 L=75m; L=6.5m G=-2.56%; K=22.32 L=40m; L=22.9m G=-0.77%; K=24.9 L=30m; L=9.51m G=-1.97%; K=14.49 L=25m; L=4.08m G=-0.26%; K=25 L=40m; L=4.24m G=-1.85%; K=16.17 L=25m; L=171.03m G=-0.3%

HORIZONTAL ALIGNMENT: L=23.50m R=200.00m; L=49.81m; L=23.34m R=-200.00m; L=44.75m; L=35.95m R=250.00m; L=15.42m; L=42.70m R=-150.00m; L=11.55m; L=91.92m R=1000.00m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
100.00	0.06	911.457	911.40
102.04	0.05	911.434	911.38
110.00	0.01	911.333	911.32
111.22	0.01	911.315	911.30
120.00	0.01	911.178	911.16
130.00	-0.05	910.994	911.05
140.00	-0.00	910.779	910.78
150.00	0.01	910.535	910.53
151.85	-0.05	910.488	910.54
160.00	0.01	910.284	910.28
170.00	-0.02	910.072	910.09
175.19	0.01	909.980	909.97
180.00	-0.00	909.905	909.91
190.00	0.01	909.782	909.77
200.00	0.02	909.699	909.68
210.00	0.01	909.623	909.61
219.94	-0.02	909.546	909.56
230.00	0.01	909.441	909.43
233.12	0.01	909.400	909.39
240.00	0.02	909.296	909.28
250.00	0.01	909.112	909.10
255.89	0.03	908.996	908.97
260.00	0.03	908.917	908.89
270.00	0.08	908.771	908.69
271.31	0.08	908.757	908.67
280.00	0.01	908.693	908.68
290.00	-0.04	908.664	908.71
300.00	0.00	908.606	908.61
306.72	0.01	908.545	908.54
310.00	-0.01	908.509	908.52
314.01	-0.03	908.458	908.49
320.00	0.05	908.371	908.32
325.56	0.04	908.277	908.24
330.00	0.03	908.195	908.17
340.00	0.05	908.036	907.99
343.46	0.05	907.995	907.94
350.00	0.07	907.938	907.87
360.00	0.01	907.897	907.88
370.00	-0.01	907.867	907.88
375.00	-0.01	907.851	907.86

LONGITUDINAL SECTION - CONTROL HR01
SCALE 1:500H 1:100V

VERTICAL 1:100 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	24.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
This Drawing must not be used for Construction unless signed as Approved

Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title HAUL ROAD HR01
PLAN AND LONGITUDINAL SECTION SHEET 1

Original Size A1 Drawing No: 21-24377-C330 Rev: B

Plot Date: 30 January 2017 - 4:37 PM

NOTES:
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4. ALL CONSTRUCTION WORKS TO BE SUPERVISED BY SUITABLY QUALIFIED GEOTECHNICAL ENGINEER
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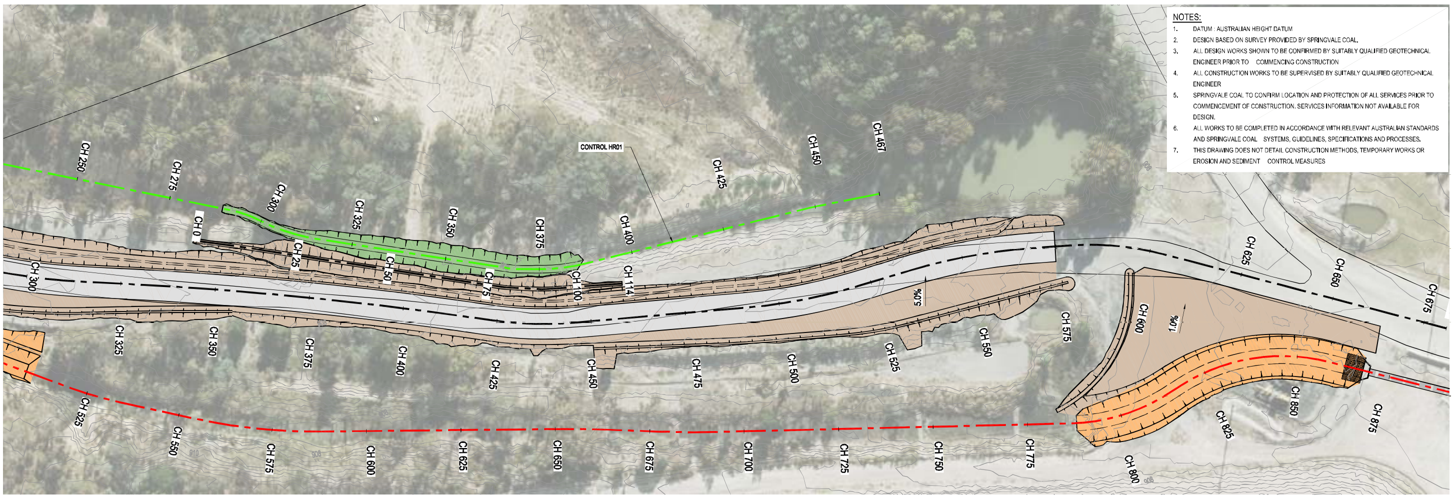

SCALE 1:500 AT ORIGINAL SIZE

DATUM RL. 904.00

VERTICAL ALIGNMENT: L=171.03m G=-0.3%; K=10.85 L=40m; L=1.76m G=-3.99%; K=4.55 L=20m; L=7.89m G=0.41%; K=13.95 L=25m; L=59.46m G=-1.38%

HORIZONTAL ALIGNMENT: L=91.92m R=1000.00m; L=5.79m; L=22.88m R=-100.00m; L=44.64m; L=30.88m R=-150.00m; L=13.75m; L=33.17m R=150.00m; L=10.19m; L=24.55m R=75.00m; L=77.77m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
365.00	-0.00	907.882	907.88
370.00	-0.01	907.867	907.88
380.00	0.02	907.836	907.82
390.00	0.08	907.806	907.72
400.00	0.12	907.776	907.65
410.00	0.26	907.746	907.48
417.47	0.29	907.724	907.43
420.00	0.31	907.716	907.41
423.27	0.32	907.706	907.38
430.00	0.35	907.686	907.33
440.00	0.39	907.656	907.27
446.15	0.30	907.637	907.34
450.00	0.30	907.626	907.32
460.00	0.19	907.595	907.41
470.00	0.02	907.565	907.54
480.00	0.01	907.535	907.53
490.00	-0.03	907.505	907.53
500.00	0.07	907.475	907.41
510.00	0.10	907.445	907.35
520.00	0.10	907.415	907.32
521.67	0.10	907.410	907.31
530.00	-0.07	907.380	907.45
535.42	0.02	907.335	907.31
540.00	-0.00	907.276	907.28
546.99	-0.02	907.149	907.16
550.00	-0.03	907.080	907.11
560.00	-0.01	906.792	906.81
568.59	0.03	906.472	906.44
570.00	0.01	906.417	906.41
578.75	0.00	906.176	906.17
580.00	0.00	906.156	906.15
590.00			906.11
600.00			906.17
603.33			906.18
609.14			906.15
620.00			906.05
630.00			905.92
640.00			905.74
650.00			905.58

LONGITUDINAL SECTION - CONTROL HR01
SCALE 1:500H 1:100V

VERTICAL 1:100 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drawn M.COLLINGS | Designer L. HAMMERSLEY
Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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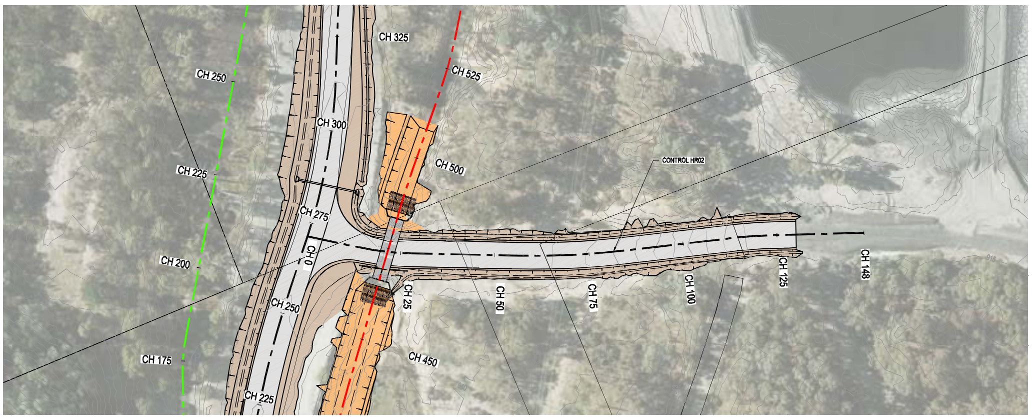
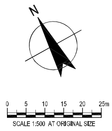
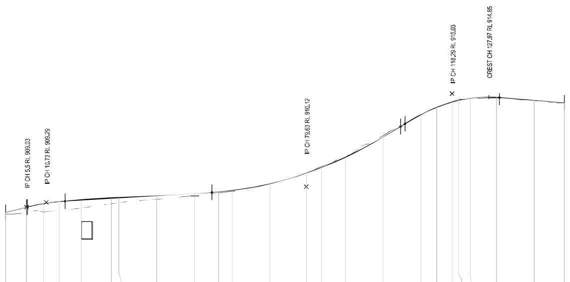
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title HAUL ROAD HR01
PLAN AND LONGITUDINAL SECTION SHEET 2

Original Size A1 Drawing No: 21-24377-C331 Rev: A

Plot Date: 30 January 2017 - 4:37 PM







DATUM RL. 905.00

VERTICAL ALIGNMENT: L=5.5m G=4.96% | L=0.23m G=4.95% | K=2.67 L=10m | L=38.89m G=1.2% | K=4.35 L=50m | L=1.16m G=12.7% | K=1.75 L=25m | L=17.24m G=-1.61%

HORIZONTAL ALIGNMENT: L=14.15m | L=13.87m R=-75.00m | L=28.39m | L=27.19m R=-200.00m | L=30.57m | L=8.93m R=100.00m | L=24.91m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	0.08	908.757	908.67
5.50	0.31	909.030	908.72
10.00	0.45	909.218	908.77
14.15	0.46	909.325	908.87
20.00	0.42	909.400	908.98
28.03	0.29	909.496	909.21
30.00	0.25	909.520	909.27
40.00	0.19	909.640	909.44
50.00	0.13	909.760	909.63
56.42	0.05	909.841	909.79
60.00	0.04	909.913	909.87
70.00	0.01	910.272	910.26
79.63	-0.01	910.834	910.85
83.61	-0.04	911.129	911.17
90.00	-0.04	911.679	911.72
100.00	-0.08	912.728	912.81
110.00	0.04	913.922	913.88
114.18	-0.03	914.303	914.33
118.29	-0.03	914.578	914.61
120.00	-0.04	914.665	914.71
123.12	0.03	914.779	914.75
130.00	0.03	914.835	914.81
140.00	0.02	914.676	914.66
148.03	0.01	914.547	914.54

LONGITUDINAL SECTION - CONTROL HR02
SCALE 1:500H 1:100V

NOTES:
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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

VERTICAL 1:100 AT ORIGINAL SIZE 0 1 2 3 4 5m
HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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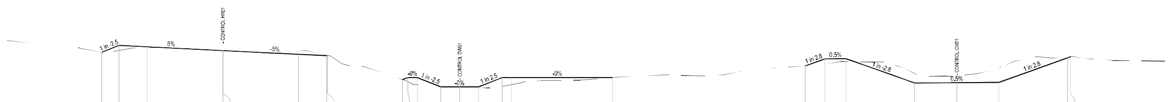
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **ACCESS ROAD HR02**
PLAN AND LONGITUDINAL SECTION

Original Size A1 Drawing No: **21-24377-C332** Rev: A

Plot Date: 30 January 2017 - 4:37 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C330 ROAD LSECT.dwg



DATUM R.L. 908.00

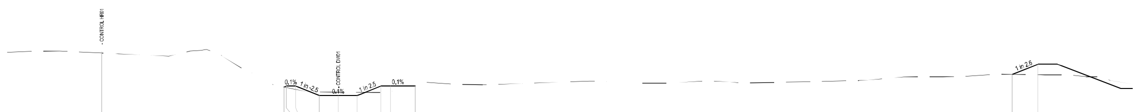
OFFSET FROM CENTRELINE	DESIGN SURFACE LEVEL	DEPTH CUT - / FILL +	EXISTING SURFACE LEVEL
-6.42	910.687	0	910.69
-5.5	911.054	0.27	910.78
-4	910.979	0.05	910.93
0	910.779	-0	910.78
0	910.779	-0	910.78
4	910.579	-0.18	910.76
5.5	910.504	-0.03	910.54
5.55	910.525	0	910.52
9.51	909.232	-0.01	909.24
9.8	909.347	0.23	909.12
10.3	909.347	0.38	908.97
11.55	908.847	-0.07	908.92
12.55	908.847	-0.02	908.87
13.55	908.847	0.03	908.81
14.8	909.347	0.47	908.88
15.3	909.347	0.38	908.97
20.64	909.347	-0	909.35
30.85	909.96	0	909.96
31.89	910.339	0.28	910.06
33.01	910.344	0.15	910.19
36.64	909.061	-0.5	909.56
38.88	909.071	-0.36	909.43
41.11	909.082	-0.78	909.86
44.74	910.399	-0.04	910.44
44.9	910.454	-0	910.46

CH 140

DATUM R.L. 908.00

OFFSET FROM CENTRELINE	DESIGN SURFACE LEVEL	DEPTH CUT - / FILL +	EXISTING SURFACE LEVEL
0	911.178	0.01	911.16
9.41	909.321	0	909.32
9.74	909.454	0.26	909.2
10.24	909.454	0.32	909.13
11.49	908.954	-0.16	909.11
12.49	908.954	-0.16	909.11
13.49	908.954	-0.16	909.11
14.74	909.454	0.34	909.12
15.24	909.454	0.27	909.19
18.37	909.453	0	909.45
40.86	910.206	-0	910.21
41.87	910.571	0.29	910.28
42.99	910.576	0.23	910.34
46.62	909.293	-0.3	909.6
48.85	909.303	-0.38	909.69

CH 120



DATUM R.L. 908.00

OFFSET FROM CENTRELINE	DESIGN SURFACE LEVEL	DEPTH CUT - / FILL +	EXISTING SURFACE LEVEL
0	911.457	0.06	911.4
9.65	909.599	0	909.6
9.77	909.648	0.07	909.57
10.27	909.648	0.17	909.48
11.53	909.149	-0.18	909.33
12.53	909.15	-0.18	909.33
13.53	909.151	-0.17	909.32
14.79	909.653	0.34	909.31
15.29	909.653	0.29	909.37
16.61	909.655	0	909.65
48.23	910.27	0	910.27
49.6	910.801	0.55	910.25

CH 100

NOTES:
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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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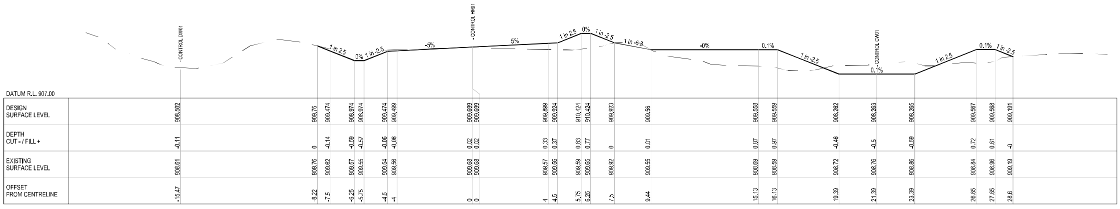
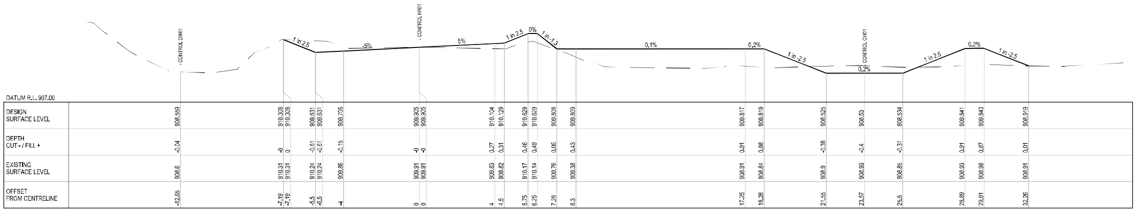
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 1 OF 10

Original Size A1 Drawing No: **21-24377-C340** Rev: A

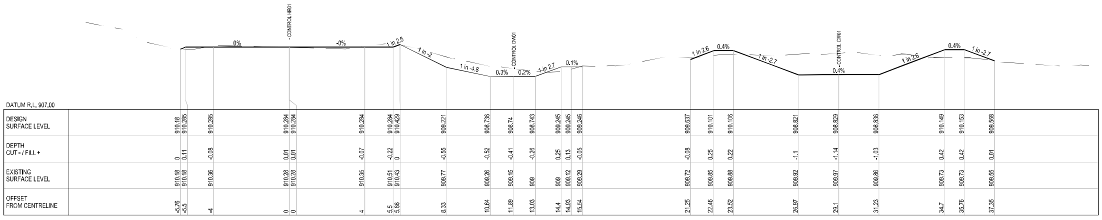
Plot Date: 30 January 2017 - 4:36 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C340 ROAD XSECT.dwg



CH 200



CH 180



CH 160

NOTES:

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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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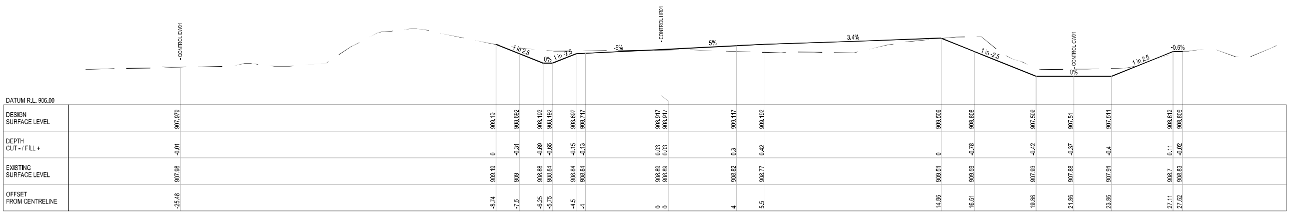
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 2 OF 10
Original Size A1 Drawing No: **21-24377-C341** Rev: A

Plot Date: 30 January 2017 - 4:35 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C341.dwg



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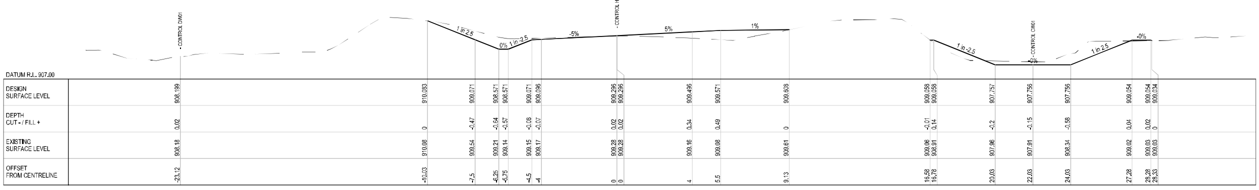
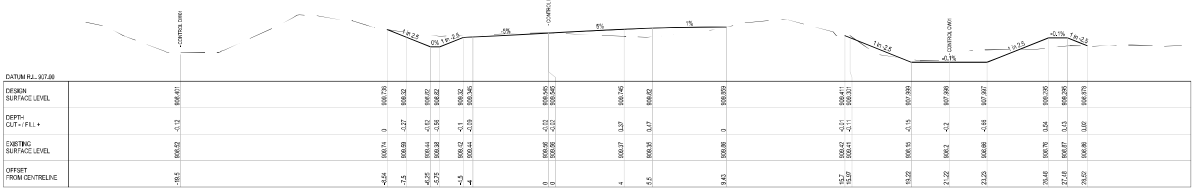


CH 240



CH 220

NOTES:

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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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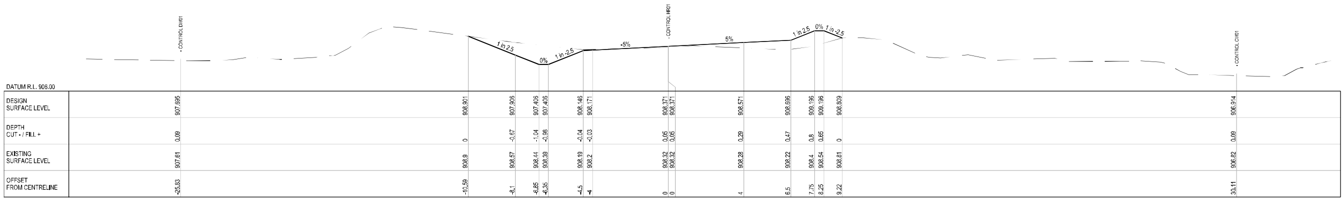
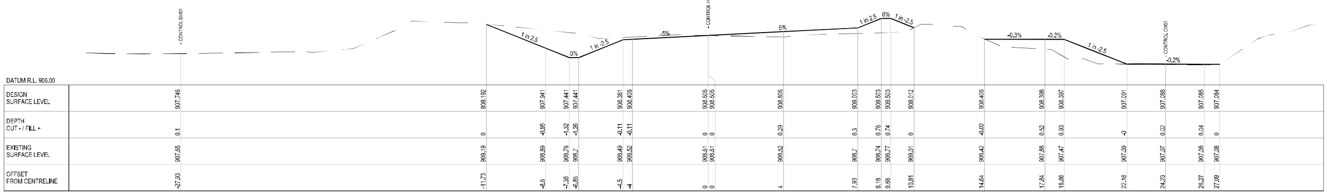
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 3 OF 10
Original Size A1 Drawing No: **21-24377-C342** Rev: A

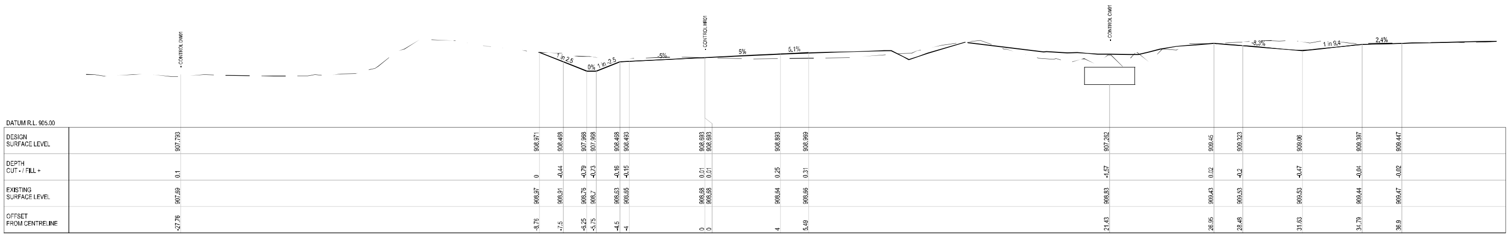
Plot Date: 30 January 2017 - 4:35 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C342.dwg



CH 320



CH 300



CH 280

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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
Scale AS SHOWN
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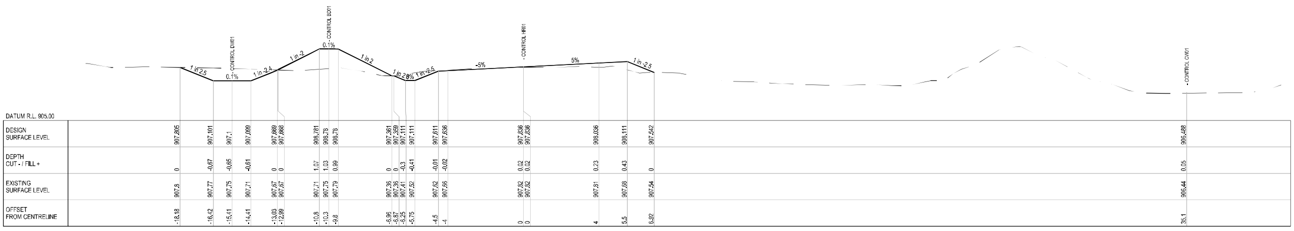
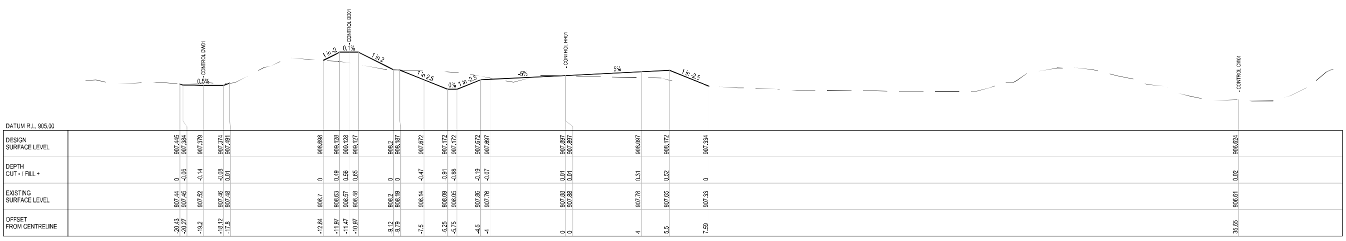
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 4 OF 10

Original Size A1 Drawing No: **21-24377-C343** Rev: A

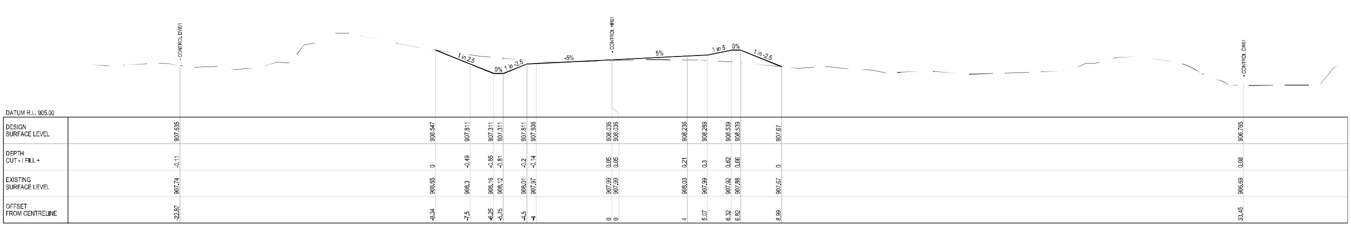
Plot Date: 30 January 2017 - 4:34 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C343.dwg



CH 380



CH 360



CH 340

NOTES:

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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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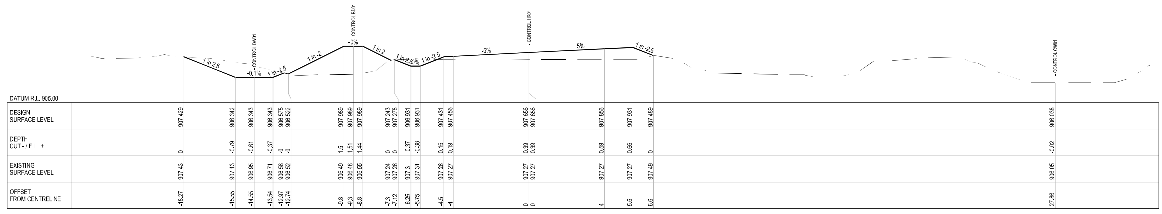
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 5 OF 10

Original Size A1 Drawing No: **21-24377-C344** Rev: A

Plot Date: 30 January 2017 - 4:34 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C344.dwg



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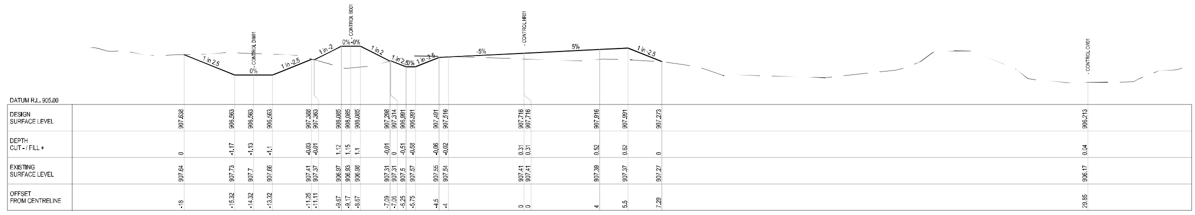
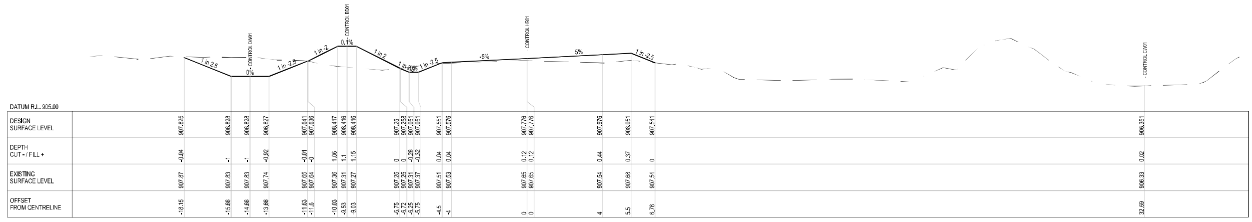


CH 420



CH 400

NOTES:

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6. ALL WORKS TO BE COMPLETED IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARDS AND SPRINGVALE COAL SYSTEMS, GUIDELINES, SPECIFICATIONS AND PROCESSES.
7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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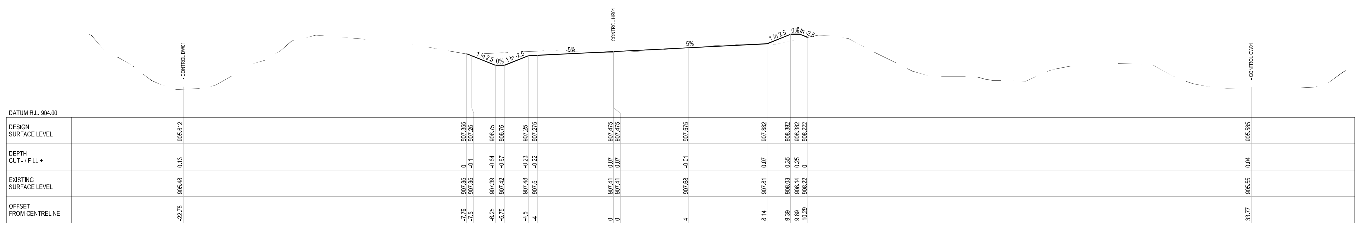
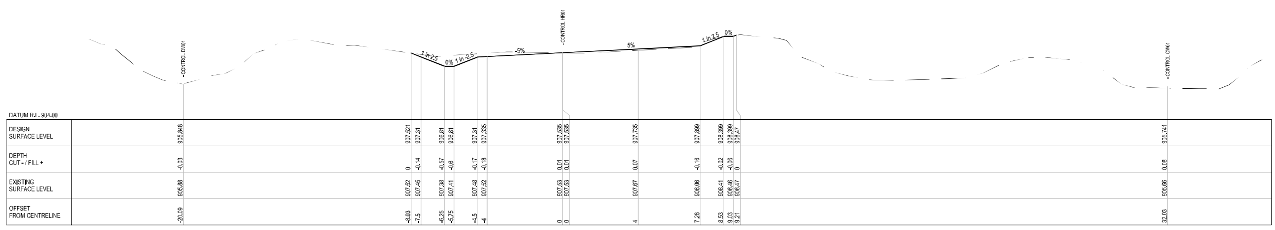
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 6 OF 10

Original Size A1 **Drawing No: 21-24377-C345** Rev: A

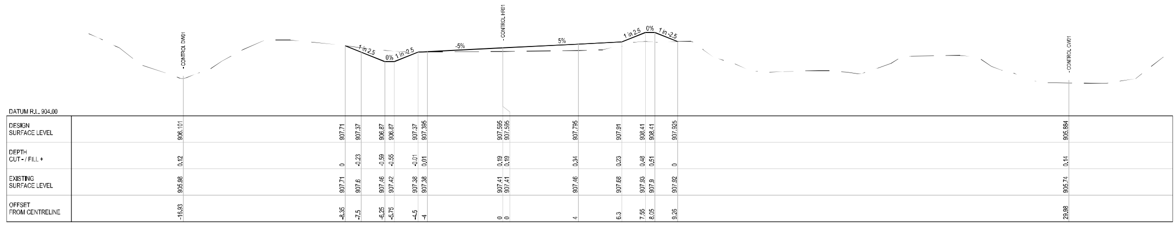
Plot Date: 30 January 2017 - 4:34 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18684\Tech\responses\tt-Transmit DWGs\tt-Transmit DWGs\21-24377-C345.dwg



CH 500



CH 480



CH 460

NOTES:

1. DATUM : AUSTRALIAN HEIGHT DATUM
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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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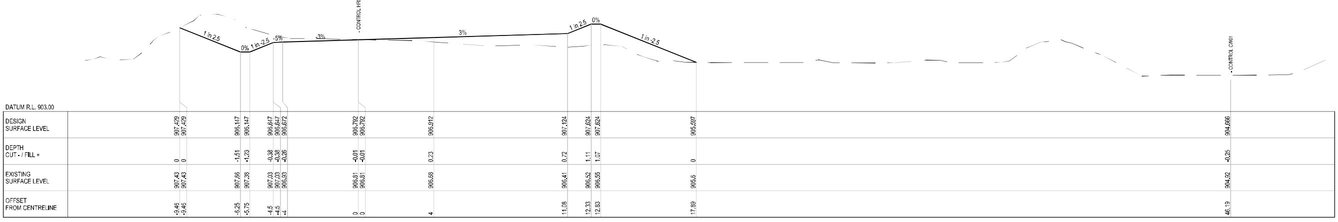
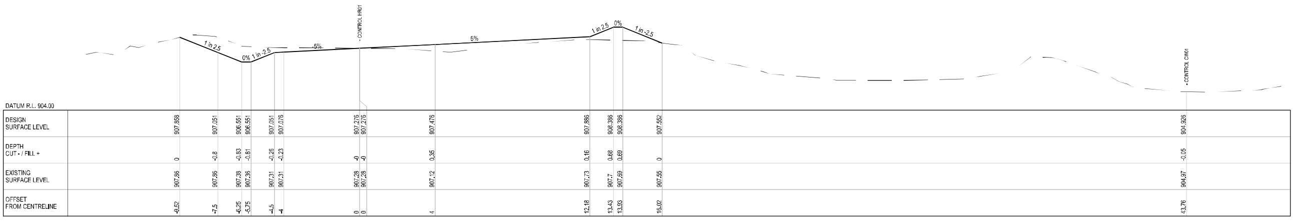
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 7 OF 10

Original Size A1 **Drawing No: 21-24377-C346** Rev: A

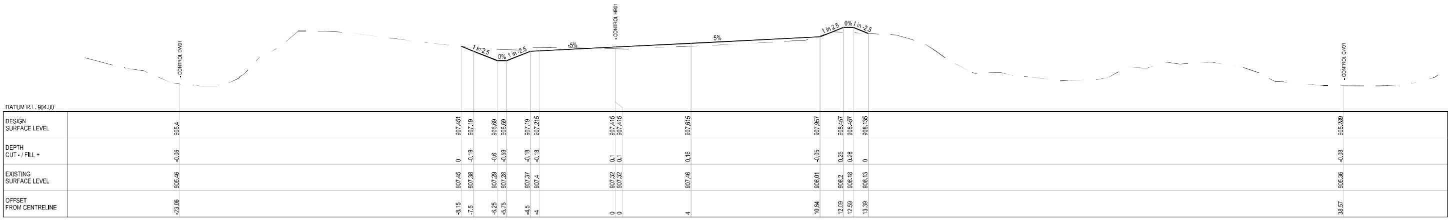
Plot Date: 30 January 2017 - 4:33 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18684\Tech\responses\tt-Transmit DWGs\tt-Transmit DWGs\21-24377-C346.dwg



CH 560



CH 540



CH 520

NOTES:

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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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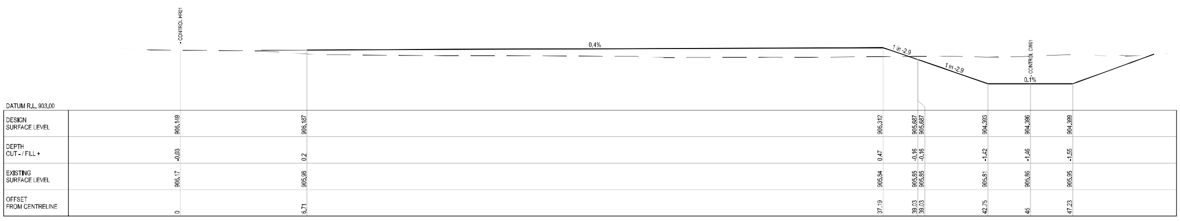
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 8 OF 10

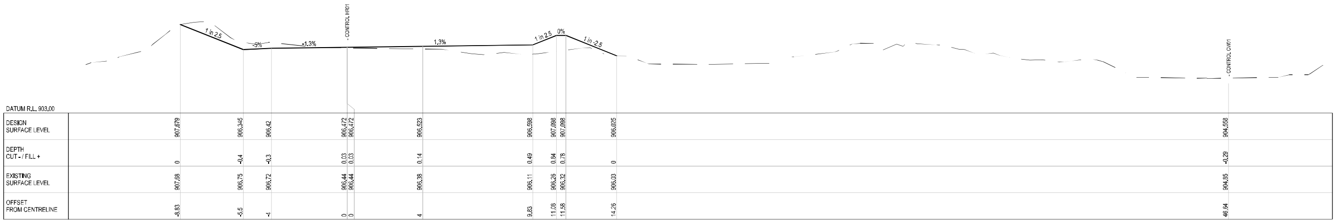
Original Size A1 Drawing No: **21-24377-C347** Rev: A

Plot Date: 30 January 2017 - 4:33 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C347.dwg



CH 600

CH 580



CH 569

NOTES:

1. DATUM : AUSTRALIAN HEIGHT DATUM
2. DESIGN BASED ON SURVEY PROVIDED BY SPRINGVALE COAL.
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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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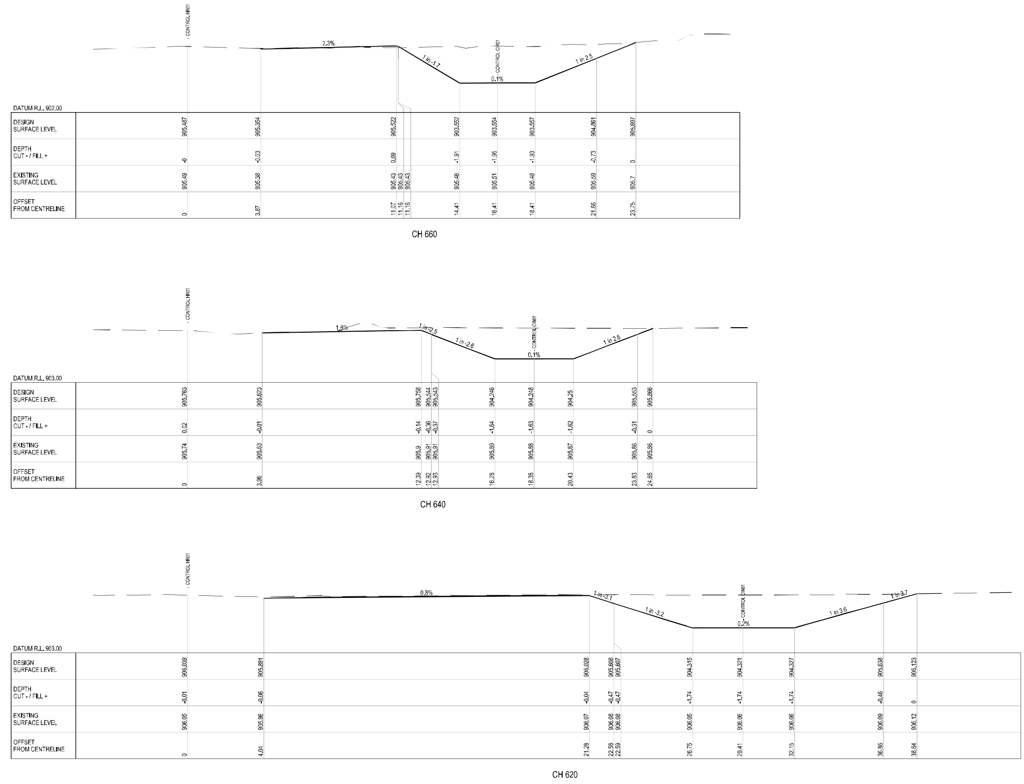
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 9 OF 10

Original Size A1 Drawing No: **21-24377-C348** Rev: A

Plot Date: 30 January 2017 - 4:32 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C348.dwg



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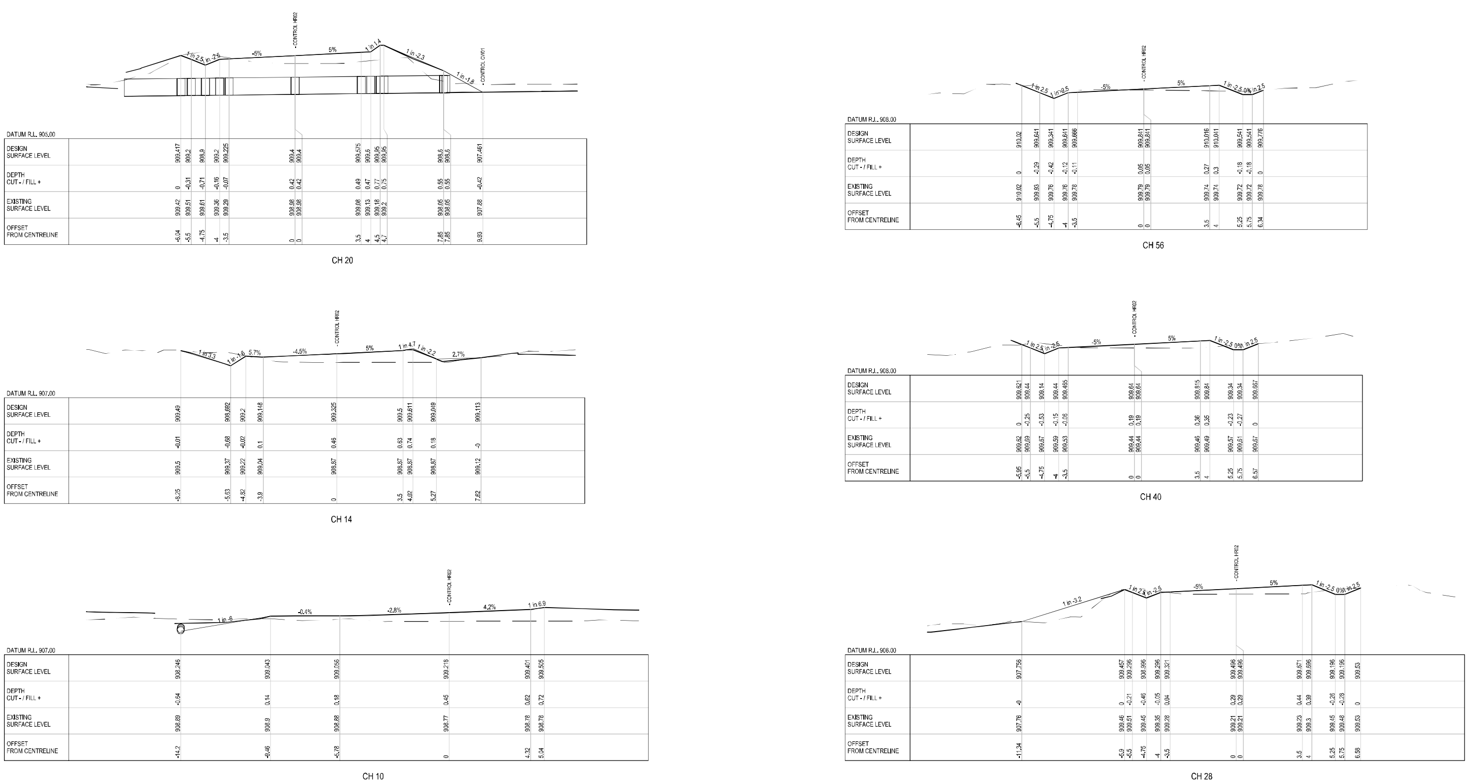
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR01**
CROSS SECTIONS - SHEET 10 OF 10

Original Size A1 Drawing No: **21-24377-C349** Rev: **A**

Plot Date: 30 January 2017 - 4:32 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C349.dwg



NOTES:

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Approved (Project Director)
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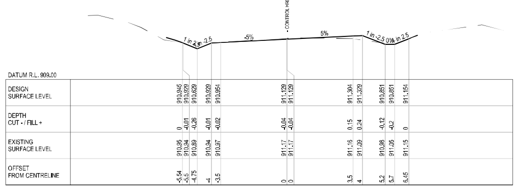
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR02**
CROSS SECTIONS - SHEET 1 OF 2

Original Size A1 Drawing No: **21-24377-C350** Rev: **A**

Plot Date: 30 January 2017 - 4:31 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C350.dwg



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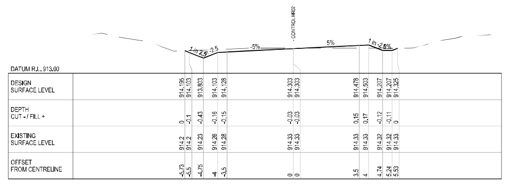
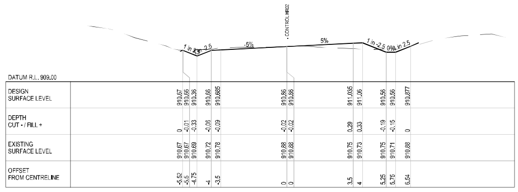
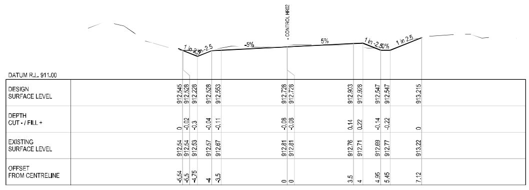


CH 114



CH 80



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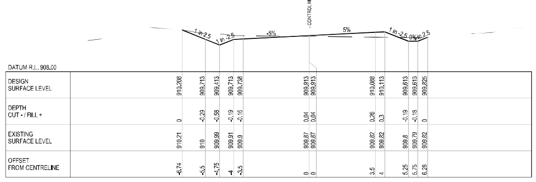
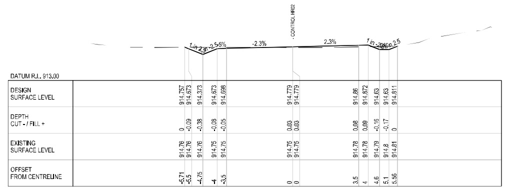
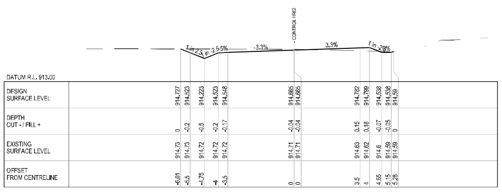


CH 60



CH 123



CH 120

NOTES:

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SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
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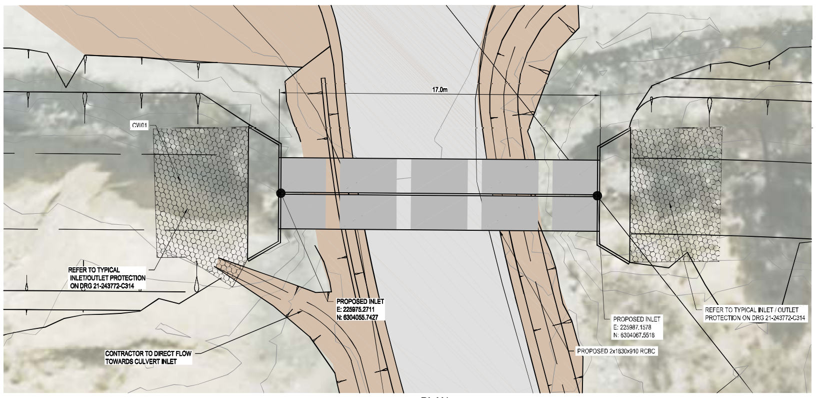
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD HR02**
CROSS SECTIONS - SHEET 2 OF 2

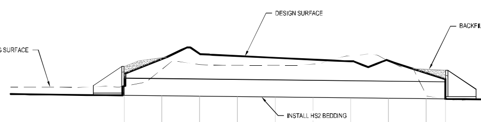
Original Size A1 **Drawing No: 21-24377-C351** **Rev: A**

Plot Date: 30 January 2017 - 4:31 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C351.dwg



PLAN
SCALE 1:100

SCALE 1:100 AT ORIGINAL SIZE



DATUM RL. 905.00

VERTICAL ALIGNMENT	L=17.02m G=-1.11%									
HORIZONTAL ALIGNMENT	L=17.02m									
FINISHED SURFACE LEVELS	907.93	909.36	909.63	909.52	909.42	909.33	909.24	909.28	908.62	907.26
LEVEL DIFFERENCE TO FSL CUT - / FILL +	-0.49	-1.95	-2.24	-2.15	-2.07	-2.00	-1.93	-1.99	-1.36	-0.01
PROGRESSIVE INVERT LEVEL	907.438	907.416	907.394	907.371	907.349	907.327	907.305	907.282	907.260	907.249
EXISTING SURFACE LEVEL	907.93	908.81	909.06	909.03	909.03	909.08	909.53	909.25	907.46	907.26
CHAINAGE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	17.02

LONGITUDINAL SECTION - CULVERT CW01-A
SCALE 1:1

NOTES:

1. DATUM : AUSTRALIAN HEIGHT DATUM
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No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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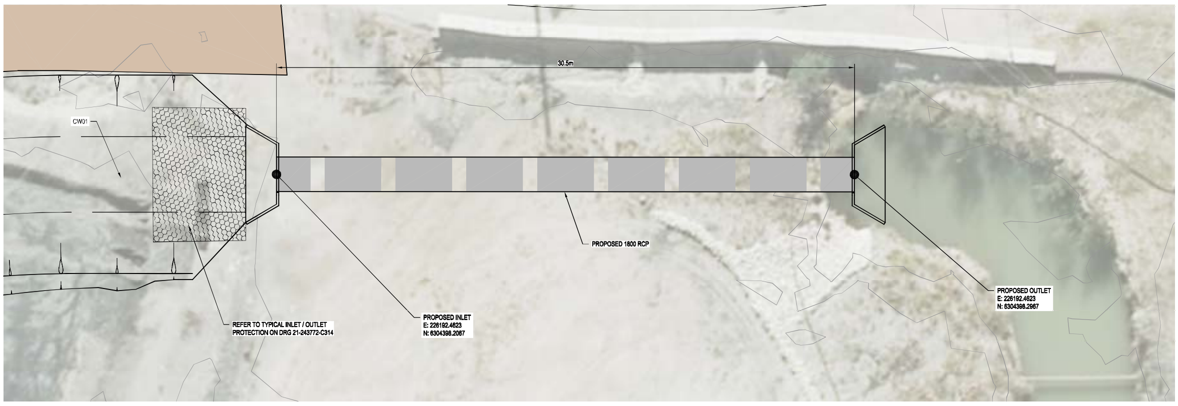
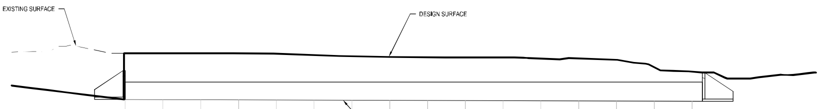
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CLEAN WATER CULVERT CW01-A**
PLAN & ELEVATION

Original Size A1 **Drawing No: 21-24377-C360** **Rev: A**

Plot Date: 30 January 2017 - 4:30 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C360-CULVERTS.dwg



PLAN
SCALE 1:100



DATUM RL. 901.00

VERTICAL ALIGNMENT	L=30.55m G=-0.32%															
HORIZONTAL ALIGNMENT	L=30.55m															
FINISHED SURFACE LEVELS	905.41	905.41	905.41	905.41	905.39	905.32	905.26	905.22	905.20	905.19	905.19	905.13	905.15	905.07	904.67	904.44
LEVEL DIFFERENCE TO FSL CUT - / FILL +	-2.44	-2.45	-2.46	-2.46	-2.45	-2.38	-2.33	-2.30	-2.28	-2.28	-2.29	-2.24	-2.26	-2.18	-1.80	-1.57
PROGRESSIVE INVERT LEVEL	902.968	902.961	902.955	902.948	902.942	902.935	902.929	902.922	902.916	902.909	902.903	902.896	902.890	902.884	902.877	902.871
EXISTING SURFACE LEVEL	905.41	905.41	905.41	905.41	905.39	905.32	905.26	905.22	905.20	905.19	905.19	905.13	905.15	905.07	904.67	904.44
CHAINAGE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00

LONGITUDINAL SECTION - CULVERT CW01-B
SCALE 1:1

NOTES:
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7. THIS DRAWING DOES NOT DETAIL CONSTRUCTION METHODS, TEMPORARY WORKS OR EROSION AND SEDIMENT CONTROL MEASURES

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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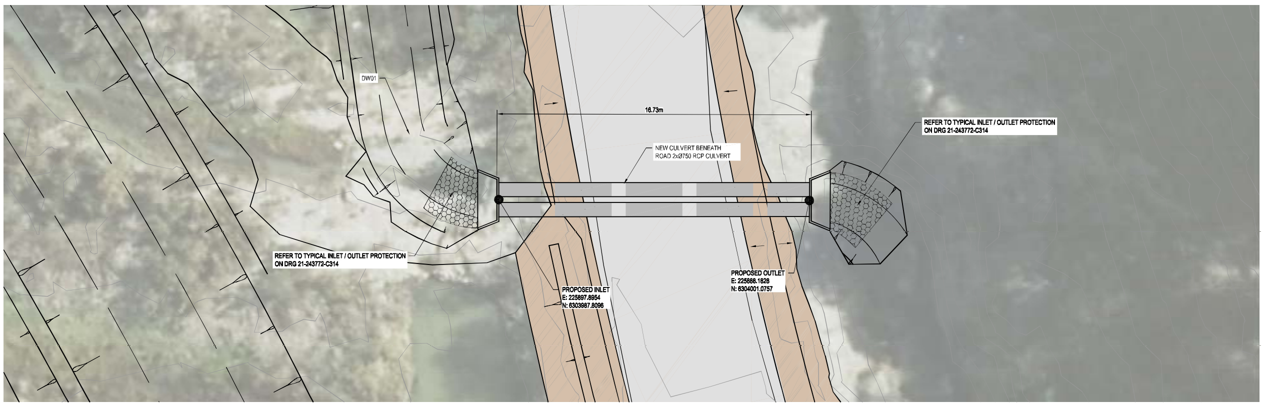
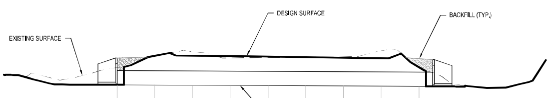
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CLEAN WATER CULVERT CW01-B PLAN & ELEVATION**

Original Size A1 Drawing No: **21-24377-C361** Rev: A

Plot Date: 30 January 2017 - 4:30 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C360 CULVERTS.dwg



PLAN
SCALE 1:100



DATUM RL. 907.00

VERTICAL ALIGNMENT	L=16.73m G=-0.49%								
HORIZONTAL ALIGNMENT	L=16.73m								
FINISHED SURFACE LEVELS	908.72	910.25	910.25	910.23	910.21	910.18	910.15	910.11	909.65
LEVEL DIFFERENCE TO FSL CUT - / FILL +	0.00	-1.54	-1.55	-1.54	-1.53	-1.51	-1.49	-1.46	-1.01
PROGRESSIVE INVERT LEVEL	908.720	908.710	908.700	908.690	908.680	908.670	908.660	908.650	908.640
EXISTING SURFACE LEVEL	909.63	910.25	910.47	910.14	910.16	910.18	910.20	910.52	909.65
CHAINAGE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00

LONGITUDINAL SECTION - CULVERT DW01-A
SCALE 1:1

NOTES:
1. DATUM : AUSTRALIAN HEIGHT DATUM
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0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
Date
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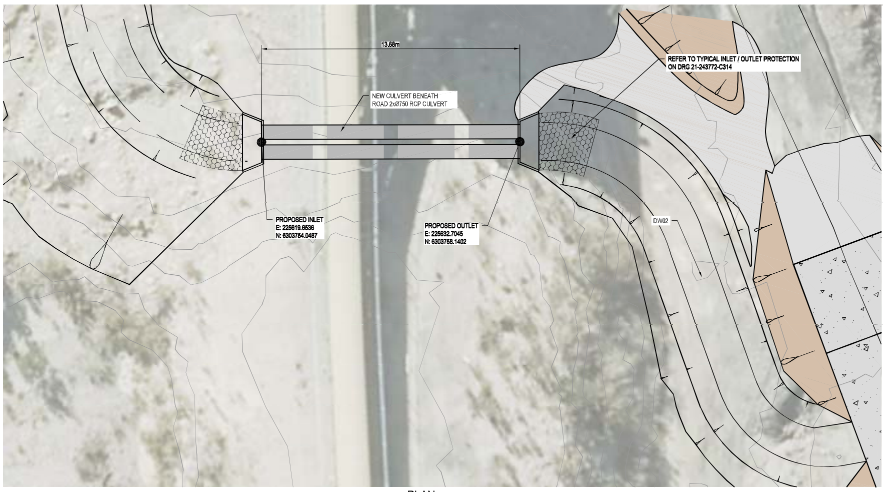
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **DIRTY WATER CULVERT DW01-A PLAN & ELEVATION**

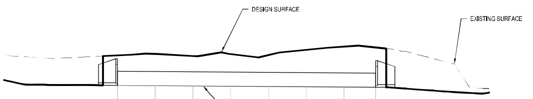
Original Size A1 Drawing No: **21-24377-C362** Rev: A

Plot Date: 30 January 2017 - 4:29 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C360 CULVERTS.dwg



PLAN
SCALE 1:100

SCALE 1:100 AT ORIGINAL SIZE



DATUM RL. 915.00

VERTICAL ALIGNMENT	L=13.68m G=-0.75%							
HORIZONTAL ALIGNMENT	L=13.68m							
FINISHED SURFACE LEVELS	918.59	918.67	918.56	918.66	918.61	918.89	919.06	919.02
LEVEL DIFFERENCE TO FSL CUT - / FILL +	-1.59	-1.69	-1.59	-1.70	-1.66	-1.96	-2.14	-2.11
PROGRESSIVE INVERT LEVEL	917.004	916.989	916.974	916.959	916.944	916.929	916.914	916.902
EXISTING SURFACE LEVEL	918.59	918.67	918.56	918.66	918.61	918.89	919.06	919.02
CHAINAGE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	13.68

LONGITUDINAL SECTION - CULVERT DW02-A
SCALE 1:1

NOTES:

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SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
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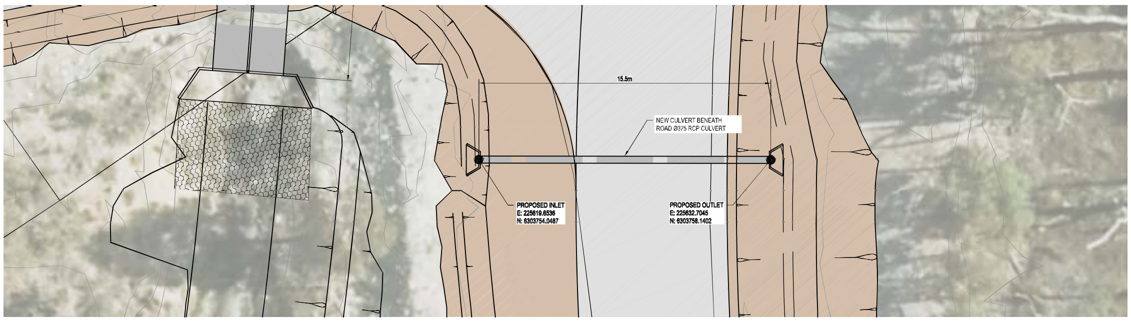
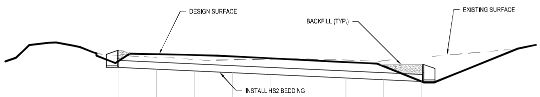
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **DIRTY WATER CULVERT DW02-A PLAN & ELEVATION**

Original Size A1 Drawing No: **21-24377-C363** Rev: A

Plot Date: 30 January 2017 - 4:29 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C360 CULVERTS.dwg



SCALE 1:100 AT ORIGINAL SIZE



DATUM RL. 905.00

VERTICAL ALIGNMENT	L=16.05m G=-4.67%								
HORIZONTAL ALIGNMENT	L=16.05m								
FINISHED SURFACE LEVELS	908.61	908.95	908.90	908.83	908.73	908.63	908.53	908.31	907.51
LEVEL DIFFERENCE TO FSL CUT - / FILL +	-0.36	-0.79	-0.84	-0.87	-0.86	-0.85	-0.85	-0.72	-0.01
PROGRESSIVE INVERT LEVEL	908.250	908.157	908.063	907.970	907.876	907.783	907.689	907.596	907.502
EXISTING SURFACE LEVEL	908.89	908.79	908.67	908.65	908.69	908.70	908.64	908.60	908.79
CHAINAGE	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00

LONGITUDINAL SECTION - CULVERT HR01-A
SCALE 1:1

NOTES:

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SCALE 1:100 AT ORIGINAL SIZE

No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B.	25.10.16

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Drafting Check D.GREEN | Design Check B. BATCHELDER
Approved (Project Director)
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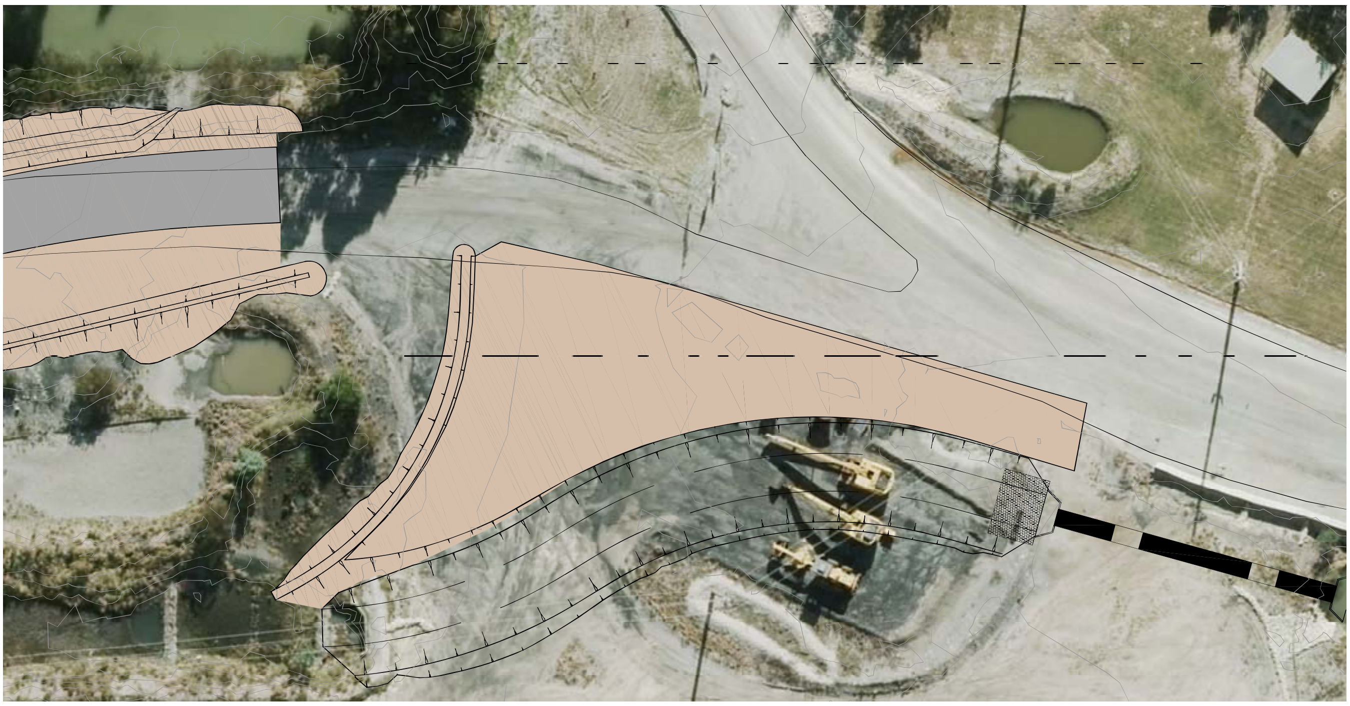
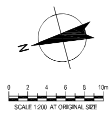
Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **HAUL ROAD CULVERT HR01 PLAN & ELEVATION**

Original Size A1 Drawing No: **21-24377-C364** Rev: A

Plot Date: 30 January 2017 - 4:29 PM Plotted by: Trish Etchells Cad File No: N:\AU\Newcastle\Projects\22\18584\Tech\responses\E-Transmit DWGs\E-Transmit DWGs\21-24377-C360 CULVERTS.dwg





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No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B	25.10.16

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Drafting Check	D.GREEN	Design Check	B. BATCHELDER
Approved (Project Director)			
Date			
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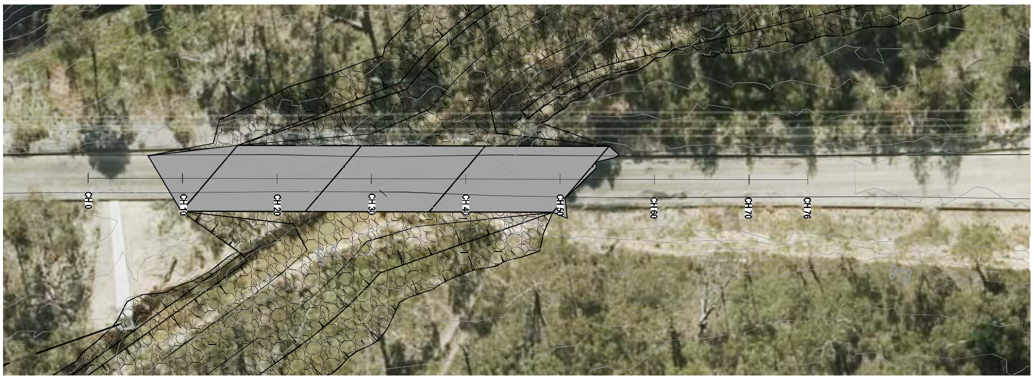
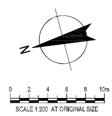
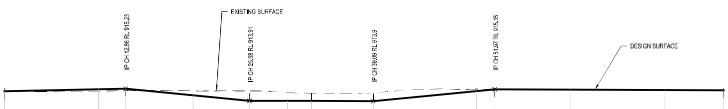
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title CAUSEWAY AU02
PLAN & ELEVATION

Original Size A1 Drawing No: 21-24377-C370 Rev: A







DATUM RL. 910.00

VERTICAL ALIGNMENT	L=12.86m G=2.2%	L=13.12m G=-10.05%	L=6.57m G=-0.14%	L=6.55m G=-0.14%	L=12.87m G=9.78%	L=24.27m G=-0.45%
HORIZONTAL ALIGNMENT	L=76.23m					

LEVEL DIFFERENCE CUT - / FILL +	0.01	0.20	0.23	-0.47	-1.06	-0.91	-0.82	-0.90	-0.22	0.00	0.04	-0.03	0.01
DESIGN SURFACE LEVEL	914.950	915.170	915.233	914.515	913.914	913.909	913.905	913.896	914.963	915.155	915.119	915.075	915.047
EXISTING SURFACE LEVEL	914.94	914.97	915.01	914.98	914.98	914.82	914.72	914.79	915.18	915.15	915.08	915.10	915.04
CHAINAGE	0.00	10.00	12.86	20.00	25.98	30.00	32.54	39.09	50.00	51.97	60.00	70.00	76.23

LONGITUDINAL SECTION - CULVERT AU02
SCALE 1:1

NOTES:

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No	Revision	Drawn	Job Manager	Project Director	Date
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B	25.10.16

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Drafting Check	D.GREEN	Design Check	B. BATCHELDER
Approved (Project Director)			
Date			
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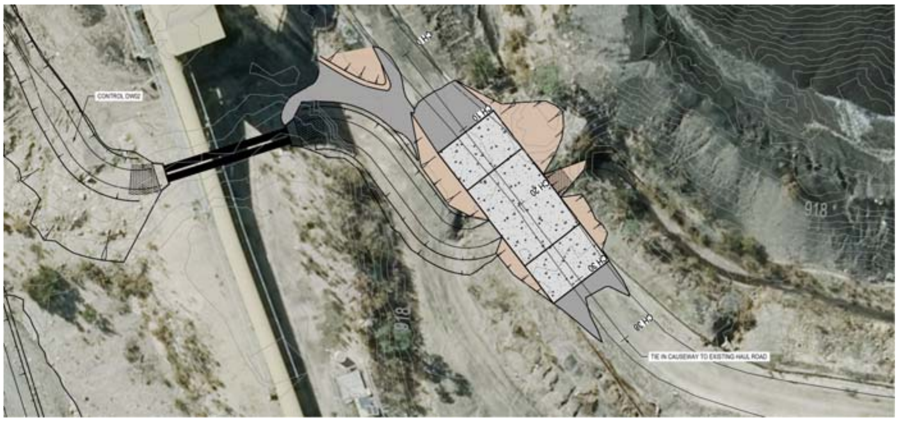
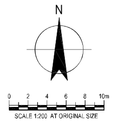
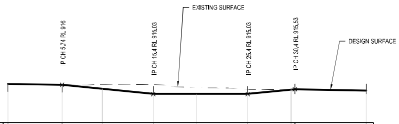
Client SPRINGVALE COAL -
Project DIRTY AND CLEAN WATER SEPARATION PLANS
Title CAUSEWAY AU02
PLAN & ELEVATION

Original Size A1 Drawing No: 21-24377-C371 Rev: A







DATUM RL. 912.00

VERTICAL ALIGNMENT	L=5.74m G=-1.63%	L=9.65m G=-10%		L=10m G=0%		L=5m G=10%	L=7.55m G=-1.87%	
HORIZONTAL ALIGNMENT	L=37.94m							
LEVEL DIFFERENCE CUT - / FILL +	-0.00	-0.06	-0.45	-0.97	-0.69	-0.51	0.02	-0.00
DESIGN SURFACE LEVEL	916.090	915.996	915.571	915.031	915.031	915.031	915.491	915.390
EXISTING SURFACE LEVEL	916.09	916.05	916.02	916.00	915.72	915.54	915.47	915.39
CHAINAGE	0.00	5.74	10.00	15.40	20.00	25.40	30.00	37.94

LONGITUDINAL SECTION - CULVERT AU03
SCALE 1:1

NOTES:
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No	Revision	Drawn	Job Manager	Project Director	Date
B	DRAWING UPDATED	M.C.	D.G.	B.B.	16.11.16
A	PRELIMINARY DESIGN	M.C.	D.G.	B.B	25.10.16

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Drafting Check	D.GREEN	Design Check	B. BATCHELDER
Approved (Project Director)			
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Client **SPRINGVALE COAL -**
Project **DIRTY AND CLEAN WATER SEPARATION PLANS**
Title **CAUSEWAY AU03**
PLAN & ELEVATION

Original Size **A1** **Drawing No: 21-24377-C370** **Rev: B**

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27 February 2017

Our ref: 2218584-65623
Your ref:

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Dear Nagindar

Modification for Water Treatment Plan Residuals
Water and Salt Balance Model Sensitivity

1 Background

Springvale Coal Pty Limited is seeking a modification (MOD 1) to State Significant Development consent SSD-5579 to address operational interactions with the proposed Springvale Water Treatment Project (SWTP). The modification is to allow for the receipt of residuals stream from the water treatment plant and emplacement within the existing reject emplacement area at the Springvale Coal Services site (SCSS).

A water and salt balance model was developed for the Coxs River catchment to assess the impact of the SWTP and the emplacement of residuals at the SCSS. The residuals stream was modelled using a maximum flow rate of 0.43 ML/day and maximum electrical conductivity (EC) of 2,500 µS/cm. These parameters were based on conservative estimates which have since been reviewed. The predicted volume of residuals is expected to range from 0.16 ML/day to 0.35 ML/day, with an EC between 1,100 µS/cm and 1,200 µS/cm.

This letter details the methodology and results of water and salt balance modelling for the Coxs River catchment to provide a sensitivity analysis of the parameters used to model the residuals stream from the SWTP to the SCSS.

2 Methodology

The water and salt balance model was developed as part of the Water Resources Impact Assessment for the Western Coal Services Project Modification 1. Note that this same model has been updated to assess the amended SWTP and considers the transfer of excess treated water from the water treatment plant to Thompsons Creek Reservoir. As a result, some modelling predictions will vary from those presented in the Western Coal Services Project Modification 1 impact assessment. However, this does not affect results for Wangcol Creek catchment.

A number of scenarios were modelled with varying flow and EC for the residuals stream, as shown in Table 2-1. Note that Scenario 1 is the same as the results presented in the Western Coal Services Project Modification 1 and amended SWTP impact assessments using the maximum flow and EC values.

Table 2-1 Modelling scenarios

Scenario	Flow (ML/day)	EC (µS/cm)
Scenario 1	0.43	2,500
Scenario 2	0.35	1,200

The following operational conditions were modelled, all with a 50% power generation requirement at Mount Piper Power Station:

- Existing conditions – based on site conditions in the year 2016.
- Future conditions – based on site conditions following the implementation of improvements to the clean water management system at the SCSS.
- Proposed conditions – based on site conditions following the commissioning of the SWTP and residuals emplacement at the SCSS.

3 Results

Average annual results of flow and EC are presented for the following locations in the Coxs River catchment:

1. LDP006 discharge to Wangcol Creek from the SCSS.
2. Wangcol Creek at the confluence with the discharge from LDP006.
3. Wangcol Creek at the confluence with the Coxs River.
4. Coxs River at the inflow to Lake Wallace.
5. Coxs River at the inflow to Lake Lyell.
6. Coxs River at the inflow to Lake Burragorang.

3.1 Scenario 1

Summaries of the change in average results between existing, future and proposed conditions for Scenario 1 are presented in Table 3-1, Table 3-2 and Table 3-3 for the water volume, salt load and EC respectively. This scenario modelled the residuals stream from the SWTP with the maximum flow rate of 0.43 ML/day and EC of 2,500 µS/cm.

Table 3-1 Summary of change in water volume results for Scenario 1

Location	Existing conditions (ML/year)	Future conditions (ML/year)	Proposed conditions (ML/year)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	848	441	570	-48%	-33%	29%
2	2,719	2,659	2,791	-2%	3%	5%
3	3,027	2,965	3,097	-2%	2%	4%
4	23,174	23,400	15,490	1%	-33%	-34%
5	33,616	33,826	25,848	1%	-23%	-24%
6	123,418	123,560	122,737	0%	-1%	-1%

Table 3-2 Summary of change in salt load results for Scenario 1

Location	Existing conditions (tonnes/year)	Future conditions (tonnes/year)	Proposed conditions (tonnes/year)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	1,521	1,107	1,446	-27%	-5%	31%
2	1,815	1,553	1,892	-14%	4%	22%
3	1,838	1,575	1,915	-14%	4%	22%
4	10,221	10,174	4,008	0%	-61%	-61%
5	11,391	11,334	5,306	-1%	-53%	-53%
6	14,315	14,305	12,630	0%	-12%	-12%

Table 3-3 Summary of change in electrical conductivity results for Scenario 1

Location	Existing conditions (µS/cm)	Future conditions (µS/cm)	Proposed conditions (µS/cm)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	2,680	3,750	3,790	40%	41%	1%
2	1,000	870	1,010	-13%	1%	16%
3	910	790	920	-13%	1%	16%
4	660	650	390	-2%	-41%	-40%
5	510	500	310	-2%	-39%	-38%
6	170	170	150	0%	-12%	-12%

As shown in Table 3-1, the emplacement of residuals at the SCSS was modelled to increase LDP006 discharge by 29% compared to future conditions. However, the increase in LDP006 discharge is compensated by the installation of clean water diversions at the site, with an overall decrease in LDP006 discharge of 33% when compared to existing conditions.

Flow is increased slightly in Wangcol Creek under proposed conditions by 3% and 5% at the confluence with the discharge from LDP006 compared to existing and future conditions respectively and by 2% and 4% at the confluence with the Coxs River compared to existing and future conditions respectively.

The results for proposed conditions compared to existing and future conditions indicate a decrease in inflows to Lake Wallace of up to 34% and to Lake Lyell of up to 24%. This is due to the commencement of the SWTP, which involves the cessation of discharges from Springvale Mine's LDP009 to the catchment, with mine water make transferred to the SWTP for use at Mount Piper Power Station.

The salt load of LDP006 discharges under future and proposed conditions was predicted to decrease by 27% and 5% respectively compared to existing conditions, as shown in Table 3-2. However, due to the associated decrease in water volume, the EC of LDP006 discharges was predicted to increase by up to 41% compared to existing conditions, as shown in Table 3-3. This was due to modelled improvements in the separation of the clean and dirty water management systems at the SCSS, resulting in clean water reporting to Wangcol Creek rather than LDP006. The impact of emplacing residuals from the SWTP at the SCSS under proposed conditions was modelled to increase the salt load at LDP006 by 31%, as shown in the comparison with future conditions, which resulted in a slight increase in EC of 1%.

The salt load and EC in Wangcol Creek was predicted by the water and salt balance modelling to decrease under future conditions compared to existing conditions, due to a reduction in salt yield from disturbed areas as they are rehabilitated and the future improvements in clean water management at the SCSS, with increase clean water contributing directly to Wangcol Creek rather than LDP006. The increase in EC modelled at LDP006 was predicted to increase the EC in Wangcol Creek by 16%

compared to future conditions. However, the changes to the clean water management system were found to mitigate the majority of this increase, with only a 1% increase in EC for proposed conditions compared to existing conditions.

The future changes to water management at SCSS was predicted to result in a negligible to slight decrease in the salt load and EC of the Coxs River at the inflow to Lake Wallace, Lake Lyell and Lake Burragorang compared to existing conditions. A more significant decrease in salt load and EC was observed under proposed conditions compared to both existing and future conditions. This occurred as a result of the SWTP under proposed conditions, with the treatment of mine water make using reverse osmosis processes to decrease EC and the reuse of this water at Mount Piper Power Station.

3.2 Scenario 2

Table 3-4, Table 3-5 and Table 3-6 present the changes in average results for existing, future and proposed conditions for Scenario 2 for water volume, salt load and EC respectively. This scenario modelled a reduced flow rate of 0.35 ML/day and reduced EC of 1,200 µS/cm for the residuals.

Table 3-4 Summary of change in water volume results for Scenario 2

Location	Existing conditions (ML/year)	Future conditions (ML/year)	Proposed conditions (ML/year)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	848	441	544	-48%	-36%	23%
2	2,719	2,659	2,766	-2%	2%	4%
3	3,027	2,965	3,072	-2%	1%	4%
4	23,174	23,400	15,465	1%	-33%	-34%
5	33,616	33,826	25,822	1%	-23%	-24%
6	123,418	123,560	122,727	0%	-1%	-1%

Table 3-5 Summary of change in salt load results for Scenario 2

Location	Existing conditions (tonnes/year)	Future conditions (tonnes/year)	Proposed conditions (tonnes/year)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	1,521	1,107	1,379	-27%	-9%	25%

Location	Existing conditions (tonnes/year)	Future conditions (tonnes/year)	Proposed conditions (tonnes/year)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
2	1,815	1,553	1,825	-14%	1%	18%
3	1,838	1,575	1,848	-14%	1%	17%
4	10,221	10,174	3,941	0%	-61%	-61%
5	11,391	11,334	5,246	-1%	-54%	-54%
6	14,315	14,305	12,606	0%	-12%	-12%

Table 3-6 Summary of change in electrical conductivity results for Scenario 2

Location	Existing conditions (µS/cm)	Future conditions (µS/cm)	Proposed conditions (µS/cm)	Change between		
				Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	2,680	3,750	3,780	40%	41%	1%
2	1,000	870	980	-13%	-2%	13%
3	910	790	900	-13%	-1%	14%
4	660	650	380	-2%	-42%	-42%
5	510	500	300	-2%	-41%	-40%
6	170	170	150	0%	-12%	-12%

Comparison of the results in Table 3-1 and Table 3-4 indicates that the reduced residuals flow rate from the SWTP to the SCSS was modelled to reduce LDP006 discharges slightly, by 25 ML/year on average. LDP006 discharges under proposed conditions compared to future conditions were predicted to increase by 23% (compared to 29% for Scenario 1). For proposed conditions compared to existing conditions, the overall decrease in LDP006 discharges was 36% for Scenario 2 (compared to a decrease of 33% for Scenario 1). The reduced residuals flow rate used in Scenario 2 was estimated to have a limited impact on the flow of Wangcol Creek compared to the results for Scenario 1, with no impact on results for the inflows to Lake Wallace and Lake Lyell.

The reduced flow rate and EC for the residuals stream modelled in Scenario 2 resulted in a reduced salt load for LDP006 discharges compared to Scenario 1, as shown in Table 3-5, and a corresponding decrease in EC of 10 µS/cm, as shown in Table 3-6. The EC of Wangcol Creek under proposed conditions compared to existing conditions was modelled to decrease by between 1% and 2% for Scenario 2 (compared to an increase of 1% for Scenario 1). As with the results for water volume, modelling of Scenario 2 indicated limited sensitivity for the salt load and EC of inflows to Lake Wallace, Lake Lyell and Lake Burragorang.

Sincerely
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